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THE FERTILIZER INDUSTRY OF THAILAND[1/]

by

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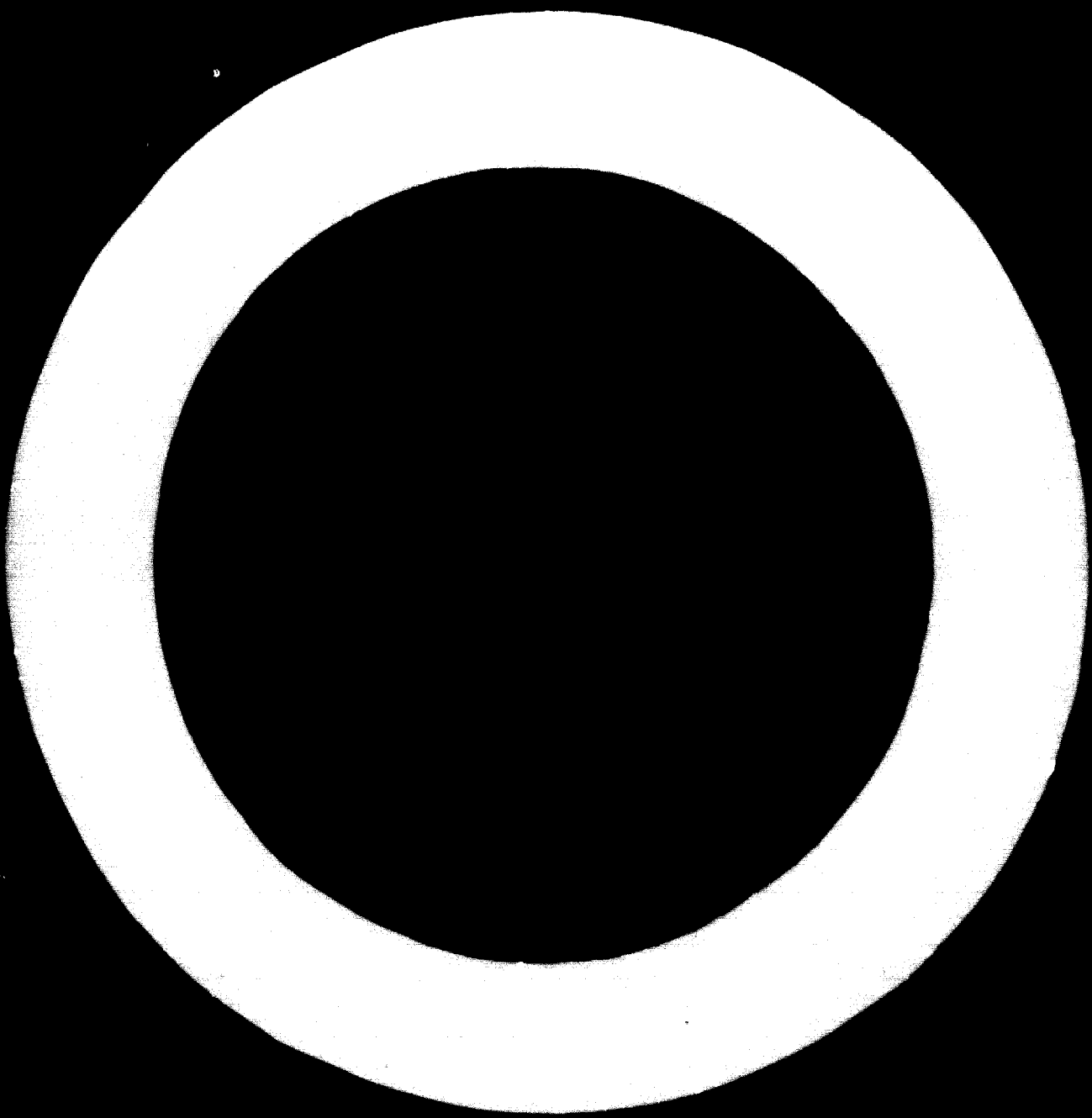


Thailand is primarily an agricultural country with over eighty percent of its population of over 30 million, deriving directly or indirectly their livelihoods on farm products. The land, situated in the tropic zone with temperature range of 50-100 degrees fahrenheit and 30-200 inches per year of rainfall, is very fertile and suitable for growing varieties of tropical crops. The country also earns foreign exchange to buy essential industrial commodities for her own need by exporting mainly her agricultural products to industrialised countries with the exception of tin and other minor minerals. This can be seen from the following export statistics of 1970:

1.	Rice	1,023,902	metric tons
2.	Rubber	253,000	" "
3.	Maize	1,329,179	" "
4.	Kenaf	243,937	" "
5.	Tapioca	1,021,099	" "

In 1970 total income from exporting agricultural product amounts to nearly 10,000 million baht or $ 450 million. Recently Thailand as well as other countries in the region that depend on exporting agricultural products suffer from the decline in prices of her exporting agricultural commodities such as rice, rubber, etc. Some soils have been exploited during a number of generations and its natural fertility has been depleted, resulting in the decline of productivity.

