CHAPTER I

Introduction

The problem

The recent sharp rise in the price of petroleum and its products has imposed heavy burdens on the Indian economy. Domestic production of 8 million tonnes of crude oil in 1974-75 met just a third of the total requirement of 23 million tonnes. The balance of 15 million tonnes was imported at prices ranging between $10.42 and $10.67 per barrel. An additional 3 million tonnes of petroleum products were also imported. To absorb the effects of the rise in crude oil prices, the Government of India chose to follow a selective pricing policy for different petroleum products. The price of gasoline attracted the highest rise (101.5 per cent), which had a clear restraining effect on consumption. In order to protect industry and transport services, the price of high speed diesel oil (HSD) was raised by only 14.7 per cent and that of kerosene by 57.4 per cent so as to bring its price to par with high speed diesel in order to prevent adulteration*. Fertilizers were left untouched until June of 1974 when their prices, too, were sharply raised. Depending on the source of the nutrient, the increase in price per unit of nutrient varied between 56 per cent and 90 per cent, and the price index of all fertilizers went up by 80 per cent.

Fertilizers are a critical component in the new technology in agriculture to which the recent Green Revolution is attributed. Substantial increases in per hectare yields, particularly of wheat and rice, have been secured in the past few years as a result of the combination of new high yielding varieties of seeds and larger doses of fertilizer inputs. A steep increase in the price of fertilizers, occurring in a single sharp move, could be expected to have delivered a rude shock to the farm economy, which had just been converted to its use. The impact of this shock on the production of wheat and rice is the object of this study.

The new technology and factor substitution

The new technology in agriculture relies principally on the adoption of techniques derived from biological innovations in the field of genetic manipulation of seeds. The new or high yielding varieties (HYV) of seeds, by greatly increasing the nutrient intake capacity of the wheat or rice plant, substantially raise its yield per unit of land, provided water is available when needed. In India, on account of the peculiar climatic characteristics, irrigation is an equal important component of the package of inputs that constitute the material base of the new technology.

The significance of water or irrigation to the new technology, perhaps, needs further explanation. India depends almost entirely on the monsoon which yields precipitation varying from region to region. With the exception of the southern tip of the Indian peninsula, the country receives most of its rain during the months June to September. In the major wheat growing tracts the annual rainfull varies between 20 and 40 inches; in the rice growing regions, while the rainfall is higher, it varies over a wider range.

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*Percentage rise in prices refers to the period, August 1973 to March 1974. It is these increases in prices that are relevant to our investigation.

In most of the country rain water supports the summer crops, called kharif, of which rice is the most important. Wheat, a winter crop, called rabi, is grown when there is a limited amount of rain. It, therefore, relies on moisture retained by the soil from the precipitation during the monsoons but mainly on irrigation from such sources as, canals, open wells, tubewells and other variants of lift irrigation. It is possible in India to grow three crops of rice during the year, but for the second and third crops irrigation, as for wheat, is necessary.

Monsoon rains are heavy and concentrated within a relatively short period of three months; even so, the precipitation does not necessarily occur in accordance with water requirements for plant growth. Besides exposing the plant, at times, to excessive water and at other times to dry spells, the unpredictable pattern of rainfall makes difficult the regulation of fertilizer inputs to correspond with different stages of plant growth. For securing best results from the new seed-fertilizer technology it is not enough to have water, it is also necessary to have control over its source, so that its use can be regulated. Thus it is found, for instance, that even where canal irrigation is available, farmers prefer to invest in tubewells because it gives them the kind of control over the use of water they need.

The scarcest factor in Indian agriculture, of course, is land. The scarcity is made worse by the peasants' attachment to it whereby, in effect, it is simply not available as a transactable commodity. For raising production the efficient direction of change in the factor mix, therefore, is towards the substitution of land by the less scarce factors. This is indeed what the new technology does; land is substituted by a combination of labour and intermediate material inputs or working capital. It has been observed that this change in technology in India has had the character, by and large, of a shift from an 'inferior' to a 'superior' technology*. /1/

As the change in technology has advanced, the value of land relative to other factors has also increased. Rigidly limited in its supply, the scarcity value of land has been continuously increasing as its productivity has risen with the application of inputs whose supply is relatively elastic. One does not, therefore, envisage a reversal in the substitution process in the short or the long run with any conceivable rise in the cost of intermediate material inputs or labour.

