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Supply response and marketed surplus behaviour of foodgrains and the public distribution system in India: Some policy implications

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SUPPLY RESPONSE AND MARKETED SURPLUS BEHAVIOUR OF FOODGRAINS AND THE PUBLIC DISTRIBUTION SYSTEM IN INDIA: SOME POLICY IMPLICATIONS

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Scope of the Paper

The agricultural sector continues to play a significant role in the national economy of India. Agriculture, even in the early 1990s, contributes more than one-third of the country's Gross National Product (GNP). Agriculture and the allied activities together provide direct and indirect employment to more than two-thirds of the total working population in the country. The agricultural sector contributes substantially to the overall foreign exchange earnings through export of different agricultural commodities. Agriculture provides raw-materials to all the agro-based Industries and supplies huge quantities of agricultural produce for the functioning of internal trade sector. Agriculture also extends considerable support to the country's transport system. The food and nutritional requirements of the people are met through agricultural production, more particularly through the production of cereals and pulses. Stability of agricultural production is of vital importance for the stability of the general price level in the economy. Stabilisation of prices of foodgrains generates real income effects and transfers them to all the rural and urban households in the country.

In general, the production processes in the industrial sector are governed by the application of several controlled and controllable mechanisms. Production processes in the agricultural sector remain largely uncontrolled because they depend on a number of independent endogeneous and exogeneous factors such as climate, rainfall, quality of soil, irrigation, quality of seeds, level and use of science and technology, application of optimum level of manures and fertilisers, availability of skilled labour, cropping pattern and cropping intensity. (A large number of factors, either directly or indirectly, either mainly or marginally, influence various production processes In agriculture). In the determination of agricultural production, market price has been considered an Important factor. In recent decades, the role of Government Policies and Programmes, (hereafter GPPs), has grown significantly. The production processes In agriculture, therefore, involve the interaction of natural, social, economic, political, market, scientific, technological and governmental factors. That the course of the combined interaction of various factors and forces has never been smooth, uniform and perfect will be clear from the complex issues examined later in the paper.

Even within the agricultural sector, the production of foodgrain crops dominates much more than the production of other crops. The dominance of foodgrain crops in the total agricultural production becomes evident from the analysis of data relating to the gross area under foodgrain cultivation, the total volume of foodgrain production, and the total monetary value of foodgrain production. In a normal agricultural year, foodgrain crops occupy three-fourths of the gross cropped area in the country. In the total monetary value of agricultural output, the value of foodgrain

production accounts for as much as 60 per cent. The analysis of ownership and operational patterns of land holdings indicates that a high proportion of farmers in India cultivate small and uneconomic holdings of land. All farmers, irrespective of their class identity, do make a variety of decisions. Among the formulated decisions, the decisions relating to the following basic questions carry greater economic significance. These decisions are economically significant first to the decision-makers themselves, secondly to all the non-farm households, thirdly to the private foodgrain trade and finally to the effectiveness of the Public Distribution System (PDS) in India. The two basic and important questions encountered by all farmers are: (i) What should be the total output that should be targeted in the cultivation of a particular crop? (ii) What proportion of the total output should be marketed for sales?. While answering the two basic questions, each and every farmer, individually and independently, makes one set of decisions on the targeted level of production and another set of decisions on the level of marketed surplus. The individual decisions of all the farmers collectively determine the total production, the total marketed surplus and the total availability of foodgrains in the economy. The problems and issues relating to increase in total supply of foodgrains, maximisation of total marketed surplus and management of total availability of foodgrains, both efficiently and equitably, deserve the highest priority in the formulation and implementation of public policies and programmes.

The widespread problems of deprivation, destitution, hunger, poverty and malnutrition in India have compelled both the Central and the State Governments to initiate a number of regulatory and development measures in the food economy. The two most important objectives of Government intervention are: (i) substantial increase in the internal production and marketing of foodgrains; and (ii) more equitable distribution of the available foodgrains among all sections of the population at reasonable and fair prices. (All other stated objectives are expected to strengthen these two crucial objectives). The initiated GPPs in the foodgrain economy have succeeded in the partial controlling of the private foodgrain trade and created a two-market-two-price system, particularly for foodgrains. Under the two-market- two-price regime, the PDS performs the most important role in the procurement, storage and distribution of foodgrains. The initiated GPPs in India have paved the way for many remarkable achievements in the food economy. But these achievements have not solved the widespread problems of deprivation, destitution, hunger, poverty and malnutrition. In spite of the remarkable achivements and the functioning of PDS for the past five decades, millions of people in the country encounter different levels of starvation. (For the year 1987-88, Minhas and others (1991) have estimated the incidence of poverty, for the country as a whole, at 42.70 per cent). Even the assumption of a lower poverty-level at 40 per cent indicates that there are around 338 million people, (out of a population of 846 millions in 1991), who suffer from different levels of starvation. The gravity of the food problem in India calls for more drastic policies and programmes both by the Central and the State Governments. In this paper, therefore, we review the relative significance of the determinants of supply response and marketed surplus behaviour of foodgrains. Based on the knowledge of the determinants, we indicate some policy implications which would contribute to the efficiency of private foodgrain trade and the effectiveness of PDS in India.