To counteract the declining value of its exports and to ensure higher income to its farming population, the government embarks on construction of irrigation network, and encourages the fertilizer industry by including it in the promoted industries, but until now with very little success. It is anticipated that only through extensive application of fertilisers, the agricultural productivity can be expanded to compensate the declining price as well as to provide the basis on which industry can continue to grow.

Present Fertilizer Consumption

Thailand is agriculturally divided into four areas namely: the north, the northeast, the central and the south. Farmers in the central grow mainly rice, because of soil suitability, with cassava and sugarcane in decreasing importance. The use of fertilizers is widespread and the centre of fertilizer trade is in Bangkok. In the north, farmers grow rice plus tobacco and other vegetables. Growing kenaf or Thai jute is widely practiced in the northeast, while maize, sorghum and castor seeds are planted on more fertile land in the northeast. The south concentrates mainly on rubber plantation and fruit trees.

Fertilizers have trickled in into Thailand for a long time, but only recently that large quantities of fertilizers has been imported into the country. This is vividly illustrated by the import figures from 1950-1970.

Year	Total Fertilizer Import
1950	9,354 metric tons
1955	24,280 " "
1960	51,000 " "
1965	88,000 " "
1970	200,000 " "

The annual consumption of fertilizers greater than 200,000 metric tons has been achieved since 1967. It has been recently estimated that 45% of total fertilizers is consumed in the central area, 31% in the northeast, 14% in the north and only 10% in the south. Fertilizer consumption cropwise is like this: 53% in rice growing, 16% in vegetable, 15.5% in fruit and 15% in other agricultural activities. The large increase in recent years has been responsible by government measures through extensive work and distribution system etc. In brief, all fertilizer consumption in Thailand is presently met by import with the exception of 25,000 tons/year of ammonium sulfate and 10,000 tons/year of urea from local production.

Trend of Fertilizer Use in Thailand

During the last ten years the fertilizer use pattern has changed very much. In 1950 the share of the N-group fertilizers is roughly about 50% of the total fertilizers used. It has been observed to decline gradually every year. In 1970 N-group fertilizer consumption is probably less than 15%.

The use of P-group and K-group has never been very great and probably the two groups together amount to less than 10%. Mixed fertilizers have gained favour with the farmers as evinced from the share of the market from 32% in 1950 to 85% in 1970. From statistical datas it can be seen that of all the mixed fertilisers used, ammonium phosphate is the main and amounts to 50% of the mixed fertilizers. Ammonium phosphate is officially recommended for rice which shows very good response to the fertilizers.

The government is also playing an important part in promoting the use of fertilizers, and from extensive experiments and distribution channels, the following formula is drawn up.

Rice mainfertilizer is	N - P 16 - 20 - 0 20 - 20	Cassava	N - P - K 15 - 15 -15
Rubber is	N-P-K-Mg 11-18-4-3	Tobacco	N - P - K 7 - 9 - 16

Potential Use of Fertilizers

Fertilizer consumption is dominated by rice which accounts roughly 53% of all fertilizer imports while the rest of fertilizers is used in rubber, tobacco, cassava and fruits. Very limited amounts of fertilizers have been applied to kenaf farming.

The fertilizer consumption in 1970 is roughly 30 times that of 1950 in tonnage or equivalent to 55 times of plant nutrient. If the area of cultivation in the country is 11 million hectares (for rice, cassava, tobacco, rubber and etc.) and the assumed fertilizers are evenly spread out on the cultivated land and then from the amount of fertilizers used in 1969, the average fertilizer consumption is only 26 kilograms or 10 kilograms of plant nutrient per hectare. This figure is to be compared favourably among Southeast Asian countries like Burma, Cambodia, Indonesia, Malaysia and the Philippines. It is still very low, when one compares this figure with that of Japan or China (Taiwan) or Korea, which countries use more than 100 kg/ha annually. Some surveies have been done recently which showed that Thailands' agriculture production cannot be increased very much without larger use of fertilizers per unit area of the cultivated land. Coupled with the information of good fertilizer response by most crops, there is a huge potential for fertilizer consumption in Thailand, and hence a large scale production of fertilizers is immediately needed. One can justify on the present fertilizer consumption alone an immediate need of a 600 tons per day ammonia plant to be converted into fertilizers. This capacity is already above the minimum economic size of ammonia plant. This plant will produce ammonia much cheaper than the present 100 tons/day plant, based on lignite.

