

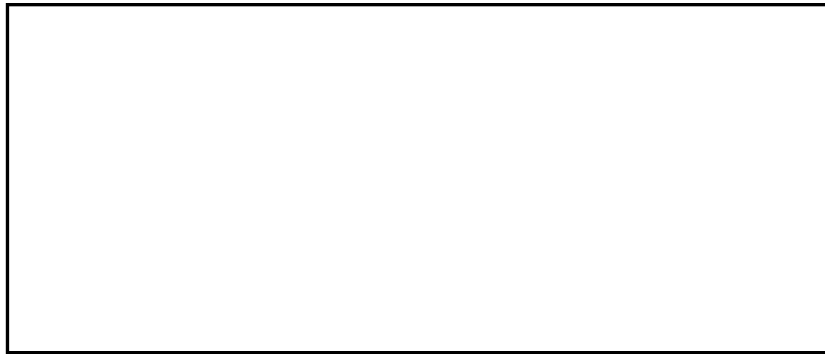
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THE IMPACT OF FERTILIZER SHORTAGES  
ON INDIAN GRAIN OUTPUT

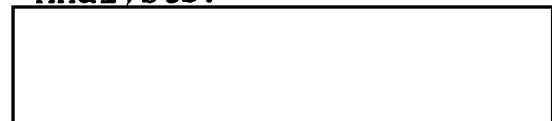
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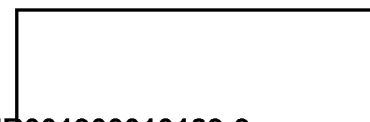
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THE IMPACT OF FERTILIZER SHORTAGES  
ON INDIAN GRAIN OUTPUT

Highlights

1. India has a chronically ailing fertilizer industry and is experiencing added difficulties because of world shortages of fertilizer and mushrooming prices of fertilizers and related raw materials, including petrochemicals. In the current Indian fiscal year ending March 1974, India has used about 2.4 million tons of chemical fertilizer,\* 300,000 tons less than during the previous year (Table 1). About half of the current supply comes from imports and half from domestic production. India has no surplus stocks and only a low level of working stocks. Consumption during the year ending March 1975 may increase again to about 2.7-2.8 million tons, depending mainly on the amount that the Indian government imports.

2. About 200,000 tons of the 300,000 ton reduction this fiscal year occurred last fall when the winter crops were being planted. Because of a high-response ratio for fertilizer used on the winter wheat crop, this shortfall can be expected to result in about 2 million tons less grain than otherwise

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\* Throughout this report fertilizer data are for Indian fiscal years, April-March, and tonnages are expressed in metric tons of nutrients (nitrogen, phosphate and potash).

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would be harvested this spring. This reduction combined with the loss attributable to fertilizer deficiencies in last summer's rice and coarse grain brings the total loss from this year's grain output to about 2.5 million tons. Total grain output in the current crop year seems/ <sup>to be</sup> estimated at about 108 million tons by both the US Agricultural Attache and the Indian government, a reduction from estimates made several months ago of 110 and 115 million tons. Even an output of 108 million tons will be a great improvement over 1972/73 crop year when drought held output down to 95 million tons. Nevertheless, increased output this year will not improve the low consumption levels because India has exhausted about 10 million tons of government stocks since July 1972 and received over 4 million tons of grain imports. Moreover, continuation of unseasonable dry weather experienced in recent weeks and a repeat of last year's rust attack before the wheat harvest could further reduce this year's crop.

3. India's domestic fertilizer industry suffers perpetual shortages of electric power, raw materials and spare parts, problems common to most industries in India. Fertilizer production capacity has expanded rapidly, but operations now average only about 70% of capacity. About half of the capacity consists of publicly-owned factories, which operate far below average efficiency because of management and labor problems.

Production during the current fiscal year is estimated at about 1.4 million tons, the same level as last year, but we estimate that output will increase to about 1.6 million tons during 1974/75 because of new capacity coming into operation.