In the wake of the adoption of biological innovations, fixed capital in the form of machines has also been introduced and has directly displaced labour in the operations in which machines are used but not when all operations directly or indirectly connected with the cultivation of a crop are considered. /3/ It is important to recognise that machines have been introduced only where biological innovations have already been adopted. Indeed, given the physical scarcity of land, the scope for extensive cultivation through labour-saving machines for increasing production was generally so limited that there was no case for machines being used before the productivity of land was substantially raised by the adoption of biological innovations. One would, therefore, rule out the substitution of

*In a cross section of a forthcoming study of technological change in tea and coffee plantations prepared by the NCAER /2/ for the ILO, it was found that the observed change in technology was accompanied by a decline in the cost of each input per unit of output, holding land as constant.

machines for intermediate material inputs, notably fertilizers, even with a much more substantial relative price change in favour of machines than occurred in June 1974. Similarly, one would rule out the possibility of the subsitution of labour for fertilizers in an already labour intensive technology where the marginal product of labour is low and can be raised only by making scarce land more productive.

In these circumstances a sharp increase in the price of fertilizers may initially cause a decline in its use, resulting in a fall in output and hence a rise in the price of the output. This rise would be significant, even with a modest decline in production, if the product was a foodgrain which has a relatively inelastic demand. In the following season the rise in the product price would tend to restore the input of fertilizers.

The technology associated with the new biological innovation has two distinguishable aspects: physical inputs (high yielding varieties of seeds, fertilizers, etc.) and the method of using them (cultural practices). In the first phase of the adoption of this technology, the emphasis has been on the physical inputs, in part due to the very varied conditions under which agriculture is practised in India. The 'know-how' for using these inputs is still in the process of being acquired. One can easily see that, confronted with a much higher price of fertilisers the farmer will be goaded into learning how to make more efficient use of fertilizers. If the scope for this exists, as indeed it does, it will have the same effect on fertilizer use as the increase in the price of output, though with a longer time lag. It will have the further effect of reducing the cost of inputs per unit of output and thereby of sustaining fertilizer inputs (or even raising them) without affecting the cost of production.

These are, however, long term considerations. Our immediate task is to estimate the effect of the June 1974 increase in fertilizer and diesel oil prices on their use in rice and wheat cultivation and on the resulting change in the output of these crops. One could, following standard practice, work out the elasticity of fertilizer and HSD consumption in response to changes in their prices, both for the short and the long run, on the basis of past data and with their help estimate the likely use level of these inputs for the 1974-75 as well as future rice and wheat crops. This approach must, however, be ruled out simply because the magnitude of annual price changes in the past and that which occurred in June 1974 are so vastly different that any relationship between fertilizer price changes and its use, derived from past data, would prove quite meaningless when employed to predict farmers' response to the June 1974 increase. One has, therefore, little choice but to examine the response of farmers to the 1974 rise in fertilizer prices directly and to deduce from it inferences as guides for anticipating the future. To this end we have selected a sample of farmers from two districts : in one both rice and wheat are grown and in the other wheat is the main foodgrain crop. From these farmers we have obtained detailed information about their inputs and outputs for the agricultural year preceding the rise in the prices of fertilizers and other petroleum based inputs and for the one following it.

