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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

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THE FERTILIZER INDUSTRY OF THE PHILIPPINES

by

Bienvenido C. Alip

Philippines

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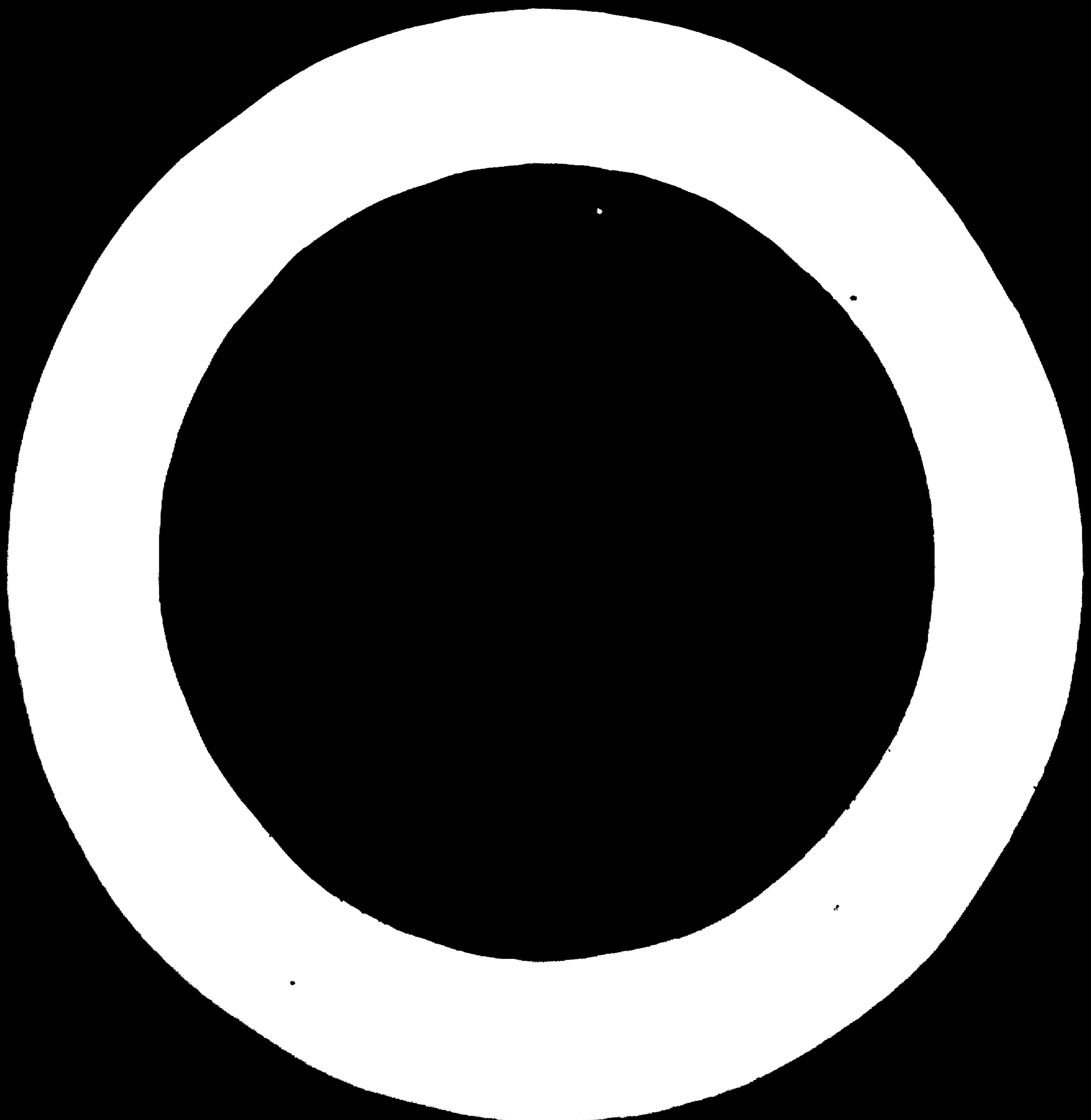

