CHEMICAL FERTILIZER INDUSTRY IN INDIA

by

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INTRODUCTION

The rate of use of chemical fertilizers in enhancing crop yields is gaining increasing importance. Controversy over the relative merits of organic manures and chemical fertilizers no longer restrains the use of fertilizers. With tremendous scientific advancement in the field of technology during the past century, the fertilizer industry has attained a primary importance in agriculture.

The general objective of this study was to determine the progress made by the fertilizer industry in India since its effective start in 1951. The fertilizer industry is of significant importance in the development of the Indian economy. India is primarily an agricultural country and had a total area of 338.7 million acres[1] under cultivation in 1960-61. The population of India has been growing at an increasing rate during the past decade. It is, therefore, essential that agricultural production should be stepped up by various methods and mainly by the use of suitable fertilizers. Fertilizer is an important means of increasing the crop production to meet the increasing demand.

India has the problem of a deficit in the balance of payments which is responsible for the shortage of foreign exchange. In view of this, the development of the fertilizer industry is also limited by foreign exchange problem.* In order to feed the fresh additions to the population at the rate of 5 million[2] persons per year, it would be necessary to provide an additional

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[1]Indian Investment Centre, Basic facts of the Indian economy, p. 16.

[2]National Institute of Science of India, Anniversary address by the President, P. C. Mahalonobis, Jan. 5, 1958, p. 15.

*Explained in Appendix.

quantity of 700,000[1] tons of food grains every year, which would require Rs.450 crore[2] of foreign exchange to import the food grains over a period of 5 years. The cost can be reduced to Rs.135 crore of foreign exchange in a five year period if an additional quantity of 350,000 tons of ammonium sulphate is ordered from abroad every year, at least two years in advance of the crop season. The cost can be further reduced to Rs.125 crore (out of which the foreign exchange computed would be Rs.50 crore) over a five year period if a new fertilizer factory of 350,000 ton capacity is started every year. This would call for decisions four or five years ahead of the crop season concerned. The apportioned cost of a heavy machine building factory which would manufacture machinery in India to install every year a new fertilizer factory of 350,000 ton capacity would be, however, so small as Rs.12 or 15 crore with a foreign exchange component of perhaps Rs.8 or 10 crore. Such a decision would have to be made only once but eight or ten years in advance of the season in which fertilizer would be used. Thus the importance of the fertilizer industry cannot be over emphasized.

In view of the fact that India is in the initial stage of development, requiring huge amounts of equipment for industrial development, it may not be advisable to incur tremendous amounts of foreign exchange on import of food grains.

HISTORY OF THE INDUSTRY

The fertilizer industry is about 100 years old, and is one of the very important industries of the world, since it plays an important role in the

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[1] Ibid., p. 15.

[2] Ibid., p. 15.

world production of food, feed and fiber. In America 25%[1] of the farm production is attributed to the use of commercial fertilizers. The use of commercial fertilizers was introduced in most countries of the world about the beginning of this century.

Figure 1 shows the world's total consumption of fertilizers. It will be seen that world consumption rose from about 2 million metric tons around the beginning of this century until the time of the world economic depression in the 1930's. The curve shows a sharp decline during the early thirties, catches up again in 1933-34 and rises to a level of 9 million tons in 1938-39. At the close of the second world war, world consumption had fallen to a level of 7.5 million tons in 1945-46. The consumption rose again with a much steeper rate of growth, leading to an increase of about 280% in 15 years. Before 1910, the two main nitrogenous fertilizers used were sodium nitrate imported from the salt deposits of Chile, South America, and ammonium sulphate obtained as a by-product during the distillation of coal. Apart from these two, potassium nitrate produced in India by boiling wood ashes with soil extracts rich in nitrates was also known to be of greater fertility.

In 1910, the total world production of nitrogen was about half a million[2] tons; one-third of this production came from coal and two-thirds from Chilean nitrate. As the demand of nitrogen fertilizer increased in the subsequent years, many plants were built to produce nitrogen fertilizer from the nitrogen in the air. As a result of this, just before World War II, 63% of the world's supply of nitrogen came from the air.

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[1] Soil Management in India, p. 143.

[2] Ibid., p. 143.

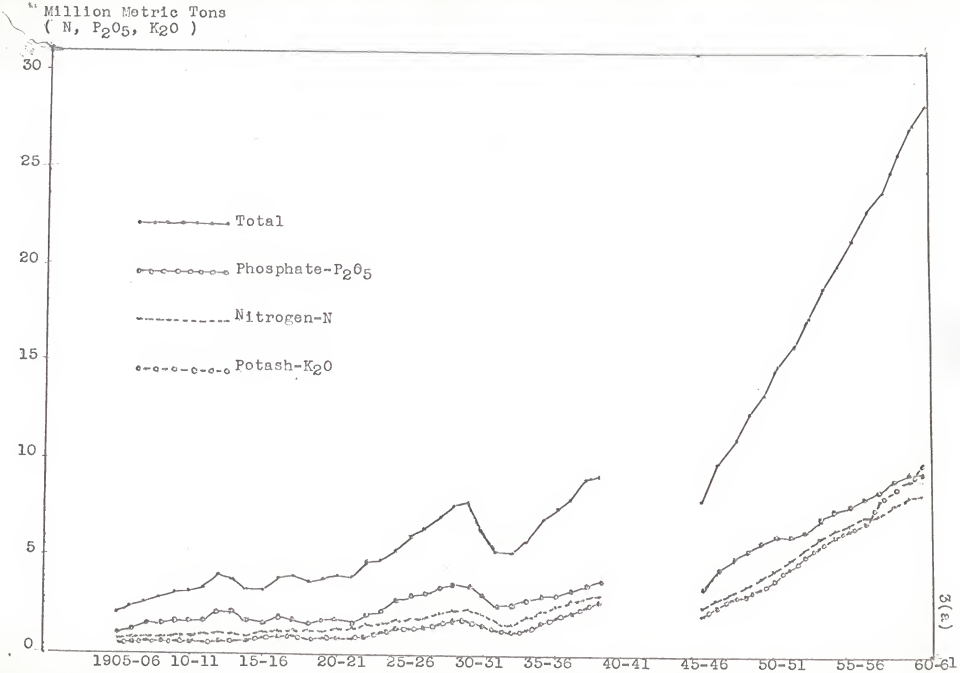

Fig. 1. Total world's consumption of nitrogen, phosphate and potash fertilizer.

Until 1920, ammonium sulphate was obtained as a by-product from the distillation of the coal. But with the discovery of the synthesis of ammonia, more than 85% of the world's requirements of nitrogen are now met by synthetic ammonium sulphate. This is the fertilizer now manufactured in India at Sindri Bihar State. The Sindri fertilizer factory, built by the state at a cost of about Rs.28 crore is under the management of the Sindri Fertilizers and Chemical Ltd. It went into production in October 1951.

Now we have seven factories producing synthetic ammonia and nitrogen fertilizers. These are: the Sindri Fertilizers, Nangal Fertilizers, Fertilizers and Chemical (Alwaye), E. I. D. parry (Ennore), Rour-Kela Fertilizers, Mysore Fertilizers and Chemicals and Shahu Chemicals (Varanasi). They produce a variety of fertilizers. Ammonium sulphate, ammonium sulphate nitrate (double salt), urea, ammonium chloride, calcium ammonium nitrate and ammonium phosphate. There are over two dozen units producing super phosphate.

Figure 1 shows the total world production of fertilizer (N, P_2O_5, K_2O), from 1905-06 to 1960-61.