I must stress again that agricultural production and fertilizer consumption in Thailand are interlocked and the need of larger scale production of fertilizers to fulfil the needs of its agricultural production has to be tackled without further delay.

Local Production of Fertilizers

Local production of fertilizers derive from two sources:

1) Bureau of Bangkok Municipal Fertilizer
2) Chemical Fertilizer Co. Ltd.

The Bureau of Bangkok Municipal Fertilizer built the first of four compost factories in 1959 in the metropolitan area of Bangkok. The main objective

of the factory is to get rid of municipal waste collection which is readily available at a daily rate of 3,700 cubic metres of raw garbage, rather than to produce fertilizers from garbage.

The product of this process is to convert garbage into compost which is excellent soil conditioner but of limited value as fertilizer.

This factory produces finally about 100 cubic metres of fine compost/day for distribution, or equivalent to 10,000 tons of compost annually. The nutrient value of the compost produce is very low, containing on average 2.33% N, 0.58% P_2O_5 and 1.01% K_2O.

It is clear from the nutrient value and amount of available compost produced, that this factory contributes very little to the fertilizers' need of the country.

The Mae Moh scheme of Chemical Fertilize Co. Ltd. was originated in the early sixties with a purpose to produce ammonium sulfate and urea from available lignite. The factory was completed in 1966, without the normal practice of considering other factors such as plant location, personnel, other raw materials, power and market. No records of thorough feasibility study of the project have ever been known. The prices of ammonium sulfate and urea at that time were unfortunately very high and it seemed that the project was economic. The idea was that in order to economic the factory, it should produce 200 tons of ammonium sulfate and 100 tons of urea a day. The factory since its operation in 1967 has had many teething troubles with the process and up to now it has only achieved at best 65% of its designed capacity.

Daily requirements of the plant are:

Lignite	270 tons/day
Sulfur	49 tons/day
Steam	120tons/day at 46 atm pressure
Electricity	11 MW at full load

The factory does not own the lignite deposit itself and has to buy from Lignite Authority at a price of 60 baht/ton or $3/ton. The actual cost of lignite as it contains a high percentage of undesirable components, which have to be disposed of, is therefore many times higher than the figure quoted above. Lignite should have the following specification:- moisture 38%, ash 12-15%, valatile matter 25% sulfur 2.5% and fixed carbon 25% with lignite ash melting point of 1300° C. It has been found that the quality of delivered lignite fluctuates widely. This is due to the nature

of lignite deposit. The gasfier in this plant is designed on a rigid specification of lignite. The low quality of lignite results in many failures and shut down of the gasification plant. It also lowers the capacity of the gasfier because it cannot be operated close to the optimum conditions.

Electricity and high pressure steam are bought from the Electricity Generating Authority power plant adjacent to the factory. It has two 6.5 MW generators. It is obvious that the total capacity of 12 Megawatt, for public use as well as the fertilizer factory is anyway inadequate. In the starting up of ammonia compressor motors, it requires high current for a short time. There have been numerous shut downs of the plant due to the inadequacy of the power plant and to high tension electrical failure from the Electricity Generating Authority. Electricity cost also takes a major share of production cost. The company is paying on average 0.27 baht per kilowatt hour or 1.3 U.S. cents. This is undoubtedly considered to be too high for the fertilizer production. High pressure steam requirement is also bought from the power plant which is also inconvenient to the factory. When there is unscheduled stoppage at the power house, the factory is automatically affected. It is clear that a better arrangement and synchronising the working schedule between the fertilizer company and the electricity plant is needed for efficient running of the factory.

Sulfur: Sulfur requirement of the factory cannot be met from the recovery of sulfur in lignite if the plant is running at full capacity. Then 44 ton/day of sulfur has to be imported through the port of Bangkok and transported 500 kilometers by rail up-country to Mae Moh. This results in higher cost of sulfur for ammonium sulfate production.

Remoteness of the factory causes many communication problems and delays the buildingup of personnel for proper maintenance and of necessary spare parts.

Cost of Production at Mae Moh

Fixed costs remain constant independent of output from the factory. It is dependent on the capital investment of the process. The process of making ammonia from lignite is expensive, and it is requiring several consecutive processing phases. It is generally accepted that this process is about double in investment cost in comparison to a factory based on naphtha. Mae Moh factory is no exception to this general observation.