Limitations of the Paper

The restricted scope of this paper gives rise to several limitations. However, only the most important limitations are noted here. First, the coverage of studies has been limited to those which have mainly examined the issues relating to foodgrain crops. Even among the foodgrain crops, the studies on cereals have been given greater importance. In other words, the studies which have concentrated on the analysis of commercial crops, either individually or collectively, have been left out. Secondly, this paper confines itself to the studies which have used Indian data. Several available studies which have used the supply response and marketed surplus data of other countries have not been considered. Thirdly, this paper examines only the more well-known studies that were published during the sixties, the seventies and the eighties. (It is important to note here that some professional journals publish papers on the two themes very regularly and make the total coverage of studies very difficult). Fourthly, the separation of discussion into supply response issues and marketed surplus issues is very artificial. This has been done only for the sake of analytical convenience. As far as the farmers are concerned, the decisions relating to supply and marketed surplus quantities occur just at two points of time in their 'long and continuous process of rational decision-making'. Researchers have resorted to the separation mainly with a view to capturing the more specific aspects of the long and continuous process of decision-making by the farmers. Fifthly, in the selection of "appropriate studies" for examining the supply response and marketed surplus behaviour of foodgrains, many studies on the closely-related aspects of agriculture could not be considered. In the selection of supply response studies, for example, the studies on production trends, production function, farm-size productivity relationship, components of growth, cropping pattern and the studies on farm management problems have not been examined. Similarly, in the selection of marketed surplus studies, the studies on market prices of foodgrains, administered prices of foodgrains, price spread, pricing efficiency, agricultural price policies and the studies on the inter-sectoral terms of trade have not been examined. Also, the studies on the structure of marketing, cost of marketing, efficiency of marketing, market integration, patterns of marketed supply, regulation of markets, futures markets, agricultural marketing policies and the studies on cooperative marketing problems have not been examined. This limitation arises mainly because of two basic reasons: (I) the direct and close Inter-relationship that pervades through different aspects of the agricultural sector; and (ii) on each of the mentioned aspects, numerous studies have been carried out. (The survey of research in agriculture by the Indian Council of Social Science Research (ICSSR) (1975) has succintly summarised the difficulties and limitations of separating and examining one aspect from all the other aspects of agriculture). Sixthly, all the selected studies have been examined and commented upon only briefly. In view of the space and time constraints and the assigned focus of this paper, many studies could not be reviewed. (Such studies, however, have been mentioned in their appropriate places for purposes of documentation). Seventhly, the selected supply response and marketed surplus studies have been reviewed and reported according to chronological order. This might have led to some degree of repetition and overlapping of discussion on some common factors which determine both the supply response behaviour and the marketed surplus

behaviour of farmers. Another important limitation of this paper is its supplementary and suggestive character. This paper merely outlines the complex interrelationships that exist between different aspects of the foodgrain economy and the operational problems of PDS. (In his survey of literature on the PDS in India, Annadurai (1992) has examined the complex interrelationships very elaborately). This paper, therefore, should be treated as a companion paper to the main paper mentioned above.

Organisation of the Paper

For purposes of better understanding and greater clarity, this paper has been divided into four Sections. Section I briefly outlines the unique characteristics of agricultural production, the origin and development of GPPs in India, achievements in the food economy and the dependence of private foodgrain trade and the PDS on the levels of supply and marketed surplus of foodgrains. Section II is devoted to a detailed examination of the economic and non-economic factors which influence the supply response behaviour of foodgrain farmers. Under Section III, the nature, significance, magnitudes, trends, distribution of control and the determinants of marketed surplus behaviour of foodgrain farmers have been analysed elaborately and critically. Some broad policy implications which would contribute to the efficiency of private foodgrain trade and the effectiveness of PDS in India have been indicated in Section IV.

SECTION I

Significance of Supply and Marketed Surplus of Foodgrains for the Private Foodgrain Trade and the PDS in India

In their retrospective judgement on the nature and characteristics of decision-making by farmers, researchers classify the decisions of farmers into "economically rational" and "economically irrational". Whether considered rational or irrational, the decisions of foodgrain farmers have greater economic significnace. As already indicated, the decisions of foodgrain farmers on production and marketing play a significant role in influencing the family budgets of both the farm and the non-farm households. Foodgrain farmers make one set of decisions that govern the quantity of targeted production, or the level of supply. They also make another set of decisions which determine the quantity of foodgrains to be marketed for sales.

Farm households meet their consumption requirements, either fully or partly, from their own farm production. These households are also entitled to purchase foodgrains from the PDS. On the other hand, the non-farm households, living in the rural and urban areas, fully depend on the following two sources of foodgrain purchases: (i) the level of availability of foodgrains in the open market (private foodgrain trade); and (ii) the level of distribution of

foodgrains in the PDS. Complete food security both for the farm and the non-farm households could be achieved only through the efficient functioning of private foodgrain trade (open markets) and the effective functioning of the PDS. In the rest of the Section, we shall briefly discuss the unique characteristics of agricultural production, the origin and development of GPPs in India, the achievements in the food economy and the dependence of private foodgrain trade and the PDS on the levels of supply and marketed surplus of foodgrains.