PLANNING IN INDIA

Planning in India stems from the fact that without planning it is difficult to ensure the most effective use of the country's limited resources to promote economic development. Another reason is that the country's population has been growing at a rapid rate during the past decade. Unless the growth of the national product in real terms is made to increase at a faster rate than population, per capita income will not rise. The rate of growth of aggregate national income cannot be stepped up without conscious efforts through planning.

The Planning Commission which was set up soon after India's independence issued a draft plan in 1950 for India's development during the five year period from April 1951 through March 1956. After 1951, successive five year plans were drafted.

First Five Year Plan

The First Five Year Plan 1951-52 to 1955-56, through its emphasis on agriculture, irrigation, power and transport aimed at creating the base for more rapid economic and industrial advances in the future. During this plan period, production of synthetic nitrogen on a really large scale was started in India with the establishment of the first state-owned unit at Sindri in 1951. The initial capacity of the unit was 335,620 metric tons of ammonium sulphate or 73,260 metric tons of nutrient nitrogen, based on hydrogen derived from gassification of coke. Ammonia was converted to ammonium sulphate by reaction with gypsum.

A decision to establish a larger fertilizer - cum - heavy water plant at Nangal in the Punjab was also made during this plan period in 1954. The plant with a fertilizer capacity of 80,820 metric tons of 'N' in the form of ammonium nitrate went into production in 1961.

Table 1 shows that during the First Five Year Plan, the consumption of nitrogen increased from 50,892 metric tons in 1951-52 to 141,746 metric tons in 1955-56, which shows about threefold increase over 1951-52, whereas there was not any significant change in the production and consumption of phosphate and potash fertilizers.

Table 1. Production, imports and consumption of fertilizers during the First Five Year Plan, 1951-52 to 1955-56.

Year	Nitrogen			Phosphoric acid (P_2O_5)			Potash (K_2O)		
	Produced	Imported	Consumed	Produced	Imported	Consumed	Produced	Imported	Consumed
1951-52	23,134	27,758	50,892	9,120	1,230	10,350	440	6,744	7,184
1952-53	64,049	40,793	104,842	15,683	4,254	19,937	440	2,540	2,980
1953-54	66,248	18,616	84,864	13,669	504	14,173	132	5,131	5,265
1954-55	83,115	34,021	117,136	14,345*	1,090	15,435	160	10,040	10,200
1955-56	81,683	60,058	141,746	12,074	92	12,166	175	6,498	6,673

Source: FAO, An Annual Review of World Production and Consumption of Fertilizers, 1950-51 to 1956.

#Difference of consumption and production, it is not given in Annual Review.

*14,345 (Figure obtained from "Eastern Economist," Annual number 1964, p. 1380.

Second Five Year Plan

The Second Five Year Plan accorded high priority to industrialization and especially to the development of basic and heavy industries. A large expansion of public enterprise in the sphere of industrial and mineral development was envisioned.

In the Second Plan, the nitrogenous fertilizer industry was proposed to be expanded from a capacity of 85,000 tons[1] of nitrogen in 1955-56 to 382,000 tons in 1960-61, the production during this period being estimated to go up from 76,000 tons of nitrogen to 290,000 tons. In the same way phosphate fertilizer as P_2O_5 was proposed to be expanded from an existing capacity of 35,000 tons in 1955-56 to 120,000 tons in 1960-61, the real production of phosphate fertilizer during this period being estimated to go up from 20,000 tons to 120,000 tons. This expansion program was to be carried, virtually wholly in the public sector, partly through increased capacity and production at the Sindri and Alwaye Factories, and partly by the establishment of new units at Nangal, Rourkela and Neyveli. The actual progress achieved in the Second Plan was, however, quite behind schedule, the total installed capacity in 1960-61 being only 158,300 tons[2] in terms of nitrogen, yielding a production of 97,150 tons. In other words, the actual fell behind targets by about 60% in the case of capacity and about 70% in terms of output. This deficiency in production of fertilizer was caused by non-establishment of fertilizer plants in time and by a lag in

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[1]Government of India, Second Five Year Plan, p. 412.

[2]Eastern Economist, Annual number 1964, p. 1375.

achieving the production targets. Although the expansion of the Sindri fertilizer factory was completed in 1959, no additional production could be obtained from this factory within the Second Plan period for such reasons as "the low performance of the lean gas plant, shortages of coal of suitable quality, lack of spare parts as well as the coking characteristics and acidic nature of the double salt produced."[1] In implementing the expansion scheme of fertilizers and chemical (Travancore), there was a delay of two years, the first stage of expansion being completed only in 1962. The Nangal fertilizer factory was brought into partial production to the extent of one-third of capacity in February, 1961. The unit at Rourkela was also commissioned within the Second Plan period, but its output was negligible. As for the Neyveli fertilizer project, it was not only not completed or even implemented in the Second Plan period, but it has not gone into production even up to this time.

Tables 2, 3, and 4 show the total output in part and consumption of nitrogenous, phosphate and potash fertilizers during the Second Plan period 1956-57 to 1960-61. In all the tables showing outputs and imports, it is assumed that total fertilizer produced and imported has been consumed.

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[1]Eastern Economist, Annual number 1964, p. 1375.

Table 2. Output, imports and consumption of nitrogen fertilizer during Second Five Year Plan (1956-57 to 1960-61) in metric tons.

	1956-57	1957-58	1958-59	1959-60	1960-61
Output	80,820	80,838	80,835	87,297	109,932
Imports	84,229	97,900	99,103	142,943	173,156
Consumption	165,049	178,738	179,938	230,240	283,088

Source: FAO, Fertilizers, An annual review of world production, consumption and trade, pp. 73, 78 and 91.

Table 2a. Output, imports and consumption of nitrogenous fertilizers by kinds.

		Ammonium sulphate	Ammonium nitrate	Ammonium sulphate nitrate	Sodium nitrate	Urea	Complex fertilizers	Total
1956-57	Output	80,820	-	-	-	-	-	80,820
	Imports	63,205	1,064	4,614	1,318	14,028	-	84,229
	Consumption	144,025	1,064	4,614	1,318	14,028	-	165,049
1957-58	Output	80,838	-	-	-	-	-	80,838
	Imports	50,415	7,423	7,873	2,324	29,865	-	97,900
	Consumption	131,253	7,423	7,873	2,324	29,865	-	178,738
1958-59	Output	80,835	-	-	-	-	-	80,835
	Imports	46,762	3,673	10,300	2,413	35,915	1/ 40	99,103
	Consumption	127,597	3,673	10,300	2,413	35,915	45/ 40	179,938
1959-60	Output	75,370	-	8,251	-	2,626	1,050	87,297
	Imports	62,620	16,822	21,492	2,015	36,441	47/ 3,553	142,943
	Consumption	137,990	16,822	29,743	2,015	39,067	83/ 4,603	230,240
1960-61	Output	82,670	10,518	10,400	-	5,294	1,050	109,932
	Imports	85,901	16,453	12,873	2,271	55,459	199	173,156
	Consumption	168,571	26,971	23,273	2,271	60,753	1,249	283,088

Source: FAO, Fertilizers, An annual review of world production consumption and trade, 1962.

1/ Ammonium phosphate; 45/ Ammonium phosphate, 47/ and 83/ includes 1,302 metric tons of ammonium phosphate.

Table 3. Output, imports and consumption of phosphate fertilizer during Second Five Year Plan (1956-57 to 1960-61) in metric tons.

	1956-57	1957-58	1958-59	1959-60	1960-61
Output	17,596	25,478	30,720	58,415	57,851
Imports	147	477	3,881	7,931	199
Consumption	17,743	25,955	34,601	66,346	58,050

Source: FAO, Fertilizers, An annual review of world production, consumption and trade, pp. 99, 105 and 117.