4. Indian imports of fertilizer in 1974/75 will be a function of many factors, of which government decisions will be the most influential. India's current foreign exchange position is unusually strong, enough to finance about five months' imports of all goods at last year's level. But New Delhi traditionally has been extremely reluctant to draw on its reserves, and when faced with rapidly rising import prices has usually adopted a wait and see attitude. Indian procrastination and suppliers' cancellation of contracts during the fiscal year ending next month caused fertilizer imports to decline some 200,000 tons from the 1972/73 level of about 1.2 million tons. Although it would be far cheaper, even with fertilizer prices more than doubled, to buy fertilizer rather than wheat, a further decline in Indian fertilizer imports cannot be ruled out despite some increases in production among its major suppliers. All in all, we tentatively project India's fertilizer imports during 1974/75 at 1.2 million tons. Government indecision, on the other hand, could cause them to fall short of this level.

Introduction

5. Last year Indian chemical fertilizer consumption amounted to 2.7 million tons, more than 4 times the amount used 8 years ago. In its present state of technological development, however, Indian foodgrain output from year-to-year is more influenced by factors other than fertilizer. The following indexes show that fertilizer consumption has been increasing at a fairly steady rate while foodgrain output has been erratic.

<u>Fiscal Year</u>	<u>Indexes (1964/65 = 100)</u>	
	<u>Fertilizer Consumption</u>	<u>Foodgrain Output</u>
1965/66	116	81
1966/67	184	83
1967/68	179	106
1968/69	257	105
1969/70	305	111
1970/71	333	121
1971/72	401	118
1972/73	413	106
1973/74 est.	368	121

6. Various studies show that foodgrain output is more closely correlated to rainfall than any other factor of production. Only about one-fourth of the foodgrain area has

irrigation and in poor weather years, some of the irrigation also fails. Insufficient monsoon rainfall in 1972/73 was the major cause of foodgrain production dropping to 95 million tons from a peak of 108 million tons achieved during excellent weather in 1970/71. Rainfall also influences the amount of fertilizer used, area planted, and prevalence of some plant diseases, all of which in turn have an influence on foodgrain output. Nevertheless, increased use of fertilizer has definitely brought higher levels of foodgrain output, particularly because it contributed significantly to yields of the new high-yielding varieties (HYV) of grains. Fertilizer is most important to the winter wheat crop which accounts for about a fourth of all foodgrain output.

#### Production

7. India's fertilizer production in 1973/74 probably will amount to 1.4 million tons, about the same as in the previous year (Table 1). Considering new capacity becoming available, however, we estimate that output in 1974/75 will increase by about 15% to 1.6 million tons. Three-fourths of the output consists of nitrogen fertilizers.

8. India's fertilizer plants consistently fall below expected levels of output. Capacity utilization for all operating plants in 1972/73 averaged about 70% of capacity. Publicly-owned plants, which account for a little more than

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half the total capacity, generally operate well below the average, while private plants as a group operate well above the average. Official Indian forecasts of domestic production in 1973/74 have been revised downward from an original level of 2.6 million tons. Expectations for 1974/75 production may be more realistic -- 2 million tons now planned in contrast to our estimate of 1.6 million tons likely to be produced. Total capacity by the end of 1973 amounted to 2.5 million tons in 55 installations. Capacity should jump to 3.7 million tons by the end of 1974 and increase again to 4.0 million tons by the end of 1975. Many of the plants will be completed at the end of 1974, however, and will contribute very little to production during these years.

9. In recent years, growth in capacity and output of the Indian fertilizer industry has been sporadic. Decisions to build new capacities or to award contracts for equipment to foreign firms have been made only after protracted studies and administrative delays. Interruptions in electric power and shortages of inputs are the most common causes of production shortfalls. In addition, labor problems, poor administration, technical problems, and lack of spare parts impede production. Most of the raw materials for the phosphate plants are imported and about half of India's nitrogen production depends on imported petroleum and petroleum products.

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10. The high price of imported raw materials may be a more serious problem to India than the tight world supply of these materials. For example, Jordan, a major supplier of phosphate rock to India, reportedly will meet its export commitments. But landed costs of phosphate rock in India have mushroomed in the last two years.