Unique Characteristics of Agricultural Production and the Fluctuations in the Supply and Marketed Surplus of Foodgrains

Numerous studies, (both Indian and foreign), have examined, theoretically and empirically, the significance of agricultural sector in the overall economic growth and economic development of a country. Many of them have examined the specific problems of the agricultural sector of developing countries. The more notable studies which have greater relevance for the Indian agricultural sector are the studies of Thirumalai (1954), Johnston and Mellor (1961), John Mellor (1962, 1966, 1968, 1976), Walter Falcon (1962, 1964), Khan (1963), Schultz (1964, 1965, 1968, 1978), Southworth and Johnston (1967), Francine Frankel (1971), Keith Griffin (1974), Douglas Ensminger (1977), Ray, Cummings and Herdt (1979), Srinivasamurthy and Rameswari Varma (1984), Mellor and Desai (1986), Paul Streeten (1987), Ashok Gulati (1987) Per Pinstrup Anderson (Ed) (1988) and Mellor and Raisuddin Ahmed (1988). (The studies which we have reviewed and mentioned for documentation purposes in this paper also bring out many theoretical and empirical insights and innovations). Most of these studies have raised, either directly or indirectly, the following basic questions which were originally raised by theories of product pricing in economics. The more important basic questions raised are:

(i) Do all Indian farmers seek the goal of maximisation of agricultural net income like the producers of industrial products?

(ii) Are production conditions in Indian agriculture similar to industrial production conditions as assumed under perfect competition?

(iii) How do farmers respond to changes in market prices and why?

(iv) How effective is the price mechanism in achieving the allocative efficiency of agricultural resources in India?

(v) How significant are the non-price factors in determining the levels of production and marketed surplus of foodgrains in India?

(vi) How significant and effective are the Government policies and programmes in the agricultural and food sectors of India?

While seeking answers to these questions, many studies have discussed and documented the unique characteristics of different production processes in agriculture. In view of the limited focus of this paper, we shall discuss here only the most important unique characteristics of Indian agriculture.

(i) Unlike industrial production, agricultural production depends much more on the favourable conditions of natural forces such as sunlight, circulation of air, fertility of land, quantum and distribution of rainfall, availability of irrigation and climatic conditions. In this connection, the observation of William Found (1971) appears pertinent: "One of the most permanent aspects of land-use decision making is that many events cannot be predicted with 100 per cent accuracy. Prices at the time of harvest, availability of hired labour, machinery breakdown, technological change, governmental action and weather conditions are all examples of factors which affect land-use, productivity and income, but which are seldom known precisely before they occur". No wonder, agriculture in India still continues to be a gamble in the monsoon.

(ii) Agricultural production does not follow a pre-determined input-output relationship. The input-output relationship varies across crops, seasons, classes of farmers, regions and countries. The dependence of agriculture on natural forces and the varying input-output relationship largely account for the observed uncertainties and production risks in agriculture.

(iii) Agricultural production and supply operations follow seasonal cycles. The seasonal factors are more significant in agricultural production than in industrial production. Considerable length of time passes between the use of inputs and the harvesting of crops. In this connection, Dharm Narain (1965) has rightly observed: "In agriculture, in particular, the biological nature of production process makes for a considerable lag between production inputs and outputs. The lag between the time of decision in respect of utilisation of land, the most important input factor, and the fruition of that decision into output is still larger". It is because of this characteristic of agricultural production that there is always a strong tendency for imbalance between the supply of and the demand for foodgrains.

(iv) As producers, farmers have a wide variety of choices. In the utilisation of land, in fixing the production target, in the combination of crops and in the use of inputs, each farm household is free to make individual choices on many production aspects. The wide variety of choices enjoyed by the farmers often disturb the macro-level production targets fixed by Government agencies.

(v) In the manufacturing sector, the producers are guided by the objective of profit-maximisation. They participate in production purely as producers of commodity. Industrial production, by and large, is meant for marketing and sales. On the contrary, farmers make decisions not only as producers but also as consumers of their own agricultural produce. In particular, the targeted production and marketing decisions of foodgrain farmers depend largely upon the estimated consumption requirements of their families.

(vi) In the industrial sector, the price mechanism brings out allocative efficiency of resources more smoothly than in agriculture. The role of the price mechanism in achieving the allocative efficiency of agricultural resources tends to be limited by the physical, financial, marketing, institutional and infrastructural constraints and imperfections. In the more backward agricultural areas, these constraints and imperfections exert greater negative influence on production, productivity, supply and marketing of foodgrains.

(vii) Market price has been considered as the single most important factor determining the level of industrial production. In agricultural production, market price cannot play as powerful a role as in industrial production. In fact, under certain conditions of agriculture, the non-price factors such as fertility of land, rainfall, irrigation, weather, technology, institutional and infrastructural constraints determine the level of production much more than the price factor.

(viii) Both in industrial production and in agricultural production, labour constitutes an important input item in the cost of production. A major part of the labour force in Indian agriculture consists of the entrepreneur and his family. Cost of production in agriculture, therefore, is made up of hired-labour and owned-labour components. The dominance of family labour in subsistence agriculture and the problems of imputation of family labour,(largely arising from opportunity cost estimations), make the calculations of cost of production in agriculture more difficult and undependable than in industry.

(ix) The problem of distinction between "operational cost" and "maintenance cost" is more complicated in agricultural production than in industrial production. If prime costs are defined as the difference between the costs incurred when output is positive and those incurred in producing nothing, while remaining in business, (i.e., maintaining equipments so that production can be readily resumed at any point of time), some costs which appear to be prime are really maintenance costs.

(x) The inter-market price differences for agricultural products tend to be greater than the cost of transportation. The inter-market price differences arise mainly because of varying actual cost of production across different classes of farmers. The actual cost of agricultural production differs even from one individual farmer to another. The differences in transport cost and storage cost of different classes of farmers complicate the costing and pricing problems of agricultural products further. On the basis of actual cost of production, actual transport cost and actual storage cost, market prices of agricultural products fluctuate over time and across space much more than the market prices for industrial products.