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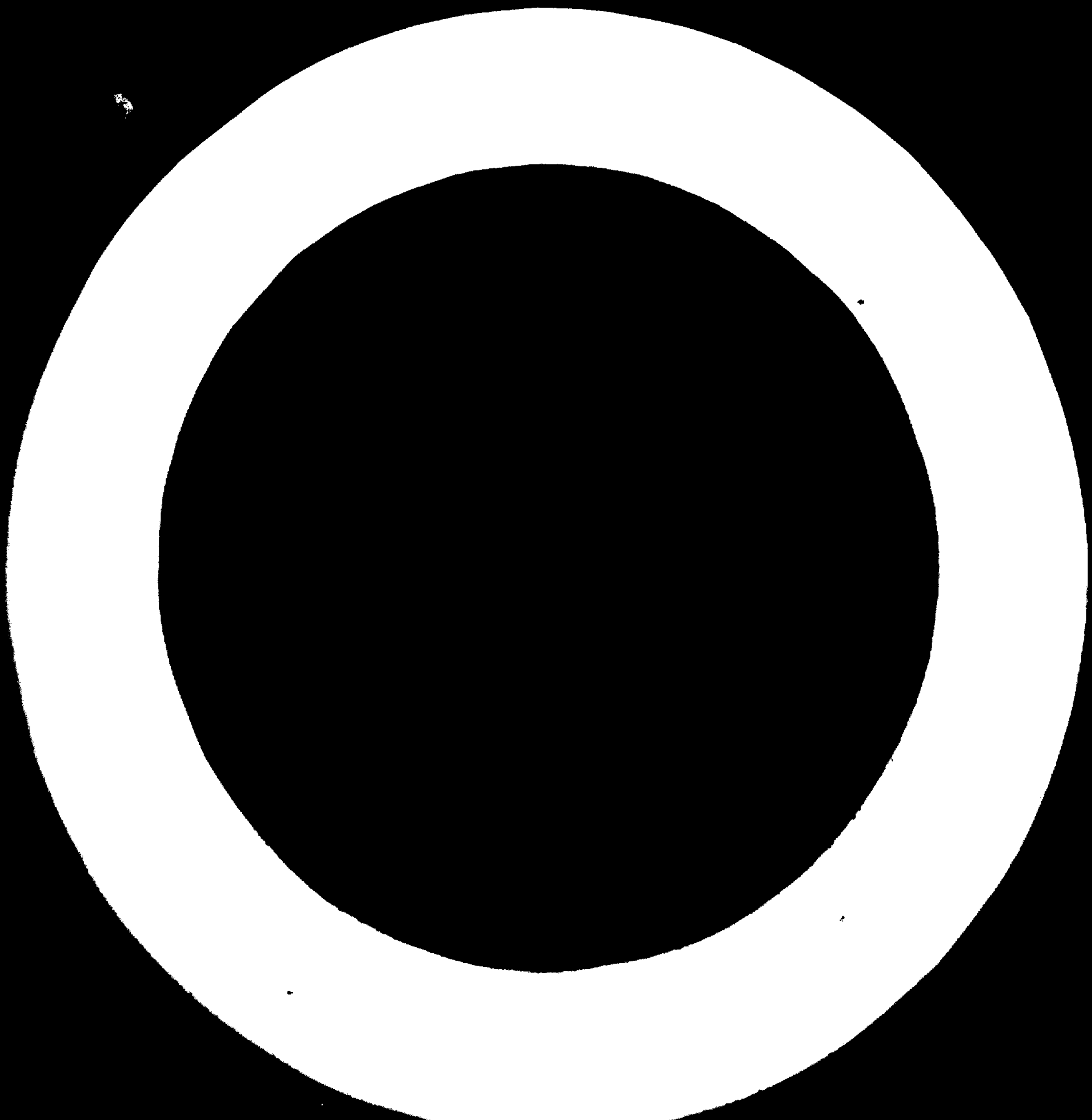

A. Historical Background

The fertilizer industry in the Philippines at present is composed of four chemical fertilizer plants, three organic fertilizer plants and several small importer-compounder fertilizer plants. The bulk of fertilizer production in the country is chemical fertilizer, roughly 90% of the total.

The four chemical fertilizer plants, with their respective locations, rated capacities (gross weight basis) and start of production are in Table 1 below.

Table 1. Chemical Fertilizer Producers

Name of Firm	Rated Capacity (metric tons)	Plant Site	Start of Operation
1. Atlas Fertilizer Corp.	162,000	Toledo, Cebu	1958
2. Maria Cristina Fertilizer and Chem. Corp.(Marcelo)	86,624	Iligan City	1958
3. Chemical Industries of the Philippines (Chemphil)	81,000	Taguig, Rizal	1960
4. Planters Fertilizer1/	390,000	Limay, Bataan	1966
Total	719,624		

Chemphil, Atlas and Planters produce all types of fertilizers (nitrogenous, phosphatic and potassic) while Marcelo produces only the nitrogenous type.