Weather

The influence of weather on short run fluctuations in agricultural production in India is well known. In no direct enquiry, however detailed and meticulously designed and conducted, can the effect of weather on the input decisions

of the farmers or the size of the crop be quantitatively measured. It has been argued that weather uncertainty constitutes a risk factor, which influences the farmer's input decisions. Thus, for instance, the observed lower per hectare yield on large farms in India and their inferior input mix has been attributed to the greater risk borne by them. /4/ What is true between farms of different sizes could also be true between years for the same farmer, provided the farmer is able to assess the risk confronting him before he takes his input decisions. But this is usually not possible. On the output, however, the effect of the weather is clearly manifest, though it would be difficult to isolate it in precise quantitative terms.

The impact of weather in India is felt principally through the quantum of rainful and its distribution over the year. If the rains have been inadequate or badly timed a poor harvest cannot be prevented merely by increasing fertilizer or labour inputs. Only an alternative source of irrigation which is adequate and over which the farmer has some control can prevent it. On the other hand, good and well timed rains can raise yields without any increase in fertilizer inputs. On a rain-dependent farm the use of fertilizers is discouraged if rains fall, but on an irrigated farm the farmer will have more freedom in taking his decision. He will use his normal input of fertilizers unless he has good reason to believe that floods or frost or some other unfavourable turn in the weather will prevent him from realising the additional yield he expects. It is, however, clear that while the farmer will bear the risk of such occurrences, he will have little basis for anticipating them so as to modify his input decisions. On the other hand, electricity cuts induced by overall power shortages or the restricted availability of HSD, both supplying the energy for pumping water for irrigation, could discourage the farmer from using his normal input of fertilizers.

Since the farmer is likely in most years to be guided by the expection of normal weather, while the output varies with the weather, a definite quantitative relationship between an input and the crop yield cannot be empirically established on the limited experience of a year or two. Thus it would be possible to find a rise in the yield rate over any two consecutive years associated with a decline in per hectare input of fertilizers as well as its opposite, depending on how much better or worse the weather was in the second year compared to the first.

This would also mean that ex ante factor proportions per unit of output (expected) would be different from the ex post (actual). Consider, for instance, a year which turns out to be unexpectedly good compared with the previous year which, let us say, was an average or 'normal' year. Yields in the second year would be higher than warranted by the farmer's 'normal' input-output expectations of, say, fertilizers and the ex-post input of fertilizers per unit of output would be lower than the ex ante. On the other hand, while a bigger than expected yield might require more labour input than anticipated, particularly, for post harvest operations, the ex post labour input per unit of output might remain the same as the ex ante. This would lower the quantity of fertilizers per unit of labour. Moreover, one would also observe the seeminly curious phenomenon that the yield rate has increased while the input of fertilizers per unit of land has remained unchanged. It is easy to see that the impact of weather fluctuations on relative changes in the use of different inputs per unit of land would be much less than per unit of output.

The uncertainty inherent in the situation renders the farmer's decision-making task much more complex and explains, in a good part, the variation between the mix of inputs actually applied by the farmers and the one recommended to them, on the basis of input-output relationships that emerge from experimental farm stations. Notwithstanding the observed long term cyclical pattern in annual weather conditions, a farmer must guess the weather prospects at the beginning (July) of any single agricultural year because the probability distribution of a bumper, good, indifferent or bad year is never markedly different. The best bet for the average farmer (not necessarily the more enterprising one) usually is to minimise his risk by anticipating a year which is neither good nor bad and then as the season advances to modify his input decisions in accordance with the manner in which the monsoon progresses. However, the extent to which these mid-course modifications can be made to achieve a closer adjustment with the weather conditions is clearly limited.

If it were true, as indeed it seems, that a farmer generally assumes 'normal' or average weather conditions while taking his input decisions, his response to any change in relative factor prices (or a general rise in factor prices relative to output prices) would be more accurately reflected in the input per unit of land relationship, which is weather free, than the input per unit of output relationship, which is not only influenced by the weather, but is removed from the conditions under which the farmer took his input decision by the extent to which the weather deviates from the 'normal'. In the analysis that follows we shall, therefore, measure change in input use only in relation to a unit of land.