The unique characteristics of agricultural production directly contribute to uncontrolled and uncontrollable fluctuations in the supply and marketed surplus behaviour of foodgrains. The wide and dramatic market price swings observed at the macro-level merely reflect the fluctuations in

the supply and marketed surplus behaviour of foodgrains. (Towards the end of this Section, we shall substantiate this point through a few macro-level illustrations). The production fluctuations and the price swings in the farm sector tend to be more frequent and of greater amplitude than those of the non-farm sector. The supply and marketed surplus fluctuations and instabilities, directly and indirectly, cause many problems to all the households in the economy. The wide price fluctuations very often arise mainly due to fluctuations in the levels of supply and marketed surplus of foodgrains. Commenting on the importance of eliminating the wide and frequent price variabilities of agricultural commodities, Willard Cochrane (1958) observed thus: "Out of this price variability-regular and irregular, wide and narrow-emerge several farm problems: variable farm incomes, low incomes over extended periods and uncertainity in planning production".

Evolution of Government Policies and Programmes and the Achievements in the Foodgrain Economy

The British rulers in India, upto 1943, strongly believed in the successful operation of the principle of ***laissez faire***. The "automatic adjustment" mechanism, as the built-in component of free trade, became unquestionable. Free market and free trade, according to them, completely satisfied both the sellers and the buyers of commodities. Government intervention in any aspect of production, marketing and trading was considered as a disturbing and distorting factor. The principleof non-interference, as practised by the British rulers, (along with droughts and floods), contributed to the frequent occurrence of famines, epidemics and millions of starvation deaths. The occurrence of famines was treated more as a periodic natural calamity than as a matter of great concern compelling the Government to increase the food supply substantially. Famines and food shortages were the unfortunate legacy of the British rule in India. Many expert studies have analysed and documented the causes and consequences of such disasters. The more notable among them are the studies of Dadabhai Naoroji (1888), Romesh Dutt (1900, 1950), Sir Henry Knight (1954), Bhatia (1967), Dantwala (1973) and Sen (1981, 1989).

The outbreak of the Bengal famine in 1943 created disastrous effects for the entire population of eastern India and starvation deaths in Bengal wiped out an estimated 1.5 million people. An unprecedented food scarcity struck the entire country. The Government of India was compelled to interfere in the foodgrain economy. The Government appointed a committee under the chairmanship of Sir Theodore Gregory for laying the foundation for Government's policy formulation with regard to different aspects of the foodgrain economy. The Report of the Foodgrains Policy Committee (1943) considered three altemative policy options: (i) complete free trade (monopoly of private trade); (ii) complete state trading (monopoly of Government trading); and (iii) the via media foodgrain policy in which both the private traders and the Government trading agencies operate. After considering the consequences and policy implications of all the three options in great detail, the Committee recommended the adoption of the via media foodgrain policy under which

the Government would involve itself in the operations of production, marketing, trading and stocking of foodgrains. The Committee argued that free foodgrain market mechanism, if left to itself, would protect neither the producers nor the consumers of foodgrains. From the period of non-interference, the Central and State Governments moved into the period of increasing interference in all the aspects of national economy. The first set of intervention and regulatory measures in the foodgrain economy was introduced in 1943. The Bengal famine of 1943, therefore, must be regarded as a landmark in the long history of food and famine problems in India.

On the basis of recommendations of the Report of the Foodgrains Policy Committee (1943) and the Report of the Famine Enquiry Commission (1945), the Government of India (1946) issued the first ever agricultural policy statement in January 1946. The Policy Statement proclaimed:

> "The all-India policy is to promote the welfare of the people and to secure a progressive improvement of their standard of living. This includes the responsibility of providing enough food for all, sufficient in quantity and of requisite quality. Forthe achievement of this objective, high priority will be given to measures for increasing the food resources of the country to the fullest extent, and in particular to measures designed to increase the output per acre and to diminish dependence on vagaries of nature. Their aim will not only be to remove threat of famine but also to increase the prosperity of the cultivator, raise levels of consumption and create a healthy and vigorous population".

The policy statement outlined ten important objectives to be achieved by Government intervention. They included: (a) increase in the production of foodgrains and of protective foods; (b) improvement in the methods of agricultural production and marketing; (c) stimulating the production of raw materials for industry and exports; (d) securing remunerative prices to the producers and fair wages to the agricultural labourers; (e) ensuring the fair distribution of the foodgrains produced; and (f) promoting nutritional research and education.

From the time of adoption of food policy by the Central Government and introduction of schemes under the Grow More Food Campaign in 1943 and upto adoption of the New Agricultural Policy in 1992, both the Central and the State Governments continue to initiate a large number of policies and programmes with respect to production, marketing, trading and distribution of foodgrains. (In view of the assigned focus of this paper, we prefer not to get into the discussion of the programmes themselves). As a consequence of the initiated GPPs, the Government operations in the food economy increased phenomenally. The Reports of different Official Committees, the Annual Reports of different departments of the Central and the State Governments, the Economic Surveys, the Five Year Plan documents, the publications of the Central and State Planning Commissions and the Budget documents of the Central and State Governments are some of the sources which outline the working and impact of the GPPs. The Reports of the National Commission on Agriculture (1976) have also assessed and documented the impact of most of the GPPs. A large number of independent studies have also analysed and documented the working and the

effects of the GPPs. The studies of Shah and Vakil (1979), Kahlon and Tyagi (1983), Dantwala and others (1986), Chopra (1988), Tyagi (1990) and Venugopal (1992) have made excellent overall and more specific assessments on the initiated GPPs. The GPPs initiated through a wide variety of land reforms, incentives, subsidies, support services, PDS operations and so on contributed to the gradual but definite transformation, modernisation and production growth in Indian agriculture.