Domestic Production in 1970 The four local fertilizer plants produced 254,942 metric tons gross weight of fertilizers in 1970, as shown in the following table.

Table 2. Domestic Production in 1970 (metric tons)

Types of Fertilizer	ESFAC	ATLAS	CHEMPHIL	MARCELO	TOTAL
Ammonium Sulphate	-	38,942	3,772	34,344	77,063
Urea	21,647	-	-	-	21,647
Complex	128,196	12,615	-	-	141,011
Ammonia	-	-	-	10,706	10,706
Ammophos	-	2,378	-	-	2,378
Superphosphate	-	2,147	-	-	2,147
TOTAL	149,843	56,282	3,772	45,055	254,252

1/ Formerly ESSO Standard Fertilizer and Agricultural Chemical Co.(ESFAC) Acquired recently by the Sugar Planters Cooperative and Marketing Association (SPCMA)

Domestic Importation of Fertilizer in 1970

The Philippines imported 250,194 metric tons of various kinds of chemical fertilisers in 1970. These fertilizers came from Japan, Germany, Holland, United States, France, Belgium, England and Hongkong.

The breakdown of importations is as follows:

Ammonium sulphate	33,820 metric tons
Ammonium chloride	3,174
Ammonium phosphate	226
Urea	98,319
Superphosphate	1,739
Other phosphatic fertilisers	18,824
Potassium chloride	58,773
Potassium sulphate	2,091
Other potassic fertilisers	28,350
Complex fertilisers	2,396 + 156 drums
Other fertilisers n.e.s.	2,482
Total	250,194 metric tons

Table 3 gives a summary of the production and importation of fertilisers in 1966,1967,1968,1969.

Table 3: Production and Importation of Fertiliser Materials, 1966-69

Type of Fertilisers	1966 Prod. MT	1966 Import. MT	1967 Prod. MT	1967 Import. MT	1968 Prod. MT	1968 Import. MT	1969 Prod. MT	1969 Import. MT
Ammosulphate	42,449	34,689	80,426	96,763	43,586	53,743	77,446	39,257
Complex	46,580	—	77,800	—	180,255	—	161,247	—
Superphosphate	2,400	—	1,000	495	2,000	1,250	1,963	994
Urea	3,000	—	10,229	—	17,948	—	27,045	—
Mixed fertilisers	19,703	25	38,701	4,587	—	—	—	—
Ammonia	—	—	8,447	—	40,000	30,005	14,389	1,896
KCl	—	2,102	—	105	—	37,270	—	—
Ammophos	—	2,041	—	2,760	—	4,038	—	4,707
Total N		26,029		58,909		110,910		77,206
Total P_2O_5		10,303		13,159		28,093		25,608
Total K_2O		7,782		11,505		47,598		22,575

Manufacturing Processes in the Existing Plants

The various processes involved in the existing plants in the country and their respective products are the following:

1. Maria Cristina Fertiliser Corp. (Marcelo)

a. Process for making anhydrous ammonia.- The feed (natural gas, liquefied petroleum gas or refinery gas) is first treated to remove sulfur compounds and other objectionable impurities, and to hydrogenate unsaturates to tolerable levels. The treating processes vary depending on the composition of the fee.

The treated feed is mixed with steam, heated, and fed to the primary reformer. Here the hydrocarbons react with steam in the presence of a nickel catalyst to form a mixture of hydrogen, carbon oxides, residual methane, and excess steam. The reformer is a specially designed fired heater with catalyst placed in parallel down-flow tubes. Conditions typical of recent designs are 250 psig and 1,400°F at the furnace outlet.

Next, the gas goes to the secondary reformer, an adiabatic fixed-bed reactor which also contains a nickel reforming catalysts.

Air is introduced at the inlet to provide nitrogen for the ammonia synthesis. The oxygen from the air is consumed by combustion reactions, which supply heat to reform most of the residual methane. The outlet temperature is 1,600°F.

After the secondary reforming, gas is cooled and fed to the shift converter, another fixed-bed catalyst reactor. Here most of the carbon monoxide reacts with steam to form carbon dioxide and more hydrogen. Shift converters typically operate in the range 650 to 850°F. New catalysts have recently become available, however, which permit operation at temperature as low as 400°F, where more complete conversion is attained because of more favorable equilibrium conditions.

