CHAPTER VIII
SUMMARY AND CONCLUSIONS

VIII.1 Objectives, Scope and Coverage

India is one of those countries where within the overall framework of market oriented economy, public sector has emerged as an important counterpart of the private sector. The fertiliser industry is an important industry representing a vital link between agricultural development and industrial growth. This industry was at a primitive stage of development at the time of independence and private sector was hesitant to invest in it. Therefore, Government took upon itself the task of setting up fertiliser plants. The Government diverts huge amount of resources towards this industry by way of investing in public sector and by providing subsidies in general. Nitrogenous fertilisers account for 75 per cent of the total capacity of all the chemical fertilisers. And more than half of the total capacity of nitrogenous fertilisers is in public sector. Considering the importance of nitrogenous fertiliser industry, the role of public sector in it and the fact that huge amount of scarce economic resources are being diverted towards this industry, an attempt has been made in the present work to study and evaluate the economic efficiency of nitrogenous fertiliser units in the public sector in India. Though attempts have been made in the
past to compare the efficiency of public sector as a whole with private sector, hardly any attempt has been made to evaluate the efficiency of individual plants in the public sector. The present study attempts to evaluate the efficiency of individual fertiliser plants in the public sector.

The study has covered all the eleven nitrogenous fertiliser plants that are wholly owned by the Government of India and were installed before 1985. The period of study is 1979-80 to 1988-89. The economic efficiency has been evaluated in terms of four indicators, namely capacity utilisation, productivity, profitability and structure of cost. The evaluation has been done at plant level as well as at feedstock based group level. Two aspects of economic efficiency have been distinguished:

1) For each indicator of economic efficiency, inter-plant and inter-group comparisons have been made yearwise as well as for the period 1979-80 to 1988-89 as a whole.

2) Changes in economic efficiency, over the period 1979-80 to 1988-89, in individual plants and groups have been compared; and trend growth rates have been computed.

VIII.2 Methodology

Economic efficiency in micro economic theory is defined with reference to the allocative efficiency, market
efficiency and productive efficiency. Since there are problems in the estimation of these efficiencies, market models are used as indirect criteria for economic efficiency. The perfectly competitive model is, however, unrealisable in the real world due to its restrictive assumptions. Model of workable competition does not give unique results. Therefore, alternative indicators of economic efficiency, namely capacity utilisation, profitability, productivity and cost are used to evaluate economic efficiency.

Capacity utilisation is the ratio of actual production to capacity. In the present study engineering concept of capacity, namely installed capacity has been used to measure capacity utilisation in various plants and feedstock based groups.

The structure of cost has been analysed by decomposing the average total cost into its constituents and estimating the contribution of each element to total differences in average total cost between plants and between feedstock based groups.

Commercial profitability has been analysed by using six measures, namely rate of profit on gross capital stock at historical cost, rate of profit on gross capital stock at replacement cost, rate of profit on net capital stock at historical cost, rate of profit on net capital stock at replacement cost, gross profit per tonne of output and net profit per tonne of output.
Inter-plant and inter-group comparisons of total factor productivity, labour productivity, capital productivity and raw material productivity have been made. The growth of these productivities over time in various plants and feedstock based groups has also been measured. Indices of total factor productivity have been computed by using Exact Index Number approach.

VIII.3 Summary of Findings

VIII.3.1 Capacity utilisation

Extent of capacity utilisation in various plants shows that Trombay achieved the highest level of capacity utilisation of 87 per cent per annum on the average, followed by Nangal and Panipat with average levels of capacity utilisation of 77.05 per cent and 68.66 per cent respectively. Among various feedstock based groups, the group of Natural Gas based plants achieved the maximum level of capacity utilisation of 66.2 per cent per annum on the average, followed by the group of Fuel Oil based plants with average level of capacity utilisation of 63.84 per cent. Major factors responsible for the under-utilisation of installed capacity are equipment problems, power problems and raw material shortages.

VIII.3.2 Structure of cost

Among the plants, Panipat has been found to be the plant with lowest average total cost of rupees 9231.42 per
tonne of nitrogen followed by Bathinda with rupees 9350.67 per tonne of nitrogen. Among the feedstock based groups, the group of Fuel Oil based plants shows minimum average total cost of rupees 11280.35 per tonne of nitrogen. There are wide differences in the average total cost for various plants and groups. Differences in the cost of under-utilisation of capacity and cost of raw materials have been responsible, the most, for differences in average total cost. However, other elements of average total cost have also contributed towards these differences. Differences in the cost of raw materials are due to differences in the consumption of feedstock per tonne of nitrogen in various plants.

VIII.3.3 Profitability

Among various plants, Panipat has been found to be the most efficient plant in terms of profitability with maximum average rate of profit on gross capital stock at historical cost amounting to 15.48 per cent per annum and maximum average rate of profit on gross capital stock at replacement cost amounting to 6.05 per cent per annum. Gross profit of rupees 1852.49 per tonne of output is second highest. In terms of some of the net ratios too Panipat has shown maximum rate of profit. Among various groups, the group of Natural Gas based plants has emerged to be the most efficient group in terms of profitability.
with maximum average rate of profit of 3.32 per cent on gross capital stock at replacement cost, minimum net loss per tonne of output and highest rate of profit on net capital stock at replacement cost. The group of Fuel Oil based plants shows highest rate of profit on gross and net capital stock at replacement cost.