The policies and programmes of the Central and the State Governments first motivated millions of farm households and induced them to target for the maximum agricultural production. Many remarkable achievements in Indian agriculture became possible because of the favourable interaction of natural, social, economic, political, market, scientific, tecnological and governmental factors. The political and Governmental factors have played a more significant role in all the remarkable achievements in Indian agriculture. The initiated GPPs, upto 1970, mainly focussed on the aspects and factors which directly contributed to the tremendous output growth. The initiated GPPs, during the 1970s and the 1980s, mainly concentrated on the distributional and equity aspects of the available foodgrains. Among the initiated GPPs in the food economy, the PDS continues to play the most important role in providing food security for the poorer sections in the population. Both the Central and the State Governments substantially depend on the PDS for achieving the objective of more equitable distribution of foodgrains among all sections of the population. (We shall briefly discuss the significant failures of the GPPs, the PDS and those of the Indian agriculture in Section IV where we indicate some policy implications which would contribute to complete food security for the entire population in the country). The following are the indicators of remarkable achievements in the areas of production, imports, public procurement, public distribution and Government stocks of foodgrains. (Minor variations in figures of achievements arise mainly because of using the data from different official sources. Minor variations also arise because of using the data relating to calendar year, financial year and marketing year).

The estimated gross production of foodgrains stood at 50.80 million tonnes in 1950-51 which increased to 82 million tonnes in 1960-61. In 1970-71, the gross production of foodgrains increased to the level of 108.40 million tonnes. In 1980-81, the gross production reached the level of 129.6 million tonnes; the same, in 1990 - 91, touched an all-time record level of 176.40 million tonnes.

Imports of foodgrains (mainly rice and wheat) stood at 4.8 million tonnes in 1950-51 which decreased to 1.37 million tonnes in 1956. Imports of foodgrains during 1960-61 accounted for 3.5 million tonnes. But, in 1966, imports reached a record level of 10.31 million tonnes. However, during 1974-75, imports declined to 7.54 million tonnes. In 1983-84, imports once again became considerable and stood at 4.20 million tonnes. In 1990-91, imports of foodgrains remained at the negligible level of 0.60 million tonnes.

Government agencies (the Food Corporation of India, State Civil Supplies Corporations or their authorised agencies) procure foodgrains either through statutary levy on the produc-

ers, traders and millers of foodgrains, or through the minimium support price operations. In 1951, the total procurement of foodgrains (mainly rice and wheat) stood at 3.80 million tonnes or 7.90 per cent of the net foodgrain production. (Net foodgrain production is arrived at by deducting 12.50 per cent of foodgrain production from the estimated gross foodgrain production in the country. The 12.50 per cent is assumed to be used for seed and feed, and in wastage). In 1961, the total procurement was only 0.50 million tonnes which worked to a mere 0.70 per cent of the net foodgrain production. However, in 1966, foodgrains procurement increased to 4.00 million tonnes or 15.82 per cent of the net production of 63.27 million tonnes in that year. Public agencies, in 1971 procured a total of 8.90 million tonnes of foodgrains which worked to 9.30 per cent of the net production. In 1980-81, foodgrains procurement increased to 13 million tonnes, or 11.40 per cent of the net production. Foodgrains procurement reached a record level of 19.60 millom tonnes in 1990-91 which worked out to 12.70 per cent of the net production during 1990-91.

The public distribution of foodgrains stood at 8.00 million tonnes in 1950-51 which worked out to 15.30 per cent of the net availability of foodgrains. (Net availability of foodgrains in the country is determined by adding the net imports of the year and the Government releases of foodgrain during the year to the estimated net production of foodgrains). In 1960-61, the public distribution remained only at 4.0 million tonnes, or 5.30 per cent of the net availability. In the severe drought year of 1966, the public distribution of foodgrains touched a record level of 14.08 million tonnes which became 13.17 million tonnes in 1967. (The total public distribution during 1966 and 1987 worked out to 22.25 per cent and 20.28 per cent of the estimated net internal production). In 1970-71, the public distribution, however, declined to 7.80 million tonnes which worked out to 8.30 per cent of the net availability. In 1980, the public distribution increased to 14.99 million tonnes, or 11.40 per cent of the net availability of foodgrains. The public distribution of foodgrains in 1987 and in 1988 increased to 18.70 million tonnes and 18.58 million tonnes, mainly because of "the drought of the century". The public distribution of foodgrains increased to 20.60 million tonnes in 1991 which worked out to around 13.00 per cent of the net availability. (Public distribution figures from the year 1978 to 1990 included the distribution of foodgrains released under the Food for Work Programme of the Government).

The trends in the Government stocks of foodgrains (total closing stocks held by the Central and State Governments) indicate another set of remarkable achievements in the Indian food economy. In 1952, the Government stocks of foodgrains stood at 1.95 million tonnes which declined to a mere 0.30 million tonnes in 1956. In 1961, the Government stocks remained at 2.64 million tonnes. But, in 1967, the stocks touched a low level of 1.96 million tonnes. From 1968 to 1971, the Government stocks of foodgrains started increasing. In 1971, the actual stocks stood at 8.14 million tonnes. From 1972 to 1974, Govemment stocks started declining and the actual stocks came down to 2.73 million tonnes in 1974. The period from 1975 to 1985 marked the record

period of Government stocks in foodgrains. In 1975, the foodgrain stocks stood at 8.29 million tonnes which, in 1985, touched an all-time record level of over 28 million tonnes. (The 1985 figure included both the buffer stocks and the operational stocks held both by the Central and the State Governments). The Government stocks of foodgrains during 1990 remained colse to 20 million tonnes.