The shift converter effluent is cooled and fed to a CO_2 absorber. The solvent for CO_2 removal can be selected from a variety of good commercially proven sovents, depending on the economics of a specific case. The more attractive solvents can be grouped as potassium carbonate solutions (with or without activators), organic solvents in which CO_2 has a high physical solubility, and organic bases. Monoethanolamine, an organic base with a long history of successful use, in many cases, still proves to be the most attractive solvent.

The final step in the preparation of the synthesis gas is methanation, the conversion of residual carbon oxides back to methane by reaction with hydrogen.

The purified synthesis gas from the methanator is a 3 to 1 mixture of hydrogen and nitrogen containing about 1% inerts--methane and argon. This gas is compressed to synthesis loop pressure, about 5,000 psig.

The hydrogen and nitrogen circulate through the loop and react in the synthesis converter to form ammonia. The reaction takes place in the presence of a promoted iron catalyst at the temperature of 750° to 950°F. The feed gas is heated to reaction temperatures by exchange with the effluent gas and by exchange through cooling tubes embedded in the catalyst.

The converter effluent is cooled to 100°F, at which point part of the ammonia product is condensed and separated. The gas from the primary separation is then boosted in pressure and combined with the fresh make-up gas. The inerts are bled from the system in a small purge stream.

The combined make-up and recycle gas is then chilled to 35°F, where most of the remaining ammonia is condensed and separated. The liquid ammonia from the two separators is combined and delivered to produce storage.

b. Ammonia sulphate manufacture.- Anhydrous ammonia and strong sulphuric acid are placed in continuous saturator/crystalliser units operating either under vacuum or atmospheric pressure.

The reaction is as follows:

$$2NH_3\ (g) + H_2SO_4\ (l) = (NH_4)_2SO_4\ (s) - 67,710\ cals/gram$$

Ammonia and sulphuric acid are introduced via a slurry recycle line, wherein they react the superheat the recirculating slurry which is subsequently flashed in the upper chamber at a vacuum generally about 55 cm hg. The loss of water in this zone supersaturates the slurry, which recirculates to the lower suspension vessel via an internal pipe and comes into contact with small crystalls and nuclei, therby inducing further crystal growth in terms of size rather than in number. The slurry is recycled thermo-dynamically and/or by an external pump, and as it is brought into contact with newly added reactants, the exothermic heat produced destroys undesirable nuclei and fines.

In most cases, crystals are recovered from ammonium sulphate slurry by recycling through continuous or automatic batch-type centrifugals wherein the product is screened and spin-dried before being conveyed to the drier. In some plants, continuous top-feed filters are used instead of centrifugals. For small outputs, top-feed filter driers can sometimes be employed with advantage, since the product can be separated, washed and dried in a singly machine.

2. Planters Products, Inc.

a) Urea production.- Carbon dioxide and anhydrous ammonia are combined at about 2840 psig to make urea. Ammonium carbamate is an intermediate reaction. Carbon dioxide, which also comes from the ammonia unit, is compressed in four stages to a design pressure of 2840 psig. Ammonia is raised to the same pressure through a direct displacement feed pump. These feedstocks first react in the orifice mixer along with the recycled ammonium carbamate. A large portion of the carbon dioxide is converted into ammonium carbamate in the mixer. The balance of carbon dioxide is all converted into ammonium carbamate in the reactor and 60 to 65 per cent of the ammonium carbamate is made into urea. The reaction is accomplished with an excess of ammonia.

Ammonium carbamate is decomposed in two stages and recycled to the reactor. The aqueous urea solution is concentrated and crystallized and the last traces ammonia are removed.

The urea crystal slurry contains 40 to 45 weight per cent when it enters the prethickener. After the crystals are separated from the slurry by centrifugal force and washed, they are dried through hot air. The pneumatic drying system takesthe crystals to the top of the prilling tower where they are remitted and sprayed downwards. The prills are already dry when they hit the bottom of the tower these are subsequently screened and set to product storage.

b) Normal superphosphate manufacture.- Normal superphosphate is made by acidulating ground phosphate rock with sulphuric acid. This is done in a cone-type reactor where the chemical reactions start and drop, as a fluid, to a ventilated den. As the chemical reactions continue in the den, the fluid becomes a porous solid. The mass is transferred from the den to the storage for curing.

c) Granulation Processes.- The raw materials for the granulation processes are ammonia, phosphoric acid, sulphuric acid, potash, and in some formulations, sand and sulphate of potash magnesia.