<u>Source of Shipment</u>	<u>US Dollars per Metric Ton of Nutrient (P<sub>2</sub>O<sub>5</sub>)</u>		<u>Percent Increase</u>
	<u>1972</u>	<u>1974</u>	
Florida	60.16	175.09	191
Morocco	55.60	221.39	298

Although the above prices do not apply to all shipments of phosphate rock to India, they are believed to reflect accurately the order of magnitude changes that have occurred in landed costs. As a result, India may forego some fertilizer materials or may cut other essential imports.

Fertilizer Imports

11. The chronic shortfalls in plans for domestic production of fertilizers have forced India to import a growing share of the total fertilizers used in recent years. Imports nearly doubled between 1970/71 and 1972/73 (Table 3). They accounted for 45% of total fertilizer consumption in the latter year. We tentatively estimate imports during 1974/75 will be slightly below the 1972/73 level of 1.2 million tons,

although information available at present is far from firm.\* In any case, an estimate attributed to India's Ministry of Petroleum and Chemicals putting anticipated 1974/75 fertilizer imports at two million tons appears to be very unrealistic unless the government initiates much more aggressive purchasing policies. At present, information available indicates that India already has scheduled at least 600,000 tons of imports during 1974/75. The government realizes that each ton of fertilizer imported could mean 10 tons less grain imports, or a saving of 5 times the cost of the fertilizer. Nevertheless, the government traditionally adopts a wait and see attitude.

12. Urea is by far India's major nitrogen fertilizer import, followed by calcium ammonium nitrate. Major suppliers of urea include Japan (more than one-fourth of the total), Saudi Arabia, Kuwait, Poland, Bulgaria and the USSR. Romania is a major supplier of calcium ammonium nitrate. Imports of ammonium sulfate come chiefly from the USSR, Japan and Italy. Phosphate fertilizers, which are imported in the form of complex fertilizers containing two or more nutrients, come mainly from the United States, Canada and West Germany. All of India's potash fertilizers must be imported; Canada, East Germany and West Germany being the principal suppliers at present, but the USSR, the largest world producer, recently agreed to supply 30,000 tons or about 10% of India's potash needs.

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13. Prospects for increased imports of fertilizer in India in 1974 will depend mainly on India's success in negotiating contracts with Japan, the USSR and Eastern Europe. During the last half of 1973 Japan and some East and West European suppliers reportedly failed to meet fertilizer export commitments to India. In some cases, shipments by East European suppliers appear to have resumed following India's agreement to cover skyrocketing shipping charges. The extent to which undershipments in 1973 will be made up, however, remains uncertain. Moreover, in the past, India often sought to purchase fertilizer at bargain prices, a practice that probably will make it difficult to negotiate for imports in today's tight market.

14. There are, however, a few signs that the world fertilizer situation may be easing slightly, even though demand cannot be fully satisfied. For example, Japan now is expected to meet 97% of its 1973/74 export commitments for urea and 80% of those for ammonium sulfate. The USSR, Bulgaria, Poland and Romania all are expected to increase production of fertilizers substantially in 1974 and may have greater flexibility to increase exports of fertilizer. The USSR recently agreed to ship India 138,000 tons of fertilizer nutrients.

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15. At least 3 months is required to buy fertilizer abroad, ship it to India, and distribute it to the villages. The summer crop, which accounts for about 40% of fertilizer consumption is planted during May-July coinciding with the arrival of the southwest monsoon. Fertilizer imports not already underway probably will arrive too late for the early planting, but arrivals during May-July could still be used for areas with late planting or for 2nd and 3rd fertilizer applications. The winter crop is planted in November and December. This gives India about 8 months to arrange purchases and shipping. Recent indications of improved supplies of fertilizer in world markets, albeit at high prices, indicates that India has perhaps an even chance to locate import supplies for the winter planting if she acts during the next few months. India has shown no indication in the recent past, however, that it has either the inclination or the ability to act quickly even in the face of a serious threat.