Table 3a. Output, imports and consumption of phosphate fertilizers by kinds.

		Single super-phosphate	Concentrated super-phosphate	Complex fertilizers	Total
1956-57	Output	17,566	30	-	17,596
	Imports	147	-	-	147
	Consumption	17,713	30	-	17,743
1957-58	Output	25,478	-	-/	25,478
	Imports	474	-	1/3	477
	Consumption	25,952	-	23/3	25,955
1958-59	Output	30,720	-	-/	30,720
	Imports	793	2,756	42/332	3,881
	Consumption	31,513	2,756	28/332	34,601
1959-60	Output	51,415	-	7,000	58,415
	Imports	-	-	43/7,931	7,931
	Consumption	51,415	-	29/14,931	66,346
1960-61	Output	50,851	-	7,000	57,851
	Imports	-	-	199	199
	Consumption	50,851	-	7,199	58,050

Source: FAO, Fertilizers, An annual review of world production consumption and trade, 1962.

1/ and 23/ Di-ammonium phosphate; 42/ includes 174 metric tons of ammonium phosphate and 158 metric tons of di-ammonium phosphate; 43/ and 29/ includes 5,680 metric tons of ammonium phosphate.

Table 4. Output, imports and consumption of potash fertilizers during Second Five Year Plan (1956-57 to 1960-61) in metric tons.

	1956-57	1957-58	1958-59	1959-60	1960-61
Output	1,200	1,200	800	960	960
Imports	6,798	18,747	18,040	30,960	27,960
Consumption	7,998	19,947	18,840	31,920	28,920

Source: FAO, Fertilizers, An annual review of world production, consumption and trade, 1962.

Table 4a. Output, imports and consumption of potash fertilizers by kinds.

	Potassium sulphate	Muriate over 45% K_2O	Crude potash salts	Other potash fertilizers	Complex fertilizers
1956-57	893	5,905	-	-	-
1957-58	3,613	15,134	-	-	-
1958-59	3,059	14,981	-	-	-
1959-60	3,360	27,600	-	-	-
1960-61	5,760	22,200	-	-	-

Source: FAO, Fertilizers, An annual review of world production, consumption and trade, 1962, pp. 142.

Third Five Year Plan

Among its various aims, the Third Five Year Plan covering the period 1961-66 emphasizes the expansion of basic industries like steel, chemicals, etc. When the time came for fixing the targets for the third plan, the Government of India was driven to propose an installed capacity of one million[1] tons of nitrogenous fertilizer giving an output of 800,000 tons[2]. The

[1] Eastern Economist, Annual number 1964, p. 1375.

[2] Government of India, Third Five Year Plan, p. 65.

Government, in fact had done forward planning, during the second plan period, with a view to achieving a capacity of 750,000 tons of nitrogen by the middle of the third plan. Accordingly, it was decided in the latter part of the second plan to establish fertilizer projects at Visha Khapatnam and Kothagudium in Andhra Pradesh, Durgapur in West Bengal, Nahorkatiya in Assam, Hanumangarh in Rajasthan, Forakhpur in Uttar Pradesh and in Madhya Pradesh. A significant change in Government thinking was that instead of relying almost on the public* sector for the establishment of fertilizer industry, it decided to permit substantial development of fertilizer industry in the private** sector also.

In the actual course of events, most of the schemes, whether in the public sector or the private, have failed to progress according to schedule. The mid-term evaluation of the third plan, shows that as against the original capacity target of one million tons of nitrogen in 1965-66 at the end of the third plan, only a capacity of 640,000 tons[1] is likely to be achieved. Though it was planned well in advance during the second plan period that fertilizer capacity should be stepped up to 750,000 tons in terms of nitrogen by the middle of the third plan. At the present time the capacity is only 387,000 tons.

There are various reasons for the delay in implementations of the projects and not achieving the target production during the third plan period. One of the reasons is that most of the expansion of fertilizer industry has been allocated to the public sector, where most of the projects are behind schedule.

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*Public sector = where the major share in the investment of an enterprise is by the Government of the country.

**Private sector = where the investment is made by private individuals.

[1]Eastern Economist, Annual number 1964, p. 1376.

The following projects are behind schedule and will be completed on the date shown.

1. The Gorakhpur project will not be completed during the third plan and may start operating in 1966.

2. The Namrup project may start producing on a commercial scale towards the end of the third plan.

3. The Trombay project, scheduled to be commissioned in 1964, may not go into production before 1965.

4. The Neyveli project may be delayed similarly.

5. The Kobra project which was originally licensed in the private sector and has now been shifted to the public sector, will not be completed during the third plan.

6. The proposal of the West Bengal Government to set up a nitrogenous fertilizer plant at Durgapur has encountered the government's inability to find the necessary foreign exchange.

The above five plants will command on completion an installed capacity of 341,390 tons. As a result of delay in their implementation, the fertilizer production may not hit the target production.

Tables 5, 6, and 7 show the complete list of all the fertilizer producing plants in India, factory wise and production wise, which are already in production, licensed and yet to go into production and those which are planned and yet to be licensed. The data given in Table 9 shows that the actual amounts distributed (or consumed) during the first two years of the third plan period are quite below the target figures for the corresponding years.

Table 5. Installed capacity of fertilizer plants in India, factory wise and production wise as of July 31, 1963. (in production)

Name of factory	Ammonium sulphate N	Urea N	Ammonium sulphate nitrate N	Calcium ammonium nitrate N	Ammonium chloride N	Ammonium phosphate sulphate N	Ammonium phosphate sulphate P_2O_5	Nitro phos-phate	Super phos-phate	Di-calcium phosphate
Fertilizer Corporation of India, Ltd. Unit: Sindri	73,260	10,730	36,450	-	-	-	-	-	-	-
Fertilizer and Chemical, Travancore Ltd., Alwaye	20,930	-	-	-	2,030[1]	5,360[1]	6,700[1]	-	-	-
Mysore Chemical and Fertilizer Ltd., Mysore	1,380	-	-	-	-	-	-	-	-	-
Steel Factories - by-products	14,840	-	-	-	-	-	-	-	-	-
Fertilizer Corporation of India, Ltd., Unit: Rourkela	-	-	-	60,800	-	-	-	-	-	-
Fertilizer Corporation of India, Ltd., Unit: Nangal	-	-	-	82,480	-	-	-	-	-	-
New Central Jute Mills Co., Ltd. Varanasi	-	-	-	-	10,160[1]	-	-	-	-	-
E.I.D. - Perry Ltd., Ennore	-	-	-	-	-	8,240	10,300	-	-	-
Super phosphate factories	-	-	-	-	-	-	-	-	129,520	-
Total	110,410	10,730	36,450	143,360	12,190	13,600	17,000	-	129,520	-

Source: Eastern Economist, Annual number 1964, p. 1379.

[1]Also for expansion.