Ammonia may be received in the granulation unit as vapour from ammonia plant or as aqua ammonia from the storage tanks. In the case of aqua ammonia vapour is stripped and fed into the pre-neutraliser.

In some formulations where the required phosphoric acid is not enough to neutralise the required ammonia, sulphuric acid is added to complete the neutralisation. The slurry from the pre-neutraliser is fed to the granulator sometimes called ammoniator, where it is mixed with the recycled granules and the balance of the required ammonia. The product leaves the granulator in granule form and is passed through a drier and screened. The product size is coated, cooled, and sent to the product bins. The oversized products are crushed and, along with the undersized product, recycled to the granulator. Potash and sand are added at the granulator.

3. Atlas Fertiliser Corporation

a) Sulphuric acid plant.- Two identical units produce a total of 240 metric tons per day of sulphuric acid, 100 per cent basis. The plant is of a pyrite-burning contact process type and uses vanadium mass as catalyst.

Pyrites containing 45-48 per cent sulfur are roasted in a "Fluo-Solids" furnace and the dust laden gas containing SO_2 is cleaned by passing through cyclones, a wet scrubber and an electrostatic precipitator. The gas is diluted with air, passed through a drying tower, and then introduced into the catalyser heat-exchanger system to convert the SO_2 to SO_3. The SO_3 is absorbed in concentrated acid through a packed tower, to produce sulphuric acid.

b) Phosphoric acid plant.- Rock phosphate and sulphuric acid are metered and fed into a single, agitated St. Gobain reactor producing a slurry of phosphoric acid and gypsum. The slurry is filtered through a continuous Dorr-Oliver vacuum pan filter and washed counter-currently with water. The strongest acid (30% P_2O_5) is sent to storage as product.

c) Superphosphate plant.- To produce single superphosphate, sulphuric acid, rock phosphate and water are carefully metered and blended in a pug mixer producing a thick hot paste. This paste is continuously discharged in a slowly rotating "den" where the chemical reactions go nearly to completion and the paste hardens to relatively dry powder, which is sent to storage for curing.

To produce triple superphosphate, the process is exactly the same except that phosphoric acid is used in place of sulphuric acid, and no water is added

d) Complex fertiliser plant.- Sulphuric acid, phosphoric acid and ammonia are fed into a series of three St. Gobain reactors forming a slurry of ammonium sulphate and ammonium phosphate. The slurry overflows into a granulator and is blended with a dry recycle of single superphosphate, muriate of potash and fines. The mixture is then dried forming pellets, cooled and then screened. Only the well formed pellets are sent to storage as product while the fines are recycled. Oversized pellets are ground and join with the recycle.

The grade of fertiliser is determined by the proportions of the raw materials being fed and this may be varied into an infinite number of combinations. Analyses are carefully performed around the clock to assure uniformity of the fertiliser.

The main advantage of Atlas Fertilizer is the well defined fertiliser granules which make for easy handling and uniform quality.

e) Ammonium sulphate plant.- Aqua ammonia, anhydrous ammonia and sulphuric acid are carefully metered into a draft-tube baffle crystallizer (Swenson) and through constant agitation and recirculation large crystals of ammonium sulphate are formed and continuously withdrawn from the crystallizer as 50 per cent solids in the product slurry. The big crystals are separated by means of a centrifuge, dried and sent to storage as the final product. This liquor is recycled to the crystalliser.

The plant has a capacity of 240 metric tons per day of large crystal ammonium sulphate (70% + 20 mesh) containing less than 1 per cent moisture. These large ammonium sulphate crystals make handling easier.

Organic fertilisers.- The three organic fertiliser plants with their respective locations, are:

1. Carabao Fertiliser Crop. - Makati, Rizal
2. General Fertiliser Corp. - San Juan, Rizal
3. Chemical Products Corp. - Bocaue, Bulacan

Carabao and General Fertiliser Corp. produce chemical compost fertiliser, i.e., fertiliser manufactured from mechanical mixing of chemical fertiliser and organic filler material like saw dust, fish meal, copra meal, etc. while Chemical produces organic fertiliser (tobacco residue) abtained as a by-product in the processing of tobacco waste for nicotine extraction.