Consumption

16. Based on current estimated of 1973/74 production and imports, consumption of fertilizer in 1973/74 was about 2.4 million metric tons, a reduction of 300,000 tons from 1972/73. The shortages, especially those stemming from imports, were

most serious in the second half of 1973. Thus, we estimate that the summer planted crops probably received 100,000 tons less, and the winter planted crops, 200,000 tons less than the previous year.

17. Availability in 1974/75 may return to the 2.7 million ton level, and the supply will again be available for the normal 40:60 seasonal pattern of application. This predicted level of fertilizer consumption in 1974/75 falls far short of planned targets and also short of Indian demand at controlled prices. Nonetheless, it suggests that fertilizer shortages will be no worse in 1974/75 than they were in earlier years.

#### Effects

18. The effect of a fertilizer shortfall on foodgrain production depends on the crops and seasons affected because of varying fertilizer response ratios. One ton of fertilizer used on the HYV of wheat under controlled water conditions during the winter season is estimated to produce 12-15 tons of additional grain. One ton of fertilizer used on summer crops, mainly rice and coarse grains, probably yields only half as much grain. This greater importance of fertilizer on winter wheat is the problem with the 1973/74 crop: the estimated 200,000 ton fertilizer shortfall for the 1973/74 winter crop could reduce output 1.8 to 2.25 million tons (Table 5). This shortage contributed significantly to a

possible overall reduction in the 1973/74 crop of 2.2 to 2.8 million tons below what it might have been had fertilizer supplies not declined. Likewise, if 2.7-2.8 million tons of fertilizer becomes available in 1974/75, the additional supply could produce about 3 million more tons of grain.

19. Whether or not the fertilizer-induced grain shortfall this year compels additional grain imports depends largely on the overall size of the grain harvests and whether the government feels that sizable foreign exchange expenditures on additional grain imports are necessary. Initial estimates made last fall of the 1973/74 grain harvest were for a record crop. The Indian government estimated that the favorable monsoon would enable the 115 million metric ton grain target to be met, while the US Agricultural Attache, who is generally more realistic in forecasting the size of the Indian crop, placed it at about 110 million metric tons. In both cases, the estimators had some indications of the extent of the fertilizer shortage for the winter crop, which makes up 40-45% of the total annual output. Greater fertilizer shortages than were anticipated and abnormally dry weather during January have hurt winter crop prospects. A late January press report stated that the Ministry of Agriculture is now estimating the 1973/74 crop at only 108 million tons which seems reasonable. Continued poor weather conditions during the coming two months before the harvest could further reduce the estimate.

20. Even if India harvests 108 million tons of grain this crop year, per capita consumption levels will not improve from last year's drought level. At the beginning of the drought in mid-1972, private stocks were large and the government had 9-10 million tons of buffer grain stocks. Since then, private stocks have been drawn down and government stocks depleted. In addition, the Indian government imported 4.2 million tons of grain during calendar year 1973 and has arranged import of only 1.9 million tons during the first half of 1974.

21. Sharply increased fertilizer prices may force India's 1974/75 fertilizer import bill to as much as \$500 million compared with an estimated \$200 million in 1973/74. Failure to secure fertilizer imports could lead to costlier grain imports next year. Taking into consideration estimated 1974/75 oil imports of \$1.1 billion, petroleum and fertilizer imports, together may cost an estimated \$1.6 billion, nearly half of 1974/75 export earnings. To help finance these expensive imports, India will almost certainly seek additional foreign aid and debt rescheduling; draw down foreign exchange reserves which now amount to about \$1.1 billion; seek financial support from the IMF; and pare imports where possible.