A large number of studies have examined the distributional effects of the overall economic growth on various sections of the population. Among these studies, many of them have examined, more specifically the impact of agricultural output growth on the incidence of poverty ratio both at the national and at the State levels. For his doctoral research, Chandrasekara Naidu (1991) has reviewed some of the leading studies which have carefully examined the poverty ratios and trends across the country and over time. In view of the assigned focus of this paper, we do not go into the details and debates on poverty levels in India. However, we proceed with the poverty proportion of 40 per cent of the total population which is slightly lower than the poverty proportion of 42.70 per cent of Minhas and others (1991) for the year 1987-88. As already indicated, the 40 per cent of the total population (i.e., 338 million people in 1991) encounter different levels of food insufficiency and starvation. In spite of the tremendous growth in agricultural output and other achievements in the foodgrain economy, a huge level of "dormant demand" for foodgrains, (or "latent hunger" among people), persists. This only indicates the poor "trickle-down effects" of output growth in foodgrains. In meeting this unrealised demand for foodgrains, both the private foodgrain trade and the PDS in India could play a significant role. In order to achieve the objective of complete food security for all, the private foodgrain trade and the PDS in India need to be restructured and revitalised.

Dependence of Private Foodgrain Trade and the PDS on the Supply and Marketed Surplus of Foodgrains

The remarkable achievements in the areas of production, imports, public procurement, public distribution and the Government stocks are the indicators of phenomenal growth of public sector agencies like the FCI, State Civil Supplies Corporations, the PDS operations and the network of Fair Price Shops in the country. But, when compared to the huge quantities of foodgrains procured, distributed (sold) and stocked by millions of private traders, even the phenomenal growth of public sector agencies becomes small. The non-availability of reliable data with respect to the operations of millions of private foodgrain traders strongly comes in the way of estimating the magnitudes of private operations in foodgrains. Among the four important wholesale foodgrain marketing agencies, namely, private foodgrain trade, regulated markets, cooperative marketing agencies and the public sector marketing agencies, the private foodgrain traders and the public sector agencies have major shares in foodgrain operations. Even among the big two, the private foodgrain trade has much greater power and control in the purchasing and marketing of foodgrains. Analysis of

public procurement and public distribution data indicates that the public sector agencies in India procure, market and distribute only around 15 per cent of the net production of foodgrains. In other words, private foodgrain traders purchase, market and sell around 85 per cent of the net production of foodgrains. (In the net production figure of the year, the estimated proportion of foodgrains retained by the farm households for consumption purposes should be deducted for arriving at the proportion of foodgrains actually traded in, both by the private traders and the public sector agencies). It has been estimated that public sector agencies procure and distribute less than one-third of the total marketed surplus of foodgrains. (The total estimated marketed surplus of foodgrains (mainly rice and wheat) accounts for around 40 per cent of the net production of foodgrains). The continued predominance and supremacy of private foodgrain trade in the food economy of India is very perceptible. (The economic reforms of liberalisation and privatisation introduced by the Central and State Governments, especially from 1991-92, suggest that the supremacy of the private foodgrain trade might even grow further in the years to come). In all the policy formulations and programme implementations, therefore, both the Central and the State Governments should recognise the relative significance of the private foodgrain trade. (In Section IV of this paper, we shall come back to these issues again).

The analysis of supply, demand and price trends in the foodgrain economy indicates that several periods of increasing foodgrain production and marketed surplus were followed by periods of stability in the open market prices of foodgrains, greater availability of foodgrains both in the open markets and in the PDS. On the contrary, the periods of declining foodgrain production and marketed surplus were followed by periods of rising open market prices, increasing imports of foodgrains, lesser availability of foodgrains both in the open markets and in the PDS. In other words, both the levels of internal production and the marketed surplus of foodgrains determine the levels of open market prices, the levels of net availability of foodgrains both in the open markets and in the PDS. The following national-level, secondary data-based conclusions of earlier studies bring to focus the high degree of dependence of the private foodgrain trade and the PDS on the levels of internal production and marketed surplus of foodgrains. Many studies have analysed and reported definite conclusions on the relative significance of private foodgrain trade and the PDS and on the relationships between the levels of foodgrains, open market prices and the levels of money supply. Our illustrations are drawn from some of the conclusions of the excellent studies by Kahlon and Tyagi (1983) Chopra (1988) and Balakrishnan (1991).

The impact of increasing the internal production and marketed surplus on the well-established Government control system itself provides a very useful lesson. The control orders and the ration system introduced in 1943 continued in the 1950s except for a brief period from December 1947 to September 1948. The bumper harvests during 1952-53 and 1953-54, and the abundant availability of foodgrains with the private foodgrain trade (free markets) made the Central and the State Governments to remove all the food controls in July 1954. The estimated gross production of foodgrains jumped upto 72 million tonnes in 1953-54 from the modest level of 50.80 million tonnes

in 1950-51. Bumper crops and substantial increases in production and marketed surplus have the power to dismantle even the well-established ration system.