Know-how or disembodied technology

In farming, material inputs and labour are also associated with what are known as cultural practices. These cultural practices do not so much determine the quantum of inputs as the manner and timing of their use. They thus incorporate the knowledge for securing optimum output results from a given combination of inputs. In traditional agriculture, cultural practices are found to be fairly uniform, because continuous farming over centuries in unchanging conditions (including state of knowledge) tends to standardise them at the highest attainable level of efficiency. Introduction of the new seed-fertilizer technology forces the farmer to acquire an entirely new dimension of knowledge and a new set of cultural practices. For this reason and also because the new technology is still in the process of dissemination, there are considerable variations in existing cultural practices. In the study cited earlier /2/ it was shown that a farmer's fund of knowledge, on which the character of his cultural practices depends, constitutes an important explanatory factor for the level of output achieved.

On the whole it can be said that the adoption of the material inputs (viz., high-yielding varieties of seeds, fertilizers, etc.,) of the new technology has spread faster than the knowledge of the efficient or optimal use of these inputs. This fact has rather important implications. In the short-run, it means that the impact of a uniform rise in fertilizer prices would be different for different farmers. Farmers using superior cultural practices and, on this account, securing better returns on fertilizer inputs before the rise in their prices would continue to do so. In the long run, an advance in the level of know-how would be a major means of reducing the cost of fertilizers per unit of output. One can legitimately expect that, among

the first steps in this direction, would be an improvement in the fertilizer mix per unit cost.

Government regulation of prices and distribution of foodgrains

Analysis of the producers' response to price changes is facilitated in an environment where prices are determined mainly by the market mechanism. Such an environment proves particularly helpful where certain input-output relationships are to be studied for the purpose of predicting any future stream of output. But, in an environment characterised by direct Government control over the price and distribution of some (or parts thereof) of all relevant inputs and outputs, as is the case in India, the situation is immediately rendered much more complex. The reliability of any projection of output becomes dependent not only on a proper accounting of all the factors directly influencing output but also on probable shifts in policy regarding the nature and extent of government control.

In respect of wheat and rice - the two products with which we are concerned here - the Government of India exercises direct control over their price as well as distribution. The nature of this control, which is not complete, we shall now describe briefly. Its primary objectives are: (i) to ensure the availability of these staple foodgrains to the low income sections of the population (confined mainly to their urban component, since in normal times a major part of the rural population grows its own foodgrains and most of the others receive part of their wage payment in kind) at prices which would enable them to secure, at least, their customary requirements and (ii) at the same time, to maintain incentives for higher production. The implicit conflict between these two objectives is minimised partly by operating a dual price system and partly by state subsidy.

The Government directly administers the price of wheat or rice, which it buys from the farmers (directly or indirectly) and sells through fair price shops to ration card holders. The quantity of wheat or rice funnelled through the public distribution channel is a fraction (which varies, but is approximately a third) of the total market supply (including imports). The Government's buying price is announced in two stages; before the crop is sown, and then just before the harvest. The former is the minimum guarantee price and the latter the procurement price. Grain is actually purchased at the procurement price which may or may not be different from the minimum guarantee price depending upon the size of the harvest and the associated price expectations in the market; it may be higher if the harvest is relatively poor but it cannot be lower even if the harvest is exceptionally good. The sale of wheat or rice through the fair price shops is at a price higher than the procurement price to cover transportation, handling, storage and other distribution costs. In practice these costs have been only partially covered, the balance being made up by state subsidy. Once fixed, neither the procurement nor the ration price are changed during the year.

Each year a target for procurement is fixed and an effort is made to reach it, on the one hand, by indirectly influencing the market mechanism and, on the other, by a direct grain levy. The former is done by restricting grain movements out of zones producing a surplus, thus forcing the market price downwards in these zones and then exercising the right of pre-emptive buying. The latter simply involves the imposition of a straightforward grain levy in

deficit zones.* The target for procurement depends on the Government's commitment for public distribution and the size of its buffer stocks at the beginning of the agriculture year. When harvests are below par and prices are expected to rise, the gap between the procurement and the market price tends to widen and it becomes more difficult for the Government to achieve its procurement target. The Government then meets its commitments to the public distribution system by running down its buffer stocks and/or larger imports.