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Table 1

India Fertilizer Production and Imports  
(in 1,000 metric tons nutrients) <sup>1/</sup>

<u>Fiscal Year</u> <sup>2/</sup>	<u>Production</u> (N, P <sub>2</sub> O <sub>5</sub> )	<u>Imports</u> (N, P <sub>2</sub> O <sub>5</sub> , K <sub>2</sub> O)	<u>Production and Imports</u> (N, P <sub>2</sub> O <sub>5</sub> , K <sub>2</sub> O)	<u>Consumption</u> <sup>3/</sup> (N, P <sub>2</sub> O <sub>5</sub> , K <sub>2</sub> O)
1970/71	1,066	633	1,699	2,177
1971/72	1,239	690	1,929	2,621
1972/73	1,386	1,219	2,605	2,699
1973/74 est.	1,400	1,000	2,400	2,400
1974/75 est.	1,600	1,100-1,200	2,700-2,800	2,700-2,800

1. Including nitrogen (N), phosphate (P<sub>2</sub>O<sub>5</sub>), and potash (K<sub>2</sub>O) fertilizers.
2. April-March.
3. Consumption exceeds production and imports during 1970/71-1972/73 because surplus stocks were drawn down. Such stocks probably were depleted by March 1973.

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Table 2

Production of Fertilizer in India  
(in 1,000 metric tons of nutrients)

in metric tons			
<u>Fiscal Year 1/</u>	<u>Nitrogen</u>	<u>Phosphate</u>	<u>Total</u>
1970/71	838	228	1,066
1971/72	949	290	1,239
1972/73	1,054	332	1,386
1973/74 est.	1,100	300	1,400
1974/75 est. 2/	1,240	346	1,600

1. April-March.
2. Capacity utilization assumed for the 1974/75 production estimate is as follows: utilization of new nitrogen and phosphate fertilizer capacities will be 30% the first year, and 40% the second year after the start of commercial operation. Capacity utilization beyond this period will average 70% for nitrogen and 60% for phosphate.

Table 3

Indian Fertilizer Imports  
(in 1,000 tons of nutrients)

<u>Fiscal Year</u> <u>1/</u>	<u>N</u>	<u>P 0</u> <u>2 5</u>	<u>K 0</u> <u>2</u>	<u>Total</u> <u>2/</u>
1970/71	482	32	119	633
1971/72	462	241	267	690
1972/73	691	211	316	1,219
1973/74 est.	N.A.	N.A.	N.A.	1,000
1974/75 est.	N.A.	N.A.	N.A.	1,100-1,200

1. April-March

2. Figures may not add due to rounding.

Table 4

Indian Fertilizer Consumption  
(in 1,000 metric tons of nutrients)

By nutrients				
<u>Fiscal Year</u> 1/	<u>N</u>	<u>P 0</u> <u>2 5</u>	<u>K 0</u> <u>2</u>	<u>Total</u> 2/
1970/71	1,487	462	228	2,177
1971/72	1,755	563	302	2,621
1972/73	1,779	587	332	2,699
1973/74 est.	N.A.	N.A.	N.A.	2,400
1974/75 est.	N.A.	N.A.	N.A.	2,700-2,800

By seasons			
	<u>Summer Planted</u> <u>(Kharif)</u>	<u>Winter Planted</u> <u>(Rabi)</u>	<u>Total</u>
1970/71	924	1,253	2,177
1971/72	1,092	1,529	2,621
1972/73	1,060	1,639	2,699
1973/74 est.	960	1,440	2,400
1974/75 est.	1,100	1,600-1,700	2,700-2,800

1. April-March

2. Figures may not add due to rounding.

Table 5

Effect of 1973/74 Fertilizer Shortfall

	(Metric Tons Nutrients)		(Metric Tons)
	Shortfall in Fertilizer Consumption Compared to 1972/73	Shortfall in Fertilizer Consumption for Grain Crops 1/	Estimated Reduction of 1973/74 Grain Crop Attributable to Fertilizer Deficiencies 2/
1973 Summer Planting	100,000	75,000	450,000-600,000
1973 Winter Planting	200,000	150,000	1.8 - 2.25 million
Total 1973/74 Harvest	300,000	225,000	2.25 - 2.85 million

1. Assumes that 75% of fertilizer consumption is on grain crops.
2. Assumes that one ton of fertilizer produces 6-8 tons output for summer planting, and 12-15 tons for the winter planting.

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