VIII.3.4 Productivity

The whole spectrum of empirical results on total as well as partial factor productivities indicate that among various plants Namrup has shown high level of total factor productivity which is 11.28 per cent greater than that in the reference plant Panipat, high levels of raw material and capital productivities which are 150.15 per cent and 42.4 per cent respectively greater than those in Panipat. However, this plant cannot be termed as the most efficient plant because high productivity in this plant is the result of concessional prices of natural gas available to it. The use of feedstock in this plant is more than the norms. On the whole Panipat appears to be more efficient plant in terms of productivities because high productivities in this plant are the result of efficiency in the use of materials consumed. Moreover, this plant shows increase in all the productivities over time. The only other plant that has shown increase in all the productivities over time is Bathinda. Among various groups, the group of Natural Gas based plants has shown highest total factor productivity, labour productivity and capital productivity.
of raw materials is highest in the group of Fuel Oil based plants.

VIII.4 Conclusions

The following broad conclusions have emerged out of the analysis of economic efficiency in terms of capacity utilisation, profitability, productivity and structure of cost.

1) Among various plants, Panipat has emerged as the most efficient plant with minimum average total cost, on the whole best index of efficiency in terms of profitability and productivity, and relatively high average rate of capacity utilisation.

ii) Among various feedstock based groups, the group of Natural Gas based plants has shown relatively higher index of efficiency than other groups, with highest rate of capacity utilisation, higher overall profitability and productivity. However, the average total cost is minimum for the group of Fuel oil based plants. In the group of Fuel Oil based plants, three plants, namely Panipat, Bathinda and Nangal out of four plants show relatively higher efficiency in the use of feedstock per tonne of nitrogen. The group of Natural Gas based plants comprises of only two plants Namrup and Trombay, none of these two is efficient in the
use of feedstock per tonne of nitrogen. Moreover, index of economic efficiency for Namrup in terms of cost and productivity has been enhanced due to cheap availability of natural gas in north eastern states. This has also affected the index of economic efficiency for the group of Natural Gas based plants. Therefore, this group cannot be termed as the most efficient group in terms of overall economic efficiency. Rather the group of Fuel Oil based plants may be termed as relatively more efficient group of plants.

iii) The group of Naphtha based plants has been found to be the least efficient group. Among the plants of the group, Gorakhpur has shown better index of efficiency in terms of all the indicators of economic efficiency because of relatively higher level of capacity utilisation. The technology of the plant is also different from Barauni and Durgapur. In Gorakhpur shell-partial oxidation process is used for gasification which is considered to be better process than the process of steam reforming which is employed in Barauni and Durgapur.

iv) In the group of Coal based plants, though the level of capacity utilisation is lowest and average total cost highest, productivity and profitability in
terms of certain measures is relatively high. This is because of high retention price. This high level of retention price is because norm of capacity utilisation for coal based plants is 60 per cent and other norms regarding the use of various inputs per tonne of nitrogen are higher. Among the plants of the group, Ramagundam has shown much better efficiency than Talcher in terms of all the indicators.

v) Capacity utilisation has been found to be the main determinant of efficiency in terms of all the other indicators of economic efficiency. It has affected average total cost and thereby has an influence on profitability also. It has affected total factor productivity also. Therefore, an increase in the level of capacity utilisation may improve efficiency in terms of other indicators also.

vi) Many factors are responsible for low level of capacity utilisation in various plants and feedstock based groups. Among these equipment problems, raw material shortages and power problems are relatively more important. Equipment problems have caused maximum loss in output. In the group of Coal based plants 67.44 per cent loss occurred
due to these problems. In other groups the loss due to these problems varied between 33.69 per cent of the total loss in the group of Natural Gas based plants and 42.66 per cent of the total loss in the group of Fuel Oil based plants. One of the reasons for such high proportion of loss is that the Government has to purchase equipment from various sources, sometimes due to aid obligations. This results in lack of coordination in the equipments and thereby in frequent breakdowns. A better policy in this regard may reduce equipment breakdowns. Better management of equipment and lesser power problems may also help in reducing the equipment problems.

VIII.5 Limitations of the Study

1) Social profitability of the public sector units has not been undertaken in the present study. Computation of social profitability takes into account the gains to the economy from the setting up of fertiliser plants. Such an analysis has wider policy implications. However, this type of analysis could not be undertaken in the present study because of the problems of calculation of shadow price and the quantification and valuation of external benefits.
ii) Though a detailed analysis of the structure of cost in various plants and feedstock based groups has been undertaken, a cost function that shows whether various plants and groups are producing at minimum cost has not been estimated.

iii) The effect of lack of autonomy in public sector on the efficiency of various plants has not been evaluated.

iv) Evaluation of the impact of managerial skills on the relative efficiency of various plants has not been undertaken.

v) Fertiliser industry has many forward and backward linkages. Income and output multiplier effects of these linkages have not been estimated.

vi) Attempt has not been made to judge the appropriateness of the fertiliser prices fixed by the Government.

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