After each year's harvest of wheat or rice the farmer confronts two prices: the procurement price and the market price, the latter normally being higher by varying degrees in different regions. After retaining what he requires for his family's consumption, he disposes of the rest either at the procurement or the market price. Where a grain levy is imposed, the proportion of his disposable surplus sold at the procurement price is more or less fixed, but where such a levy is not imposed there is no external constraint on the farmer's freedom to exercise his choice. The more relevant prices in respect of which the farmer has a choice are the ones that prevail soon after the harvest, because many farmers, particularly the smaller amongst them, do not have the capacity to hold stock for more than a short duration. It is at this time also that restrictions on grain movements out of surplus zones (when imposed) exert the maximum downward pressure on the market price bringing it close to the procurement price. The capacity of farmers to hold stocks has, however, been growing over time and the pressure on the farmer to make his choice soon after the harvest has correspondingly decreased. The role of the expected trend of prices during the inter-harvest period in the farmer's decision to sell immediately after the harvest has thus come into greater prominence, though to varying degrees in different regions. As market prices normally tend to rise over the inter-harvest period this development has made procurement more difficult. In a year of bumper harvests, it is quite possible that market prices may fall below the procurement price; in which case, the Government would find it easy to meet its procurement target and may even buy in excess both to support the market price and to build or augment its buffer stocks.

The Indian economy for many years has been characterised by the persistence of an excess demand for foodgrains, whose magnitude has fluctuated from year to year depending on weather conditions. Its impact on prices has been neutralised by imports secured through special arrangements or open market purchases - now mainly the latter - and a partial control on distribution. The burden of these unavoidable imports on the Indian balance of payments is irksome, since the much needed imports of capital goods, intermediates and raw materials for development are reduced. To minimise this burden, the approach to foodgrain imports has been characterised by restraint, particularly in recent years, which has helped to maintain a pressure of demand on prices, sometimes light and at other times insistent.

Meanwhile the administered price for public distribution of foodgrains, which understandably is not immune from political pressures, has exhibited a tendency to be sticky.

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*Other variants have also been tried, for instance, the takeover of the entire wheat trade by the Government in 1973 and the direct involvement of private trade in procurement in the following year.

In fact, it follows from the objective of the policy that in times of rising market prices, the administered price for public distribution must follow with only a short time lag. In fact, quite irrespective of the behaviour of market prices, there has been a pressure for maintaining unchanged the price paid by consumers. This tends to widen the gap between the market price and the price fixed for public distribution, thus increasing the Government's subsidy commitments. Outward pressures on the gap between the procurement and market prices have been a major reason for the less than satisfactory procurement effort of the Government in recent times.

As the market price is almost always higher than the procurement price, it would be natural for the farmer to prefer to sell all his surplus at the market price. This he would not be able to do either because of the direct grain levy on him (if it is imposed) or because of the practice of pre-emptive buying by the Government. The latter purchases are from the quantity that arrives in the market which depends on the decision of the farmer not to stock at the prevailing price differential between the procurement and market prices. The price that a farmer actually secures for his wheat or rice is, therefore, a weighted average of the amounts he sells at the procurement and the market prices. The relative proportions of these amounts out of the total stock sold vary from farmer to farmer and between one region or state and another, because the system of procurement differs between states and because inter-zonal restrictions on foodgrain movements result in wide differences in the market price between regions. Since the market price also follows an upward trend during the inter-harvest period, the average price realised by the farmer also depends on the timing of sales.

Thus in reality the farmer not only confronts two prices but a spectrum of prices which range from the procurement price at one end to the annual peak market price on the other. The price he actually realises for the total stock he sells during a full year is influenced by a complex set of factors, some exogenous (the aggregate demand and supply schedules for the region or the country, import levels, level of procurement and the system of procurement) and some endogenous (the size of the farmer's marketable surplus, the sources and type of credit available to him, his capacity to hold stocks, his expectation of prices in the current year and of the size of the harvest next year). These factors determine the gap between the procurement and market prices and the proportion of his surplus that a farmer sells at either price which, in turn, determines the average price that he actually secures for his total sales.