After detailed economic and econometric analysis of data for a number of periods, many studies have shown that the periods of increasing production and increasing marketed supply were followed by periods of price stability and periods of declining imports of foodgrains. On the contrary, the periods of declining production and declining marketed surplus were followed by periods of soaring prices and periods of increasing imports of foodgrains. As a result of the introduction of New Agricultural Strategy, (the High-Yielding Varieties Programme, HYVP), the gross production of foodgrains, (mainly wheat and rice), increased substantially from 95.50 millions tonnes in 1967-68 to 108.42 million tonnes in 1970-71. During this period, money supply, on an average, rose by 11.50 per cent per year but the price increase was observed to be only 4.60 per cent per year. Again, in spite of about 19 per cent annual growth rate in money supply, complete price stability was observed during the period 1975-76 to 1978-79. The neutralising effect of higher levels of agricultural production and marketed surplus on the market prices of foodgrains became very evident. Foodgrain production suffered a setback in the two years of 1973-74 and 1974-75. The gross production of foodgrains during 1972-73 declined to 97.03 million tonnes from 105.17 million tonnes in 1971-72. In the following two years, (1973-74 to 1974-75), the gross production of foodgrains remained around 100.00 million tonnes. Although money supply increased only about 14 per cent, agricultural prices rose by 18.30 per cent between 1971-72 and 1974-75. When a shorter period was analysed, the price increase became much sharper. For example, the wholesale price index had gone up from 245.00 in January 1974 to 407.00 in September 1974. (Chopra, 1988). Again, the wholesale price index, (Base: 1970-71 = 100), stood at 296.00 in 1985-86 which sharply increased to 390.00 during 1988-89. The nearly 100 percentage point increase in open market prices was mainly due to the falling of production of foodgrains from 150.00 million tonnes in 1985-86 to around 140.00 million tonnes during 1987-88. The appreciable price stability observed during 1989-90 was mainly due to production of foodgrains increasing from about 140.00 million tonnes from 1987-88 to more than 170.00 million tonnes during 1988-89.

The chain effects of higher levels of production and marketed surplus of foodgrains get reflected in the reduction of imports, effective management of drought years, maintenance of huge government stocks, growth in per capita net availability of foodgrains and in the possibility of earning foreign exchange reserves through export of foodgrains. More importantly, greater availability of foodgrains provide opportunities both for the private foodgrain trade and the PDS to expand their operations more effectively and more efficiently. The favourable interaction of all these macroeconomic variables significantly contribute to the establishment of more complete food security system In the country. In fact, they are the reliable components of the real food security system. The direct effects of Increased food production and increased marketed surplus on some of the other crucial macroeconomic variables, as analysed and concluded by earlier studies, could be briefly deduced as follows.

In the 1970s and the 1980s, imports of foodgrains became negligible mainly because of substantial increases in both production and marketed surplus. On the contrary, when the levels of production and marketed surplus slumped during the drought years from 1965 to 1967, the country was forced to maximise its imports of foodgrains and the PDS functioning in India was forced to depend entirely on the imports of foodgrains. The maximum import of 10.40 million tonnes during 1966 was a case in point. The observed differences in the effects of drought years before and after the mid-sixties provide clear evidence to the significant contributions made by the levels of production and marketed surplus. The high level of imports, popularly described as "ship-to- mouth" existence, explained the gravity of foodgrain shortages during the drought years of 1960s. On the contrary, even the "drought of the century" during 1987-88 was managed much more smoothly and effectively mainly because of the enormous Government stocks of foodgrains. Higher levels of production also provided opportunities for earning foreign reserves, although in small measures, during the 1980s.

The per capita net availability of foodgrains in the early 1950s was hovering around 350 grams, per capita per day, which increased to a range of 450 to 500 grams, per capita per day, by the end of 1980s. This level of improvement in the physical access to food was made possible by the enormous increase in the production of foodgrains. In other words, all these components of food security system get strengthened by the continuous increases in the levels of production and marketed surplus. As already indicated, the private foodgrain trade and the PDS have much greater role to play in ensuring complete food security, (economic access to food), for all sections in the population. In their excellent studies on the food economy of India, Tyagi (1990) and Venugopal (1992) have emphasised the urgent need for strengthening the food security system through the efficient functioning of the private foodgrain trade and the effective functioning of PDS in India. Since the level of supply and the level of marketed surplus of foodgrains are the basic sources of strength of the components of food security system, a systematic and thorough examination of the determinants of supply response and marketed response of foodgrains becomes very essential and very relevant. In the following two Sections, (Section II and Section III), therefore, we review the relative significance of the determinants of supply response and marketed surplus behaviour of foodgrains through two sets of carefully selected studies.

SECTION II

Components of Supply Response : A Synoptic Survey

On the significance of understanding the economic variables that determine the supply response behaviour of farmers, Earl Heady (1961) has observed thus: "The subject of farmers' responsiveness to economic variables has gained importance during the past few decades in both underdeveloped and developed economies. Developing economies need to understand the supply

phenomena in order to implement policies for raising the output to a level which can provide for adequate human nutrition for the increasing population and also to promote general economic development. Even in developed countries, understanding of the supply phenomena is of crucial importance for controlling surplus, for raising farm incomes and resource productivity".

In the 1950s, it was ***a priori*** believed that farmers in the underdeveloped countries like India do not respond to price changes and even if they respond, the response is negatively- related to price changes. Studies by Walter Neale (1959) and others had supported this contention. During those years, a reliable and studied statement on the responsiveness of agricultural output and the area under cultivation to changes in market prices was almost absent on the Indian situation. In the early sixties, some rudimentary attempts were made to study the components of agricultural supply response. These studies were carried out mostly in the form of crude comparisons of the trends in prices with the trends in production, juxtaposing one against the other.

