Dualistic models have offered increasing insight into the process of economic development in developing countries. They can be grouped into two classes. The first group deals with an economy in which one of the two sectors, the agricultural sector is traditional, producing wage goods (foodgrains) and has unlimited supply of labour. The marginal productivity of labour is zero, sometimes even negative, implying that the labour in this sector is paid at a rate which is higher than its productivity. The non-agricultural sector is modern and draws labour from the reservoir of cheap labour supply, the agricultural sector.

This transfer of labour from the traditional sector to modern sector does not result in decline in the production in the former. If wages in non-agricultural sector are equal to labour productivity, then the aggregate production increases with the transfer of labour between the sectors. This is the

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engine of growth in these models. An important omission in these classical models is that they have not given importance to technological changes in agriculture.2/

Agricultural sector in the second group of models have received more importance than what it received in classical models. This new strategy of economic development emphasises land augmenting technological changes in agriculture and stresses on identifying the factors that determine the process of technological changes.3/ These views came into existence due to the growing recognition that different sectors of the economy are interdependent, and understanding the determinants of growth in agricultural output is essential if this sector has to play its role in economic development.

2/ The neoclassical dualistic models do consider technological change in agriculture as crucial factor in economic development but such changes are assumed by them as neutral. This, however, is in contrast to the realities where introduction of modern varieties have proved to be land augmenting technological changes. See D.W. Jangenson, "Development of a Dual Economy", Economic Journal, Vol. 71, June 1961, pp. 309-34; Also see Mellor, (op.cit.), p.23.

Insufficient foodgrain production and their large scale imports in late 1950s made it clear that agricultural sector has to perform better in order to develop the Indian economy.

Inelastic land supply on the one hand and access to modern seeds of some foodgrains on the other, resulted in extensive adoption of land augmenting technology in mid 1960s. This strategy centres around modern agricultural inputs which have synergistic effect on the yields. In the process, the importance of chemical

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4/ If the agricultural output barely keeps pace with population growth, it not only means loss of employment and income generation but also inadequate supply of wagegoods to non-agricultural sector which adversely affects its performance. Now it is widely recognised that if any one sub-sector of Indian economy has constrained the progress of the other, it is stagnant agriculture which has limited the performance of industrial sector. See Gunvant M. Desai, Agricultural Sector and Growth Rate of NNP, 1951-52 to 1975-76, Working Paper No.168, Indian Institute of Management, Ahmedabad, 1977.


6/ In this strategy the modern varieties of seeds (HYVs) and new cultivation practices become means of reducing land constraints. The process involves (a) land and water development, (b) biochemical means of enriching soil-fertility and protection of plants from diseases, and (c) designing and adapting new biological efficient crop varieties. The success of such a technological import, however, depends on capacity to develop and adapt new location specific biotechnology by the technology importing country. See Y. Hayami and V. Ruttan, op.cit., pp.50-53; V. Ruttan, "Technology Transfer, Institutional Transfer and Induced Technical and Institutional Change in Agricultural Development" in Lloyd B. Reynolds (eds) Agricultural Development Theory, Yale University Press, London, 1975, pp.167-69.

For technologically dynamic agriculture, rapidly increasing fertiliser use cannot be over emphasised. Fertilisers have played an increasingly important role in the agricultural development of several developing countries.\footnote{It is estimated that in developing economies of Africa, Latin America, Near East and Far East, about 30 per cent of total grain production increase between 1948-52 and 1972-73 was achieved due to fertiliser use. In India, increase in fertiliser use resulted in about 53 per cent of increase in foodgrain production between 1960-61 and 1970-71. The increasing importance to fertiliser use could be judged from the fact that during 1950s the contribution of fertilisers to foodgrain production growth was only 10 per cent. See M.S. Mudhar and P.P. Andersen, "Fertiliser Policy Issues and Implications in Developing Countries", paper presented in 'FAI-IFDC' Fertiliser Seminar on Trends in Consumption and Production organised by Fertiliser Association of India, December 1-3, 1977; John W. Mellor, New Economics of Growth (op.cit.), p.49.}

In India, fertiliser use has helped in abating the increasing land constraints by improving the productivity.\footnote{The annual growth in foodgrain production between 1964-65 and 1970-71 was about 18 per cent higher than what it was between 1949-50 and 1960-61. This jump in production after the introduction of HYVs has been achieved due to increase in productivity. John W. Mellor, New Economics of Growth, (op.cit.) pp. 48-49.}
This, however, does not call for complacency. Plan after plan, foodgrain production has remained below the targeted level. The failure to achieve the targeted growth of production was mainly because the additions to fertiliser use in different plans have remained below the targeted growth.¹⁰⁻

The Sixth Five Year Plan has set a target of foodgrain production at about 149 million tonnes. This production has to be achieved by stepping up the fertiliser use to 9.65 million tonnes of plant nutrients by 1984-85.¹¹⁻ At present, when fertiliser use in the country is about 5.3 million tonnes, assessing its growth as desired in 1980s needs clear understanding of factors which have affected it in past. Policy interventions needed for creating a favourable environment for fertiliser use to grow at a desirable pace calls for clear understanding of the factors which have constrained and augmented the past growth in fertiliser use.

The present study is diagnostic in nature and focusses on economic forces affecting the cultivators' demand for fertiliser in Indian agriculture.

¹⁰⁻ This is not to underestimate the contribution of other factors in constraining the agricultural growth. See A. Vaidysnathan, "Performance and Prospects of Crop Production in India", Economic and Political Weekly, Vol.12 (33&34), Special Number 1977, pp.1359-61.

Fertiliser use is an outcome of two variables, proportion of area under different crops receiving fertilisers and the rate of fertiliser application. Since different crops respond differently to fertiliser use and also because of difference in the crop prices, a varying pattern of fertiliser use would emerge in different agroclimatic zones in the country.

Fertiliser use would increase even in comparatively unfavourable price environment provided (1) The increase in potential for fertiliser use due to technological changes more than offsets the adverse effect of change in price environment; (2) The marginal returns to move from low level towards optimum level of fertiliser use are economically attractive to cultivators; (3) The cultivators' expectation regarding the physical productivity of fertiliser use has improved.

This study has attempted to analyse the dynamics of fertiliser use in Indian agriculture within the above framework. The study is organised into seven chapters, the first one being the introduction. Chapter 2 gives an overview of the growth in fertiliser use in India, and reviews the literature. Two objectives of this chapter are to highlight how the importance of fertiliser use has increased in agricultural production programmes, and to present the exceptional
features associated with past growth of fertiliser use. Explanation to these peculiarities were first sought in the available literature on economics of fertiliser use. In Chapter 3 an analytical framework is developed to examine the questions emerging out of the review of literature. The specific questions addressed in this study are given next and are answered within this framework in subsequent chapters.

And finally, chapter 3 presents the methodology used in the present analysis.

Chapters 4 and 5 present the analysis of fertiliser use at micro level. Chapter 4 examines the changes in spread and rates of fertiliser use during pre and post-HYVs period for some important crops in different locations in the country. Chapter 5 first identifies the forces which have governed the observed micro level fertiliser use pattern and then examines the relative importance of price and production function related variables in influencing the use pattern.

In Chapter 6 the micro level understanding of previous chapters is extended to identify the forces explaining the fertiliser use at macro level. This chapter is divided into two main sections. The first section presents the findings
on the contribution of fertilisers in agricultural production, and the next section presents the analysis of how the cross-sectional and year to year variations in fertiliser use relative to its potential are governed by expectations of physical productivity and the real price of fertiliser.

Chapter 7 summarises the main findings and highlights the policy implications of these findings.