B. Problems

1. Problem of production in existing plants.-

   a. The common problem in existing plants is the inadequate supply of imported raw materials. These are:

      1) Rock phosphate - Due to rigid specifications required (P_2O_5 content), all rock phosphates are imported (mostly from USA)

2) Sulphur - Although not used directly in fertiliser manufacture, sulphur is a basic raw material in sulphuric acid manufacture. Due to low quality of local elemental sulphur deposists, sulphur has to be imported.

b. Supply of spare parts - this is a very important problem in the maintenance and repair of plants due to limited foreign exchange available and the high cost of such spare parts as are needed. The time lag required in importing such items is also quite significant.

c. Plant capacity fails to match local demand on a product-by-product basis. Capacity utilisation over the years has not gone beyond 47 per cent.

d. Local manufacturers tend to look to the industrial market for an outlet for its products instead of producing fertiliser as their prime product.

2. Problem in construction of new plants

The construction of new plants for the manufacture of fertilisers already being produced in the country has not been encouraged by the national government due to the fact that over-all capacity utilisation of existing plants has not reached 50 per cent over the past years. This under-utilization has been brought about partly by competition from imported fertilisers as a result of

a) dumping of Japanese fertilizers thru the Reparations Commission (REPACOM), and

b) tax-free importation of cooperatives.

The Board of Investments (BOI), however, as the government agency directly in charge of granting incentives to prospective investors, has included in its Third Investment Priority Program (IPP) the manufacture of urea. Although there were interested applicants then, the establishment of such a plant was not pushed through. This may be accounted for by shortage of both local and foreign capital and also the high cost of fertiliser plants.

3. Problem of research/development and central planning

Although various government agencies, institutions of learning and the private sector are currently undertaking studies on fertiliser application in agriculture, there has, to date, no definite recommendation been given for the amount of fertiliser to be applied for a specific crop in a particular region. Recommendations given so far, have been generalisations.

Aside from the lack of research organisations supplying data on fertiliser requirements and consumption by type of fertiliser, by crop and by region, there are also no research and development organisations for the development of new fertilisers and new production processes. Engineering organisations for the planning, process development and design of new plants are also lacking.

It might be mentioned here that the individual fertilizer producers have joined together and put up the Fertilizer Institute of the Philippines for their common interests. The functions being serviced by the Institute are, however, rather limited.

4. Problem of importing fertilizers.-

Fertilizer importation into the Philippines is channeled mainly through co-operatives which are tax-free. Another source is through Japanese reparations by the Agricultural Credit Administration (ACA), a governmental agency.

Considering that local fertilizer manufacturers pay taxes on both their imported raw materials and finished products, the end result is that locally manufactured fertilizers reach the consumers at a much higher price compared to the tax-free imported fertilizer.

At present, however, imports of fertilizers, like other commodities, are restricted due to stringent Central Bank regualtions governing foreign exchange spending.

5. Problem of exporting fertilizers.-

To date, Philippine exports of fertilizers are negligible due to several contributory factors. To start with, because of economies of scale, fertilizers from other exporting countries offer too much competition to locally manufactured fertilizer products price-wise.

Another factor to be considered is the high cost of shipping. The Philippines has comparatively no bottoms to speak of. Would-be exporters therefore are at the mercy of foreign-owned shipping.

Then too there is the inadequate marketing information and marketing know-how on the part of Philippine would-be exporters.

6. Problem in consumption, marketing and distribution.-

Present fertilizer utilization by the Philippine agricultural sector still leaves much to be desired. Such usage, primarily concentrated in the more progressive areas of Central Luzon, Southern Tagalog and Western Visayas, are mainly directed to rice and sugar cane production. The rates of usage are more often than not below optimum levels. This situation may be attributed to a lack of appreciation by farmers of the benefits that can be derived from proper fertilizer usage, compounded by lack of incentives for them to intensify their production.

Another factor contributing in no uncertain terms to the low fertiliser usage by Philippine farmers is the lack of adequate credit facilities open to them. Although governmental agencies directly concerned with this problem like the Agricultural Credit Administration (ACA), Development Bank of the Philippines (DBP), and Philippine National Bank(PNB) all extend production loans, the funding of these loans is inadequate for all the credit needed. Also, many Rural Banks do not participate in the Agricultural Loan Fund (AGLF) scheme instituted by the Central Bank/Development Bank of the Philippines (CB/DBP), thus depriving end-users in the specific region concerned needed credit source. On the part of factories/dealers, they can not make the items available to the consumers at any given time due to insufficiency of capital by which they can pre-stock or hold large inventories.