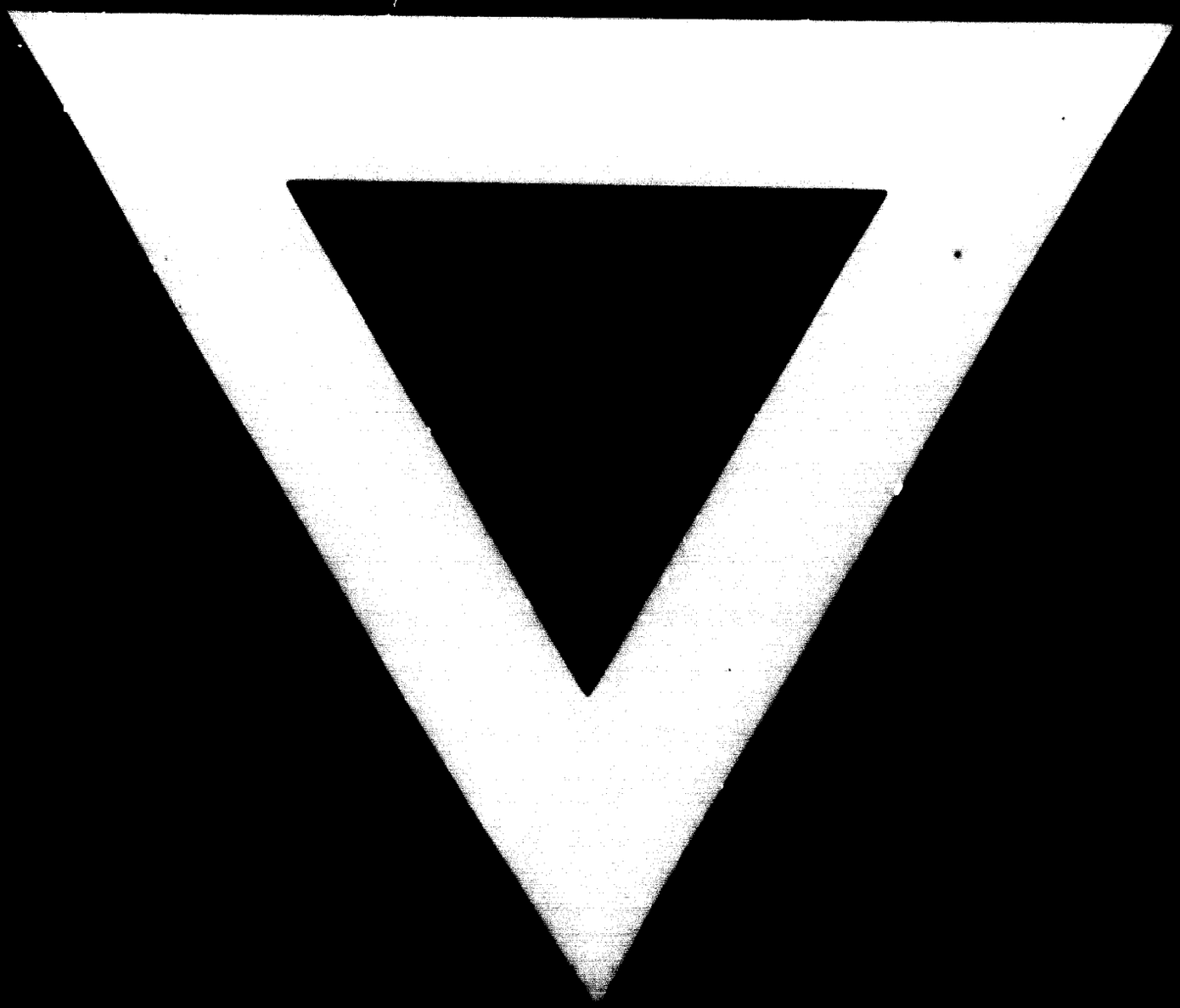
Variable costs vary according to the production of fertilizers and from report it is clear, the major cost items have been electricity, steam and lignite.

These three items amount to 50% of the total variable cost which is still on the high side.

In summary the Mae Moh factory has many difficulties, some of which can be technically solved while others are insoluble. The technical problems of the plant are listed here:

1. Variable quality of raw materials.
2. The irregularity of utilities, (water, electricity, steam etc).
3. High turnover ratio of professional staff.
4. Difficulty of spare parts procurement.

In ending my brief description of the chemical fertilizer production, I am adding a few lines of facts concerning the large scale production of fertilisers in Thailand. Raw materials needed for such a scheme (e.g. potassium salts, phosphate rock, and material for hydrogen production) have not been fully explored. Bulk importation of them has to be envisaged in any immediate plan of industrialization until local production is proved economic.



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