Table 6. Installed capacity of fertilizer plants in India, factory wise and production wise as of July 31, 1963. (licensed and yet to go into production)

Name of factory	Ammonium sulphate N	Urea N	Ammonium sulphate nitrate N	Calcium ammonium nitrate N	Ammonium chloride N	Ammonium phosphate sulphate N	Ammonium phosphate sulphate P_2O_5	Nitro-phosphate N	Nitro-phosphate P_2O_5	Super-phosphate	Di-calcium phosphate
Fertilizer Corporation of India Ltd., Unit: Namrup	20,600	24,200	-	-	-	-	-	-	-	-	-
Fertilizer and Chemicals, Travancore Ltd., Alwaye	20,930	-	-	-	40,320[2]	16,580[2]	20,730[2]	-	-	-	-
Rajensthen Fertilizers and Chemicals Corporation Ltd., Hanumangarh	81,580	-	-	-	-	-	-	-	-	-	-
Fertilizer Corporation of India Ltd., Unit: Rourkela	-	-	-	60,880[3]	-	-	-	-	-	-	-
Andhra Sugars Ltd., Kothagudium	-	80,470	-	-	-	-	-	-	-	-	-
Cormandel Fertilizers Pvt. Ltd., Vishakhapatnam	-	7,260	-	-	-	73,000	73,000	-	-	-	-
Gujarat State Fertilizer Co. Ltd., Baroda	-	40,640	-	-	-	56,900	56,000	-	-	-	-
Neyveli Fertilizers, Neyveli	-	71,120	-	-	-	-	-	-	-	-	-
Fertilizer Corporation of India Ltd., Unit: Trombay	-	45,000	-	-	-	-	-	45,000	45,000	-	-
Fertilizer Corporation of India Ltd., Unit: Gorakhpur	-	80,470	-	-	-	-	-	-	-	-	-

Table 6. cont.

Name of factory	Ammonium sulphate N	Urea N	Ammonium sulphate nitrate N	Calcium ammonium nitrate N	Ammonium chloride N	Ammonium phosphate sulphate N	Ammonium phosphate sulphate P_2O_5	Nitro-phosphate N	Nitro-phosphate P_2O_5	Super-phosphate	Di-calcium phosphate
West Bengal Fertilizer Project, Durgapur	-	59,010	-	-	-	-	-	-	-	-	-
New Central Jute Mills Co. Ltd., Varanasi	-	-	-	-	10,160[3]	-	-	-	-	-	-
E.I.D. - Perry Ltd., Ennore	-	-	-	-	-	87,403[3]	10,300[3]	-	-	-	-
Kotheri and Sons, Tuticorin	-	-	-	-	-	64,380	80,470	-	-	-	-
Superphosphate factories	-	-	-	-	-	-	-	-	-	58,030[2]	-
Di-calcium factories	-	-	-	-	-	-	-	-	-	-	11,630[2]
Total	123,110	408,170	-	60,880	14,480	219,100	241,400	45,000	45,000	58,030	11,630

Source: Eastern Economist, Annual number 1964, p. 1379.

Table 7. Installed capacity of fertilizer plants in India, factory wise and production wise as of July 31, 1963. (planned and yet to be licensed)

Name of factory	Ammonium sulphate N	Urea N	Ammonium sulphate nitrate N	Calcium ammonium nitrate N	Ammonium chloride N	Ammonium phosphate sulphate N	Ammonium phosphate sulphate P_2O_5	Nitro-phosphate N	Nitro-phosphate P_2O_5	Super-phos-phate	Di-calcium phos-phate
Mysore Fertilizer Project, Manglore	30,000	40,000	-	-	-	25,000	25,000	-	-	-	-
Fertilizer Corporation of India, Ltd., Unit: Korba	-	100,000	-	-	-	-	-	-	-	-	-
Total	30,000	140,000	-	-	-	25,000	25,000	-	-	-	-
Grand Total	263,520	558,900	36,450	204,240	26,670	257,700	283,400	45,000	45,000	187,550	11,630

Source: Eastern Economist, Annual number 1964, p. 1379.

Table 8. Fertilizer consumption targets for India during the Third Five Year Plan (1961-62 to 1965-66).

Year	Nitrogen (N) tons	Phosphoric acid P_2O_5 tons	Potash K_2O tons
1961-62	600,000	200,000	65,000
1962-63	700,000	275,000	85,000
1963-64	800,000	350,000	105,000
1964-65	900,000	425,000	125,000
1965-66	1,000,000	500,000	150,000

Source: H. R. Arakeri, G. V. Chalem, P. Satyanarayan, R. L. Donahue, Soil Management in India, p. 178.

Table 9. Production, imports and distribution of fertilizers during the Third Five Year Plan (1961-62 and 1962-63).

Year	Nitrogen			Phosphoric acid (P_2O_5)			Potash (K_2O)	
	Pro-duced	Im-ported	Distributed (consumed)	Pro-duced	Im-ported	Distributed (consumed)	Im-ported	Distributed (consumed)
1961-62	154,326	142,920	316,599	65,360	645	63,932	30,381	27,981
1962-63	194,178	229,462	426,364	83,280	7,959	92,510	44,276	36,503

Source: Eastern Economist, Annual number 1964, p. 1380.

The limiting factor in increasing consumption of nitrogen has been the supply, both from internal and external resources. The present production level of nitrogen indicates the production goal of 800,000 metric tons by the end of the third plan period may fall short considerably. The prospects for phosphate fertilizers production does not look good either. It is said that "we should be doing well if we succeeded in setting up a capacity of 500,000 tons."[1] Whereas according to targets by the end of the third plan, the consumption of phosphate fertilizer is supposed to be 500,000 tons, the

[1]Eastern Economist, Annual number 1964, p. 1383.

consumption of nitrogen fertilizer in India has increased from 50,892 metric tons in 1951-52 to 426,364 metric tons in 1962-63 which is an over eight times consumption increase.

As the plans for the Fourth Five Year Plan are under formulation, there is talk of a 2 million tons target of nitrogen, for which two new large factories would be needed every year. In case of phosphatic fertilizers, the suggested target is one million tons. Corresponding to these goals of installed capacities, the targets of output are placed at 1.75 million tons in the case of nitrogen and 800,000 tons for phosphatic fertilizers.

MANUFACTURING PROCESSES AND RAW MATERIALS USED AT DIFFERENT PLANTS

1. Trombay fertilizer project. Production of fertilizers from petroleum refinery gases has been planned at Trombay near Bombay. This unit will have a capacity of 90,000 tons of nitrogen and will use naptha in addition to refinery gases as feed-stock in almost equal proportions. The products to be manufactured are urea and nitro-phosphate. The factory will start production in 1964.

2. Assam fertilizer project. At Namrup, a synthetic nitrogen plant is under construction. It is based on associated gas from crude petroleum in the Assam oil fields. The over-all capacity of the plant as scheduled at present is 32,500 tons of nitrogen based on the production of 50,000 tons of urea and 50,000 tons of ammonium sulphate. Natural gas, which is being used here, constitutes one of the cheapest raw materials for the production of ammonia. A special feature of this factory is that it will include a gas fired steam power plant.

3. The Neyveli fertilizer project. Using the total re-cycle process, the Neyveli fertilizer project is designed to produce 152,000 tons of urea. The fertilizer plant based on lignite is an integral part of Neyveli lignite project.

4. Fertilizer Corporation of India, Unit: Rourkela. The Rourkela project, with a fertilizer capacity for 120,000 tons nitrogen, has been completed and commissioned in early 1963. The fertilizer being produced is calcium ammonium nitrate with 20% nitrogen. Because of the availability of large quantities of nitrogen as a product from the liquid air plant and surplus hydrogen from the coke ovens of Rourkela steel mills were available, setting up of a synthetic nitrogen plant was considered feasible and economical.

5. Gorakhpur fertilizer project. The capacity of the factory would be 80,000 tons of nitrogen per annum and the end product would be urea produced by the total re-cycle process. The raw material for this factory would be petroleum naptha from the refinery at Barauni which is at a distance of 200 miles from the fertilizer plant.

6. Varanasi fertilizer project. The Varanasi fertilizer factory has a production capacity of 10,000 tons of nitrogen in the form of ammonium chloride. Ammonium chloride produced in conjunction with soda ash in the modified solvey process is used in the manufacture of fertilizer in this case.