Government regulation of fertilizer and HSD distribution and prices

The distribution of fertilizers, indigenously manufactured or imported, is controlled by the Government. This control is exercised through a system of allocations which is linked to requirements as estimated periodically. The allocations are made at two levels; first to the States by the Ministry of Agriculture, Government of India, on the basis of requirements estimated by Zonal Conferences of which there are five, each comprising a number of States; and second, to the districts by the State Governments. The Zonal Conferences estimate requirements on the basis of the previous year's consumption, the area under high yielding varieties of seeds, the area irrigated under high yielding varieties of seeds, the rates of fertilizer application recommended for States and the extent of foodgrains procurement. The State Governments in their turn determine district-wise allocations on the same or similar grounds.

Allocations to states are made twice in a year - one for the kharif (summer sowing) season and the other for the rabi (winter sowing) season.

Fertilizers available for allocation are divided into two parts: (i) the Pool, which consists of imported fertilizers and is handled by the Central Government, and (ii) indigenous supply. Allocation of the indigenous supply is done through a Gazette notification issued by the Ministry of Agriculture under The Essential Commodities Act. This notification lays down the quantities of fertilizers (in terms of N and P_2O_5) to be supplied to various states by each manufacturer.

The system of allocation, in effect, not only binds manufacturers to certain markets, but it puts an embargo on inter-state movements of fertilizers.

Fertilizer mixtures manufactured indigenously are not allocated and can be sold directly by the manufacturers without restraint on movement.

Besides allocating specific quantities of fertilizers to states, the Government also controls the channels of distribution. All indigenous manufacturers must channel 60 per cent of their fertilizers through cooperatives nominated by the Government; the remaining 40 per cent can be sold through their own retailers who must, however, be registered with the Government. Previously, these retailers had to be licensed, but with a view to facilitating distribution through other than cooperative channels, a more liberal approach has now been adopted.

During the 1974-75 season, the year with which we are concerned, several State Governments were using a further control on distribution through a system of permits given to the farmers, earmarking the retail outlet from which a stipulated quantity could be purchased. This system was introduced to cope with an excess demand situation or, a situation which was believed to be so. However, it did not function efficiently because there were delays in securing the required permits and, in consequence, the farmers were either unable to obtain the fertilizers in time or in the desired quantity. There is evidence, which will be cited elsewhere, that this system had a depressing effect on the consumption of fertilizers (see Appendix). In view of this and an easy supply position most State Governments have now discarded the system and the farmers are free to buy any quantity of fertilizers from outlets of their choice.

For price control the Government distinguishes three categories of fertilizers: (a) imported fertilizers (Pool), (b) three major indigenously manufactured nitrogenous fertilizers and (c) all other indigenously manufactured fertilizers, both straight and mixtures. The Government, being the sole importer of fertilizers, fixes the retail price of all Pool fertilizers. It statutorily controls the prices of the three major domestically manufactured nitrogenous fertilizers, but does not control the prices of other domestically manufactured fertilizers. Fertilizers comprising each category are as follows:

(a) Pool fertilizers:

1. Ammonium sulphate nitrate (26% N)
2. Ammonium chloride (25% N)
3. Diammonium phosphate (18-46-0)
4. Monoammonium phosphate (11-55-0)
5. Ammonium nitrophosphate (20-20-0)

6. Ammonium phosphate (20-20-0)
7. Muriate of potash
8. Sulphate of potash
9. NPK fertilizers in various combinations.

(b) Fertilizers with statutorily control on prices

1. Ammonium sulphate (20.6% N)
2. Urea (45% N and 46% N)
3. Calcium ammonium nitrate (25% and 26% N)

(c) Fertilizers with no statutory control on prices

1. Ammonium sulphate nitrate (26% N)
2. Ammonium chloride (25% N)
3. Superphosphate (16% w.s. P_2O_5)
4. Triple superphosphate (42.5% w.s. P_2O_5)
5. Pelefos (18% P_2O_5)
6. Urea ammonium phosphate
7. Ammonium phosphate sulphate
8. Diammonium phosphate
9. Nitrophosphate
10. NPK fertilizers