Lack of suitable infra-structure is another factor abetting the low utilisation of fertilisers in the Philippines. The geographic condition of the country adversely affects the distribution and marketing of fertilisers.

Because of separated islands, poor, if not totally absent feeder roads in the provinces, and the frequent changes in modes of transport before the goods get to their destination, additional costs of handling are heavy. These costs are passed on ultimately to the end-users.

The distribution of fertilisers is carried out through various channels, namely:

a. By local manufacturing and marketing companies
   1. To appointed regional wholesaler or distributors
      a) sells direct to farmers
      b) sells through assigned dealers
         i) sells through sub-dealers
         ii) sells direct to farmers
   2. To appointed dealers
   3. To large or corporate farms
b. Distribution by private marketing co-operatives
   1. affiliated associations
   2. association planters-members
c. Distribution by the ACA (governmental agency)
   1. terminal warehouses
   2. FACOMAS (farmers co-operative marketing association)
   3. members

C. Solutions

a. Fertiliser consumption, marketing and distribution.-

Undertake more intensive promotional and educational work on fertiliser usage, as well as other phases of farm management such as proper time of planting, thorough land preparation, timely application of suitable herbicides, good water management, use of improved and selected seeds, etc. The profit-motive angle must also be considered.

To bring this about the number of personnel performing this type of work should be increased. Also, more training programmes should be instituted.

The extension of liberal credit to farmers and the construction and improvement of infra-structures (markets, transports, roads, irrigation systems, storage facilities) should be continued and intensified.

The establishment of farmers' co-operatives to help them secure more materials at less cost is also necessary.

The institution of a working arrangement between fertiliser producers/distributors in Luzon and Mindanao and Cebu in swapping their products in order to shorten product route in which their respective consumers have to wait for such products is also desirable.

D. Government Policy Relative to The Fertiliser Industry

The importance of fertiliser in the life of the nation has had a bearing on past government policies on price, credit, importation and investment in new fertiliser plants.

Some such policies of the government are as follows:

1. The government pioneered in the manufacture of fertiliser by putting up the first fertiliser plant in the country in 1951. This plant subsequently was acquired by Marcelo in 1960.
2. The government also subsidized fertiliser sales in varying degrees since 1956. Although such subsidies stimulated fertiliser demand, it also created difficulties for the local fertiliser manufacturers.
3. Various Republic Acts from 1956 to 1964 passed by the legislature provided a subsidy of about 50 per cent to farmers' co-operatives and to rice and corn farmers during the said period. Specifically, R.A. 3050 allowed farmers co-operatives to import fertiliser duty free for four years starting in 1961. Since this subsidy applied only to imported fertiliser, the growth of the local industry was adversely affected.

4. On January 27, 1970, the Monetary Board approved Resolution No.162, with the end in view of lifting the local fertilizer industry from its doldrums. Vital sections of this were:

"2 To ban completely the importation of fertilizer produced locally in sufficient quantity, with comparable quality and at competitive prices, and to reclassify ammonium sulphate and N-P-K mixed fertilizer from the Essential Producer category to the Semi-Unclassified Producer category in the Central Bank statistical of commodities."

"3 To reclassify the basic raw materials used in the manufacture of fertilizer and not yet produced in sufficient quantity by local manufacturers, like aqua ammonia, from the Semi-Essential Producer category of the Essential Producer category."

Because of this ruling, the Standard Time Deposit (STD) required for the import of ammonium sulphate and N-P-K mixed fertilizers increased from 25 per cent to 125 per cent of value and lowered the STD for aqua ammonia from 75 per cent to 25 per cent. All of these, of course, became meaningless when CB circular 289 was announced less than one month later. The results of this effective develuation may probably be good for the local fertilizer industy, but bad for the farmers.

CB Circular 289 The immediate effect of the floating rate was to increase the prior of dollars, and, therefore, of imports by about 54 per cent. And yet, the price of the locally produced fertilizer increased by less than 54 per cent. This surely improved the competitive position of the local industry vis-à-vis the imports.

The Fertilizer Research and Development Act of 1971 A proposed piece of legislation for the establishment of the Philippine Fertilizer Research and Development Center for the promotion and development of the Fertilizer Industry of the Philippines, the advancement of fertilizer technology and allied industries.

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