7. Visha Kapatnam fertilizer project. With a joint collaboration of Perry and Company with California Chemical Company and International Chemical Corporation of the U.S.A., the project will be carried out in private sector. The raw material for this factory would be naptha. It is proposed to produce under this project about 80,000 tons of fixed nitrogen per year in the form of 365,000 tons of ammonium phosphates of various grades and 16,500 tons of urea.

8. Rajasthan fertilizer project. With an annual capacity of 80,000 tons of nitrogen with ammonium sulphate as the end product, the project will be carried out in private sector. Gypsum supplies of the state will be utilized for the sulphate manufacture. Alternative feed stock for ammonia synthesis including lignite from palena are under consideration.

PROJECTION OF DEMAND OF FERTILIZER UP TO 1975-76

For assessing the fertilizer requirement of the country, a number of methods have been employed. One method was based on estimates of additional selected agricultural commodities to be obtained for the effective use of fertilizers. The work on projecting the demand and supply was done by the National Council of Applied Economic Research. The key factors influencing demand, viz., population and income are increasing rapidly. Therefore, the work was done by the Council to estimate the increase in population and per capita income till the end of the Fifth Five Year Plan in 1975-76. The demand of fertilizer depends on the total production of agricultural commodities, which in turn depends on population rise and per capita income. Hence, the importance of population projections needs hardly to be emphasized in connection with forecasts of demand for food grains over long periods of time. The population projections of the NCAER are based on the component method which takes into account the effect of the various factors on population. The estimates are presented in Table 10 below.

Table 10. Projected rural and urban population in India 1961 to 1976 (in millions).

Year	Rural	Urban	Total
1961	358.0	80.0	438.0
1966	396.0	93.0	489.0
1971	437.8	108.1	545.9
1976	477.4	125.6	603.0

Source: NCAER, Long term projections of demand for and supply of selected Agricultural Commodities, 1960-61 to 1975-76, April 1962. p. 30.

An individual's demand for a commodity depends upon his level of income in addition to other things like price fluctuations and consumer taste. The projections of demand made in this study are based on a set of assumptions regarding the factors that influence demand like per capita incomes and growth of population during the next 15 years. Thus, the growth of demand for agricultural commodities is envisaged to depend primarily on the expected rate of increase in per capita income and population. The percentage increases in per capita income over 1955-56 were of the 7, 26 and 48 respectively at the end of the Second, Third and Fourth plan periods. Table 11 presents the relevent data.

Table 11. Estimates of national income and derived per capita income over the projected period, 1960-61 to 1975-76 (in 1960-61 prices).

	1955-56	1960-61	1965-66	1970-71	1971-76
National income (in million rupees)	121,300	145,000	190,000	250,000	330,000-340,000
Population (in millions)	393	438	489	546	603
Per capita income (in rupees)	308.8	331.0	388.5	457.8	547.2
Percentage increase in per capita income over 1955-56	---	7	26	48	77

Source: NCAER, Long term projections of demand for and annual supply of selected Agricultural commodities 1960-61 to 1975-76, April 1962. p. 36.

The per capita demand for food grains, etc. over the period 1960-61 to 1975-76 was projected on the basis of the estimates of increase in per capita incomes and the projected income elasticities of demand. The year 1955-56 was chosen as the base period for projecting per capita consumption of different commodities. The model postulated for projections in this study assumes that all other factors, except changes in income, remain constant. The order of changes in per capita income had already been given, and on that basis demand is projected by the double lag model.[1]

[1] NCAER, Long term projections of demand for and annual supply of selected agricultural commodities 1960-61 to 1975-76, April 1962. p. 86.

$$Q_t = Q_o \left[1 + \frac{Y_t - Y_o}{Y_o}\right]^n$$

Q_t = per capita quantity demanded in the projected year (t),

Q_o = per capita consumed in the base year (o),

Y_t = per capita income in the projected year (t),

Y_o = per capita income in the base year (o), and

n = income elasticity of demand.

Thus, knowing the per capita consumption and corresponding population at the end of the Third, Fourth and Fifth plan periods, the order of demand for various agricultural commodities arrived at is given in Table 12.

Table 12.

Commodity	Unit	1960-61	1965-66	1970-71	1975-76
Food grains	Million tons	80.3	95.44	113.05	13.44
Oil seeds	Million tons	5.96	7.62	9.91	12.90
Cotton	Million bales	5.37	6.58	8.10	10.00
Tobacco	Thousand tons	279	335	406	493

Source: NCAER, Long term projections of demand and annaul supply of selected agricultural commodities 1960-61 to 1975-76, April 1962. p. 91.

After fixing the total demand of agricultural commodities in projected period up to 1975-76, the methodology adopted to project supply is based upon the fact that output is the product of area under cultivation and the corresponding yield per acre for any crop. The factors that influence the yield per acre are land, labor, capital and entrepreneurship, assuming that all other factors remain the same. The functional relationship for any crop between the input and output can be expressed as follows:[1]

[1] Ibid., p. 97.

O = f(A, I, C, E), where

O = output per acre

A = land (size of holding)

L = labor (number of men days)

C = Capital (irrigation, fertilizers, manures, improved seeds, etc.)

E = Entrepreneurship

The size of the holding might affect yield per acre but the available data about the relationship between the two is not conclusive. The supply of labor in India is abundant, and the Government introduced several schemes to promote labor skills. The factors of production which, in the main, determine the level of output, therefore, are capital and entrepreneur. The capital comprises such inputs as irrigation, manures, fertilizers, and improved seeds. The entrepreneur represents the farmers' attitudes and ability to adopt new techniques of development.

The average yield per acre for different crops in India is far below the corresponding yield in countries like U.S.A., U.S.S.R. and Japan. For example, the yield of rice in India is about 1,370 kg.[1] per hectare as compared to the average of 2,190 kg. for Asia and 4,630 kg. for Europe. The yield per acre of wheat in India is only about one half of that prevalent in U.S.A. and some other countries. The yield per acre over the projected period will have to be estimated by taking into account the impact of various agricultural inputs like fertilizers, manures, improved seeds, etc. For a given crop having the benefit of all the three inputs, the projected yield rate is estimated as follows:

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[1] Ibid., p. 154.

$$Y_t^1 = Y_o(1 + F_t + M_t + S_t)$$

where Y = yield per acre in the projected period t,

Y_o = yield per acre in the base period,

F_t = coefficient of response to fertilizer input in period t,

M_t = coefficient of response to manure input in period t, and

S_t = coefficient of response to improved seed input in period t.

The estimated coefficients of response are supposed to indicate the order of additional output that would result through the application of different inputs at the optimum level. The dosages of fertilizers and its response coefficients are presented in appendix Table 1 and 2.

On the basis of yield per acre, the area under cultivation for each crop was calculated. Multiplying the dosages of fertilizer per acre for each crop with the corresponding acres under cultivation, the fertilizer requirements were ascertained. Table 13 shows the future targets of consumption.

Table 13. Estimated availability (consumption) of all chemical fertilizers over the projected period, 1960-61 to 1975-76 (in thousand ton of plan food).

Particular	1960-61	1965-66	1970-71	1975-76
Nitrogenous fertilizer	300	1,000	2,000	2,800
Phosphate fertilizer	54	400	800	1,120
Potassic fertilizer	32	160	320	560

Source: NCAER. p. 132.

[1] Ibid., p. 161.

The fertilizer production level achieved by the end of third plan will have direct affect on the consumption targets of the fourth and fifth plan. The backlag in production during the second plan created a big difference between target and actual consumption during third plan. As a result, the consumption target of the fourth plan will be affected by this carry over shortages of the third plan. Figures 2 and 3 show the total production imports and targets of nitrogen and phosphorus fertilizers during 1951-52 and 1963-64.