The mechanism for regulating the price of HSD and other oil products is relatively simple. Periodically these prices are reviewed by the Oil Prices Committee which recommends to the Government such changes as it deems desirable. After the Government has considered these recommendations, and taken its decisions, these are communicated to the oil companies, who abide by them. Prices thus fixed do not have any statutory support, but are adhered to on the basis of an understanding. The Oil Prices Committee in recommending prices, takes into account government policy in respect of priority uses of petroleum products and employs discriminatory pricing as a tool to promote or discourage the use of an oil product in one or another industry.

India today produces one-third of its annual requirements of crude oil. The cost of this oil is considerably less than that of imported oil. While domestic oil was priced at parity with the international price earlier, this practice has now been given up and domestic oil is priced considerably lower. However, the Government supplies oil to the refineries at a price which represents an average of the domestic and imported prices and is roughly 20-25 per cent lower than the international price. The three distillates, light, medium and heavy, are priced on the recommendations of the Oil Prices Committee. Following the oil price rise, the Committee was anxious to minimise its impact on fertilizer prices. It therefore let the petro-chemical industry and to a greater extent the consumer of motor spirits take a larger than proportionate share of the increase in the crude oil price. However, the increase in the domestic cost of producing nitrogenous fertilizers was not the only factor determining the increase in their administered prices. The other important factor was the level of imports and the price at which these imports were secured. In 1974-75 there was a world-wide shortage of fertilizers and international prices had shot up to extremely high levels. Despite this, the Government was anxious to meet the requirements of farmers and consequently bore directly a substantial part of the increase in the import bill for fertilizers. This was reflected in the prices fixed for nitrogenous fertilizers by the Government. After 1974-75, the international supply of fertilizers improved relative to demand and international prices fell from the dizzy peaks to which they rose after

the oil price rise and Indian prices declined in line. The Government has reduced the price of fertilizers by 10 per cent.

The cost of petroleum based inputs in the production of wheat and rice before the oil price rise

Since petroleum based inputs constitute one set of inputs among others, it would be useful to know what proportion of the total cost of production they accounted for before the rise in oil prices. If this proportion were very small, then even a high rise in oil prices might not register any significant impact.

There are two principal sources of data on cost of production of agricultural crops: (a) The Farm Management Studies, and (b) The Comprehensive Scheme for Studying the Cost of Cultivation of Principal Crops. The Farm Management studies were carried out in selected districts, with at least one in each State. Two to three rounds of these studies were done during the 1950s. In the 1960s they were taken up only towards the end of the decade and even then for only some districts. The latest available data are for the district of Ferozepur in Punjab for 1970-71. It was mainly to overcome the inadequacy of Farm Management studies that the Government launched through the Directorate of Economics and Statistics a comprehensive scheme to obtain information on the cost of production of, at least, the principal crops on a regular basis. Data under the Comprehensive Scheme began to be assembled from 1971-72. Currently, the following cost data from this source are available: (i) Punjab, 1971-72, 1972-73, 1973-74, (ii) Haryana, 1971-72, and (iii) U.P., 1971-72, for wheat; (iv) Andhra Pradesh, 1971-72 and (v) Orissa, 1971-72 and 1972-73 for rice. In what follows we shall present only the data available from the Comprehensive Scheme.

Information is provided on the value of fertilizers used in the cultivation of wheat and rice crops, but not on the cost of HSD purchased by the farmers for running their tractors or other machines. The cost of "machine labour" is, however, presented. This is the expenditure on machine utilisation, including the cost of labour, repair and maintenance and depreciation. Further, the data do not distinguish between types of fuel, viz., HSD and electricity. For hired machinery, the cost is simply the rental paid to the owner which includes all his costs plus profit. Tables 1 and 2 present the available information on fertilizer and machine labour cost per hectare, per quintal and as percentage of total cost.