FACTORS AFFECTING THE FERTILIZER INDUSTRY

The lower limit of plant size for economically producing fertilizer, nitrogen, for example, is put at around 30,000 tons[1] of nutrien per year. Only a few of the underdeveloped countries, starting this new industry, are now actually using that much capacity. Only in the case, where the ample supplies of raw materials and power supplies are available and at a cheap price, this capacity figure of 30,000 tons may be much lower. For instance, a rapidly expanding steel industry may make coke-oven gas or basic slag available; the discovery of petroleum or natural gas or the establishment of a large refinery may make raw materials available. At present, raw material is being supplied to fertilizer plants in India from all the sources mentioned above.

A second important key factor to be considered is the cost of production and in turn, the cost to the farmer who is going to use the fertilizer. If the cost of production is such that the farmer cannot afford to buy it, or

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[1]FAO, Fertilizer use Spearhead of Agricultural Development 1963, p. 37.

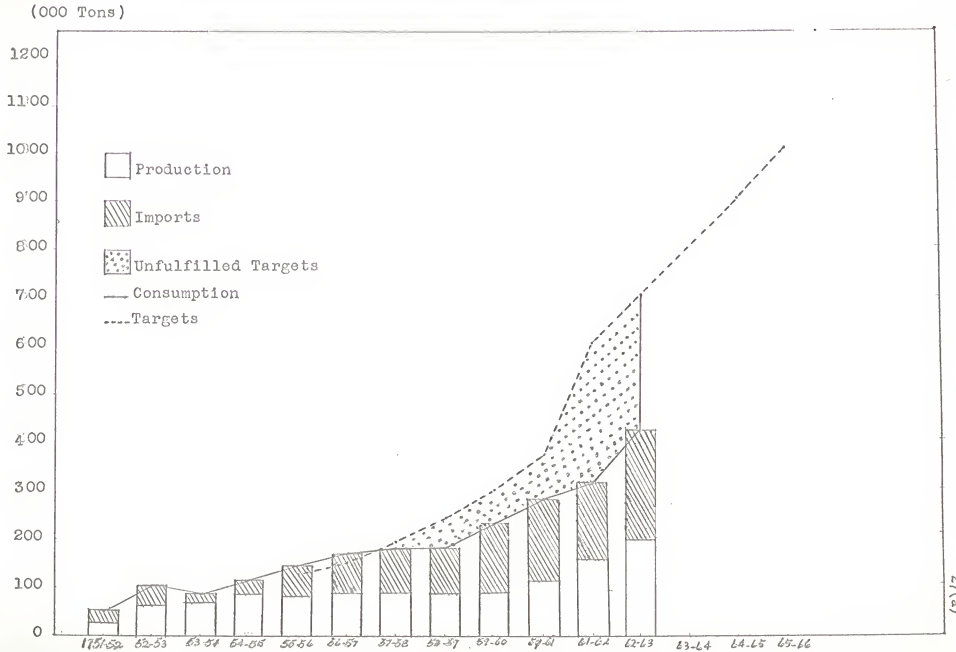

Fig. 2. Total production, imports, unfulfilled targets, consumption and targets of nitrogen fertilizer in India.

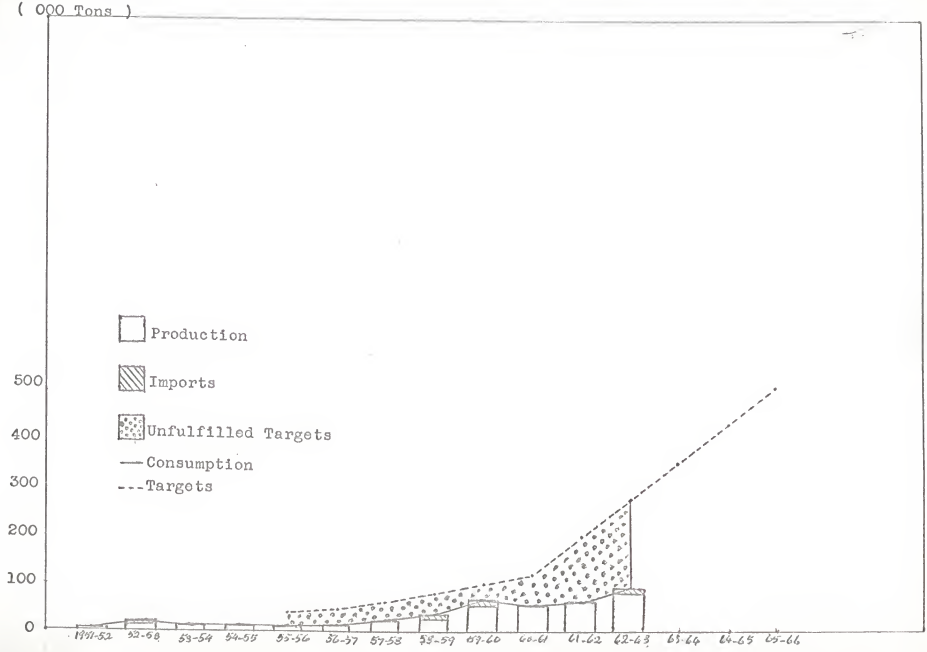

Fig. 3. Total production, imports, unfulfilled targets, consumption and targets of phosphate fertilizer in India.

if the local demand is so limited that the home manufactured fertilizer cannot be absorbed by the home market, excess production will have to be sold in highly competitive world markets. But this demand question does not arise in the case of India, where at present the total demand is much above the total supply level and is expected to remain the same for quite a few years.

(a) General Factors Affecting any Type of Plant.[1]

1) Climatic conditions, particularly maximum temperature and humidity.

2) Local (or national) facilities for fabrication or structural steel work and simple plant items such as tanks, low and medium pressure vessels, pipelines, etc.

3) Availability of skilled and semi-skilled labor for erection.

4) Availability of managerial staff and skilled and semi-skilled labor for operation and maintenance.

5) If local experience is not available, will overseas training be necessary?

6) Will custom charges be levied on imported plant and materials, etc?

(b) Factors Affecting any Given type of Plant.

1) End product to be manufactured.

2) Availability of raw materials.

3) Water and power supply (for manufacturing, as district from constructional requirements).

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[1] Ibid., p. 37.

(c) Factors Affecting Choice of Site.

1) Foundation conditions at site, whether piling for heavy plant loads will be necessary or not.

2) Drainage conditions. Will treatment of effluents before disposal be necessary?

3) State of development of immediate area of site.

4) State of communications for (i) materials to and from site; (ii) personnel.

5) Location of site in relation to markets.

6) Transportation facilities for raw materials to and from site.

7) Location of source of supply of main plant items in relation to site for the purpose of estimating sea freight and insurance, etc.

The general factors affecting the fertilizer industry mentioned above under (a), (b), and (c) are essential factors for consideration, because these factors directly determine the price of manufactured fertilizer. For instance, the consideration of climatic conditions becomes necessary due to various problems arising during storage of fertilizers. The storage of several fertilizers is a problem because of their hygroscopic nature. In India the extremes of temperature and varied climates render the storage problem more difficult. The safe storage of fertilizer depends upon (i) nature of fertilizer, (ii) climatic factors, (iii) kind of packing materials, (iv) type of storage structures, etc. In a similar way the consideration of all other factors mentioned above is necessary in selecting the site of a fertilizer plant for cheap production of fertilizer. These factors are of general nature and need consideration for any type of production.

Importance of Size of the Plant

For fertilizer plants in general, and for synthetic ammonia plants in particular, the size of the factory affects very much both capital cost per ton of installed capacity and also production cost. Comparing a factory for the production of, say, 100,000 tons[1] of nitrogen per year with one of 20,000 tons of nitrogen per year, the capital cost per ton of installed capacity of the smaller factory could well be double that of the larger. In other words, when a decision is being made for the establishment of a fertilizer plant, it always has to be in favor of big capacity plants. From this it follows that the component of foreign exchange requirement will also be high to import the machinery from outside the country, as long as the country itself is not in a position to manufacture it.

Finally it is of the utmost importance to ensure maximum utilization of the installed capacity to provide good management and effective organization and a high degree of technical skill.

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[1] Ibid., p. 38.

SUMMARY AND CONCLUSIONS

The rapid increase in the India's population raises serious problems of food supply, especially since the country is underdeveloped. The use of fertilizer will undoubtedly be one of the most important factors in supplying food for an increasing population. For centuries, India's soils have been continuously used without much of effort in maintaining soil fertility. But now there is a growing awareness of the role of fertilizers in agriculture production.

The principle fertilizers containing nitrogen are ammonium sulphate, ammonium nitrate, sodium nitrate, urea and material of animal and plant origin. Other nitrogen fertilizer of lesser importance in India are ammonium sulphate nitrate, ammonium chloride, calcium nitrate, potassium nitrate, calcium cyanamide and anhydrous ammonia.

The fertilizer industry in India has developed to a great extent in recent years. Soon after the independence, the planning commission was set up by the Government of India in March 1950, to prepare a plan for the most effective use of the country's resources. In July 1951, the planning commission issued a draft outline of the First Five Year Plan covering the period April 1951 to March 1956. After this successive five year plans were drafted which go up to 1975-76 at the end of fifth five year plan. The central objective of planning was defined as initiating "a process of development which will raise living standards and open out to the people new opportunities for a richer and more varied life."[1] By planned development, the Government of India has been trying to speed up the rate of growth. These five year plans are helping industries to attain their goals.

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[1] India 1962. Faridabad: Government of India Press, 1962, p. 175.

During the First Five Year Plan the consumption of nitrogenous fertilizers increased from about 50,892 metric tons in the years 1950-51 to 141,746 metric tons in 1955-56. In a similar way during the Second Five Year Plan the consumption has gone up from 165,049 metric tons in 1956-57 to 283,088 metric tons in 1960-61. This shows that cultivators are becoming more and more fertilizer conscious. At the same time there is a gradual increase in total imports of nitrogenous fertilizers from 27,758 metric tons imported in 1950-51 to 173,156 metric tons in 1960-61, due to inadequate internal production.

During the period 1956-57 to 1961-62 the world fertilizer capacity continued to expand steadily. Production and consumption increased by 33 and 30%[1] respectively. For the same period the production and consumption of all fertilizers in Asia have been increasing at a much faster rate than the world average. In other less developed countries and India, the tonnage of fertilizer produced and consumed is still very low compared to the land involved, but there is a growing awareness of the role of fertilizers in increasing agricultural production.

Among nitrogenous fertilizers such as ammonium sulphate, urea, calcium ammonium nitrate, ammonium sulphate nitrate, ammonium chloride, the preference of farmers which is indicated by the amount consumed is for ammonium sulphate. Ammonium sulphate was the first fertilizer to be introduced in Indian agriculture.

Among phosphate fertilizers such as single super phosphate, bone meal, hyper phosphates, ground rock phosphate, the largest consumption now is of single super phosphate. Muriate of potash and sulphate of potash are the only

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[1]FAO, Fertilizers, An annual review of world production, consumption and trade, 1962, p. 1.

two potash fertilizers being used at present. Both of these are imported. On the basis of cost, muriate of potash is cheaper than sulphate of potash and for that reason is being used to a comparatively larger extent.

There is a big gap between the level of production and consumption and seems no early chances of this gap being narrowed. In 1962-63 out of 426,364 tons of nitrogen fertilizer consumed, only less than half the amount 194,178 tons was being produced in India. Both public sector and private sector are to be blamed for failures in attaining the target level of production and for the absence of sufficient progress in the fertilizer industry.

The fertilizer industry is a capital intensive industry. Moreover, it not only calls for a great deal of finance, but also must have a good part of it in the form of foreign exchange, since there is need to import both equipment and know-how. A shortage in exchange and other things caused the delay in the development of this industry both by the public and private sectors. Difficult technical problems, delays in designing and setting up plants, in undertaking complementary developments, and in securing equipment and components may well extend the period of completion of the projects and cause delays in fulfilling the targets.

The impression emerges from these facts and figures, though not conclusive, that the supply of chemical fertilizers in India cannot keep pace with the increasing demand in the near future.

In this connection, fuller utilization of the existing fertilizer plants is warranted to meet the increasing demand, since it is already stated that the existing plants have not reached the maximum capacity. The dearth of technical know-how, as it is seen, will not be felt in the future, with the result that the existing plants and the plants that will be established in the

future could be better geared to give maximum production.

By the end of the fifth plan, it is estimated the foreign exchange problem will not be as acute as in the past. This will enable the government to release adequate exchange for importing more plants and other requirements. This will definitely contribute to the speed up of production of fertilizers to keep pace with the growing demand.

To meet the present inbalance in the demand and supply of fertilizers, the best alternative may lie in encouraging more and more the production of organic fertilizers side by side with chemical fertilizers which would lessen the burden of the problem. As a matter of fact, commendable steps are already underway in this direction.

A bright chance of setting up a big fertilizer plant is ahead, along with the proposed establishment of the biggest Bokaro steel plant in the immediate future. This will be a contributing factor for increasing the production, and thereby reducing the gap between supply and demand for fertilizers.

ACKNOWLEDGMENTS

I wish to express my sincere appreciation to Professor Paul M. Wallack, major instructor, for his encouragement and many helpful suggestions and criticisms in the preparation of this report.

I have a deep sense of gratitude for Dr. George F. Schrader for his valuable guidance.

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APPENDIX

FOREIGN EXCHANGE REQUIREMENTS DURING PLAN PERIODS

The investment and domestic savings curve are typical representative of an underdeveloped country. Figure 4 shows the national income, investment savings and consumption expenditure during 1950-51 to 1975-76. In the initial period of first five year plan the domestic savings exceeded investment. The gap between the investment and domestic savings represents foreign exchange requirements. From the figure it is clear that the gap during the third and fourth plan is widest and towards the end of the fifth plan it almost vanishes.

The First Five Year Plan was highly modest in its targets and resources. The public sector which had an actual outlay of 1960 crores[1] had the main burden of the plan and did not have much anxiety for external assistance in India had a foreign exchange reserve of 120 crores. India's requirement for the First Five Year Plan was Rs.180 crores, about 10% of the total public outlays. The direct foreign exchange component of the first plan was about Rs.400 crores[2]. In 1951-52 the first year of the first five year plan, the deficit was Rs.234 crores[3]. In subsequent years the position improved over all deficits of the balance of payment for the first plan period was Rs.318 crores. Of this Rs.196 crores was financed by external assistance, Rs.122 crores by draft in foreign exchange[4].