Normal fertilizer cost per hectare as well as per quintal of wheat is quite substantial in Punjab and significantly higher than in Haryana or U.P. Similarly, the cost of fertilizers per hectare or per quintal of paddy is much higher in Andhra Pradesh than in Orissa. The same pattern holds in respect of fertilizer cost as a percentage of total cost. It will be noticed that two figures - A and B - for percentage of total cost are presented in Tables 1 and 2. Under A total cost includes all costs actually paid out or imputed for the use of factors owned or possessed by the household. Under B the imputed costs of factors owned or possessed are excluded. Subsequently these costs will be referred to as A_2 and C costs respectively.

There appears to be no doubt that for wheat in Punjab and for paddy in Andhra Pradesh an 80 per cent increase in fertilizer prices would make a significant difference to per quintal cost of production, even if other costs were to remain unchanged. This would also be true for wheat in Haryana and U.P. though to a lesser extent. It is only in

Orissa that additional cost of fertilizers for paddy may be comparatively less important.

Table 1

Cost of Fertilizers per Hectare and per Quintal as a Percentage of the Total Cost for Wheat and Paddy

Crop and region		Cost of fertilizers per hectare (Rs.)	Yield per hectare (Kgs.)	Cost of fertilizers per quintal (Rs.)	Cost of fertilizers as a percentage of the total cost	
					A	B
Wheat						
Punjab	1971-72	230.61	26.43	8.72	13.03	21.20
	1972-73	224.76	22.56	9.96	13.62	23.10
	1973-74	299.06	24.87	12.02	14.68	23.99
Haryana	1971-72	99.15	20.98	4.73	7.83	11.94
Uttar Pradesh	1971-72	94.88	21.61	4.39	6.74	10.65
Paddy						
Andhra Pradesh	1971-72	158.41	25.22	6.3	10.73	19.14
Orissa	1971-72	20.53	16.84	1.2	1.19	2.94
	1972-73	22.09	16.72	1.3	0.47	4.10

A = Cost includes imputed values for owned factors.
B = Paid out cost.

Table 2

Cost of Machine Labour per Hectare and per Quintal as a Percentage of the Total Cost for Wheat and Paddy

		Cost of machine labour per hectare (Rs.)	Yield per hectare (Kgs.)	Cost of machine labour per quintal (Rs.)	Cost of machine labour as a percentage of the total cost	
					A	B
Wheat						
Punjab	1971-72	107.59	26.43	4.07	6.08	9.90
	1972-73	101.36	22.56	4.49	6.14	10.42
	1973-74	141.44	24.87	5.69	6.94	11.35
Haryana	1971-72	57.32	20.98	2.73	4.53	6.90
Uttar Pradesh	1971-72	41.33	21.61	1.91	2.93	4.64
Paddy						
Andhra Pradesh	1971-72	22.47	25.22	0.88	1.51	2.69
Orissa	1971-72	0.19	16.84	Negligible	0.02	0.04
	1972-73	-	16.72	-	-	-

A = Cost includes imputed values for owned factors.
B = Paid out cost.

The normal cost of machine labour per hectare or per quintal of output, like the cost of fertilizers, is higher for wheat than for paddy. It varies between States in the same manner. However, it is comparatively less per unit of output and, if the HSD component alone were considered, it would be even lower. Considering that the increase in HSD price, relevant for our period of investigation, was also small compared to the increase in fertilizer prices, one would be right in saying that the major impact of the oil price rise on agriculture would be felt through fertilizers. To this, one must, however, add this qualification that, since the cost of machine labour involves other costs besides HSD, it is the change in the cost of machine labour that the farmer would respond to. If other costs also increased, as in fact they did, then the individual impact of the increase in HSD price would be indistinguishable.