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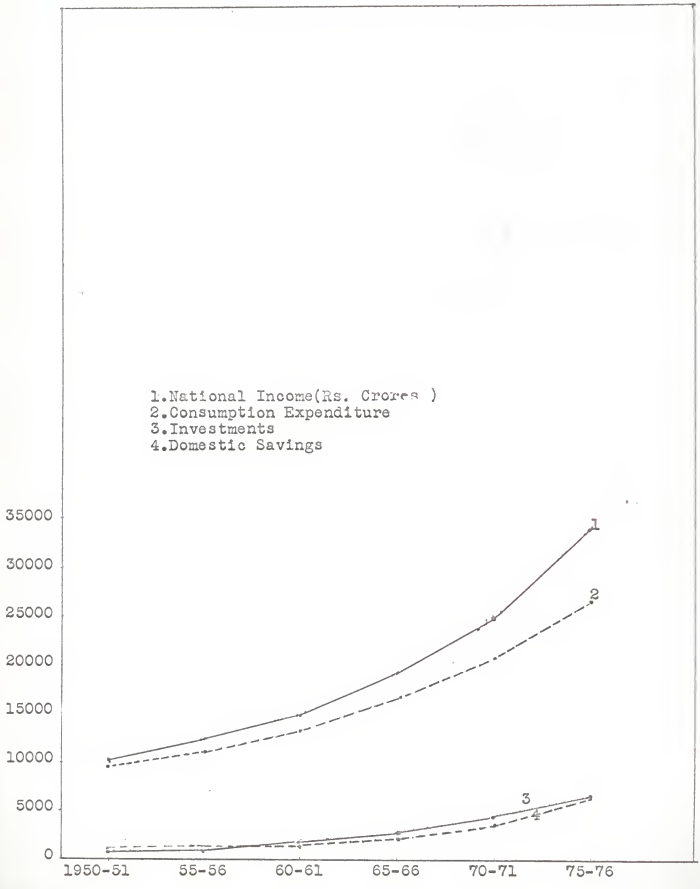
[1] Planning Commission, Government of India, Third Five Year Plan, p. 32.

[2] Ibid., p. 107

[3] Ibid., p. 107.

[4] Ibid., p. 108.


1.National Income(Rs. Crores)
2.Consumption Expenditure
3.Investments
4.Domestic Savings
35000
30000
25000
20000
15000
10000
5000
0
1950-51
55-56
60-61
65-66
70-71
75-76
1
2
3
4

The second plan envisaged an outlay of Rs.4600[1] crores, almost 2 1/2 times of the first plan for the public sector and an estimated additional investment of Rs.2400[2] crores (which rose to 3100[3] crores after the figures were revised) by the private sector. The foreign exchange requirement that could have been made available was estimated at Rs.800[4] crores.

The extreme importance of foreign exchange for an underdeveloped country can be well realized by examining the second plan. The balance of payment deficit over the second plan period was estimated in its draft to be of the order of Rs.1100[5] crores. The actual deficit came to Rs.2100[6] crores. The under estimation of foreign exchange requirements was well realized in the first year of the second plan itself when over-all deficit shot up to Rs.389 crores and next year to Rs.560 crores. Then the huge deficit obviously could not be met by the external assistance and the foreign reserve declined by Rs. 431[7] crores in these two years.

Such an adverse balance of payments situation during the second plan period was due to the under estimation of the planners for foreign exchange requirements of the plan, for failure of not sufficiently taking into account the growing import needs of a developing country which had to be imported.

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[1]Planning Commission, Government of India, Third Five Year Plan, p. 32.

[2]Planning Commission, Government of India, Second Five Year Plan, p. 92.

[3]Planning Commission, Government of India, Third Five Year Plan, p. 32.

[4]Planning Commission, Government of India, Second Five Year Plan, p. 78.

[5]Planning Commission, Government of India, Third Five Year Plan, p. 108.

[6]Ibid., p. 108.

[7]Ibid., p. 108.

The plan had envisaged a food grain import of 6 million tons while the actual figure came to 20 million tons.[1]

As a result of such acute foreign exchange problems raised during the second plan, careful consideration has been given to exchange requirements for the third plan. No project was included in the third plan unless its foreign exchange component was specifically known and the source found out.

Table 1. Expected doses of nutrients from fertilizers for different crops (in lbs. of plant food per acre).

Crop	Nitrogenous (N)	Phosphatic (P_2O_5)	Potassic (K_2O)
Rice	30	30	40
Wheat	30	30	-
Jowar	20	-	-
Bajra	20	-	-
Maize	20	20	-
Barley	20	-	-
Ragi	20	-	-
Gram	20	20	-
Tur	-	20	-
Groundnut	50	40	-
Rape and Mustard	-	40	-
Castor	50	-	-
Cotton	50	-	-
Tobacco	60	-	-

Source: NCAER, p. 242.

- = nil or negligible.

[1]Planning Commission, Third Five Year Plan, p. 109.

Table 2. Estimated average response coefficients of different crops to fertilizers over the projected period, 1960-61 to 1975-76 (in lbs. per lb. of plant food).

Fertilizer crop	1960-61	1965-66	1970-71	1975-76
Rice	7.65	8.10	8.55	9.00
Wheat	7.97	8.44	8.91	9.38
Jowar	8.32	8.81	9.30	9.79
Bajra	7.97	8.25	8.71	9.71
Maize	9.30	9.85	10.39	10.94
Barley	9.89	10.48	11.06	11.64
Ragi	10.62	11.25	11.88	12.50
Gram	7.00	7.41	7.82	8.23
Groundnut	10.20	10.80	11.40	12.00
Castor	5.36	5.67	5.98	6.30
Cotton	5.02	5.31	5.60	5.90
Tobacco	6.41	6.79	7.16	7.54
Phosphatic fertilizer (P_2O_5)				
Rice	5.36	5.67	5.98	6.30
Wheat	5.10	5.40	5.70	6.00
Maize	8.74	9.25	9.77	10.28
Gram	12.24	12.96	13.68	14.40
Tur	6.80	7.20	7.60	8.00
Groundnut	6.38	6.75	7.12	7.50
Rape and Mustard	8.50	9.00	9.50	10.00
Potassic fertilizers (K_2O)				
Rice	4.25	4.50	4.75	5.00
Groundnut	4.08	4.32	4.56	4.80

Source: NCAER, p. 243.

CHEMICAL FERTILIZER INDUSTRY IN INDIA

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AN ABSTRACT OF A MASTER'S REPORT

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1964

The chemical fertilizer industry in India was studied to evaluate the progress made by this industry since its effective start in 1951.

Three types of fertilizers, viz., nitrogenous, phosphatic and potash were, and are being used. The principal fertilizers containing nitrogen are ammonium sulphate, ammonium nitrate, sodium nitrate, urea and material of animal and plant origin. Ammonium sulphate is being used to the largest extent among the above mentioned fertilizers.

The efforts have been made to establish fertilizer industry in India in order to meet the domestic demand. Considerable importance was given to this industry since the start of India's First Five Year Plan starting in the year 1950-51.

During the First Five Year Plan the consumption of nitrogenous fertilizers increased from about 50,892 metric tons in the year 1950-51 to 141,746 metric tons in the year 1955-56. The Second Five Year Plan showed an increase in the consumption of nitrogenous fertilizers from 165,049 metric tons in 1956-57 to 283,088 metric tons in 1960-61. The estimated consumption of nitrogenous fertilizers will be one million tons in the year 1965-66, two million tons in 1970-71 and 2.8 million tons in 1975-76.

The super phosphate is being consumed to the largest extent among the phosphatic fertilizers, viz., super phosphate, bone meal, hyper phosphate and ground rock phosphate.

Muriate of potash and sulphate of potash are the only two potash fertilizers being used at present. Both of these fertilizers are being imported. The muriate of potash is cheaper than sulphate of potash, and so is being used to a comparatively larger extent.

There were nine fertilizer plants in production by July 31, 1963. Sixteen had been licensed and were yet to go into production and two more were under consideration to be licensed.

There is a big gap at present between the level of production and consumption and seems no early chances of this being narrowed. Considering the importance of this industry in the development of the economy, it is obvious that the Government of India needs to pay continuous and greater attention towards the development of this industry.