Based on the concept of adaptive expectation, Marc Nerlove (1958) examined the supply response behaviour of the U.S. farmers for given changes in market prices. Nerlove analysed the data for corn, cotton and wheat crops. The Nerlovian lagged adjustment model attempted to reduce the complex process of response behaviour involving several economic and non-economic factors into a pair of adjustment equations. The Nerlovian model assumed that, over the period of analysis, the adjustment coefficients are static in nature, irrespective of any structural changes in the economy. In the models of all the three crops, Nerlove found the supply response of farmers to price changes very positive and significant. The results and conclusions of the Nerlovian dynamic supply model produced far-reaching effects. The pioneering study, carried out in the United States, paved the way for intensive further research in the dynamics of supply in many developing countries. Following Nerlove's study of supply dynamics, a large number of supply response studies were conducted by using the Indian data. In this Section, we shall examine synoptically the contributions and conclusions of some of the more well-known supply response studies which have used Indian data.

Among the Indian supply response studies, many of them have directly applied the Nerlovian model; but some of them have made minor modifications to the Nerlovian model of supply dynamics. Some of the Indian studies have even extended the Nerlovian framework of analysis. Nowshirvani (1962), for example, examined the planting behaviour of peasants in Bihar and eastern Uttar Pradesh. These areas are among the most backward parts of the Indian sub-continent. Data for rice, wheat, barley and sugarcane crops for the pre-war period (1909-1938) and the post-war period (1953-1962) were analysed in detail. Nowshirvani fitted a modified Nerlovian model with rainfall, crop yield and trend variable as the three independent variables supplementing the main variable of price. He estimated the long-term price elasticity of area, separately for each crop and for each region. The study found that the price expectation of farmers explained very little of the area changes for rice, wheat and barley. These crops were essentially the subsistence crops of the examined regions. Only in the case of sugarcane, (a cash crop), Nowshirvani found a

somewhat significant long-term price elasticity. The food crops, in general, showed very weak area responsiveness to changes in market prices. In the determination of planting behaviour and the area under cultivation, Nowshirvani found the quantity of rainfall and its distribution over the entire crop season, variations in temperature and the trend variable exerting much greater influence on area than the price variable.

In the Indian context, the study by Raj Krishna was the first to adopt the Nerlovian model. Raj Krishna (1963) examined the supply response of selected food and cash crops to price and non-price factors for the Punjab region. He analysed the data for the period 1914 to 1945. Through this study, Raj Krishna tested the widely prevalent notion that peasants in underdeveloped countries either do not respond to price movements, or respond very little, or respond to price movements only negatively. Relative price, relative yeild, irrigation and rainfall were Included as "shifter variables" to explain the area changes. Raj Krishna found a positive and significant price elasticity of acreage for all the crops except jowar. Jowar output showed a negative response to price movements. The short-term price elasticities of output varied from 0.1 (for wheat) to 0.7 (for cotton). The corresponding long-term price elasticities ranged from 0.15 to 1.6. For most of the analysed crops, both the short-term and long-term price elasticities of output were found to be positive and significant.

Raj Krishna recognised various uncertainities in agriculture and the slowness of the supply adjustment process as the original Nerlovian model did. The prices in the preceding year, weather and irrigation were the other recognised variables influencing the planned level of production. The pioneering Indian study revealed that farmers of Punjab adjusted the acreage under competitive crops like wheat and cotton in the same manner as the U.S. farmers would have done. Raj Krishna argued that both in underdeveloped and highly-developed countries, economic forces operated alike. Raj Krishna, therefore, ruled out the special need for explaining the behaviour of the so-called subsistence farmers in terms of non-economic factors. The results of this study also disproved the widely held belief that peasants in underdeveloped countries either do not respond to price movements, or respond very little, or respond to price movements only negatively.

Instead of analysing two or multiple crops, some of the supply response studies have concentrated on the analysis of a single crop. For instance, Rao and Jai Krishna (1965) examined the supply repsonse of wheat crop in Uttar Pradesh. They analysed the acreage and price data for the period 1950-51 to 1962-63. Twelve price formulations, based on wholesale prices, were used to explain the changes in wheat acreage during the period under study. Most of the models did not explain the inter-year variations in acreage. In the revised version of the study, Jai Krishna and Rao (1967) incorporated nine alternative price expectation models and six different response equations for analysing the dynamics of acreage allocation for wheat crop in Uttar Pradesh. They tested the wheat acreage data through Nerlovian as well as non-Nerlovian models. The results of the study clearly indicated the significant influence of relative prices of wheat and its substitute crops on wheat acreage allocation in Uttar Pradesh.

The study by Dharm Narain (1965) has been generally considered as an important contribution to the literature on supply response behaviour in India. Dharm Narain examined the time-series data relating to areas under cultivation and prices of selected crops for the period 1900 to 1939. He analysed several hypotheses concerning farmers' supply response behaviour. The study, in essence, assessed the role of the basic economic principle of profit-motive in determining the supply response of Indian farmers. After careful and detailed analysis, Dharm Narain concluded that changes in prices significantly influenced the movements of areas under different crops.

In the area responsiveness, a striking difference was observed as between the cash crops and the food crops. While market price emerged as a decisive factor for area under cash crops, rainfall became the significant factor for the area under food crops. Dharm Narain observed: "Similarity between the behaviour of areas under cash crops and the prices of these crops is, in most cases, so striking that price emerges as a decisive consideration with the farmer in the areas he sows these crops. In the case of food crops, however, rainfall assumes that status which price does in the case of cash crops".

Dharm Narain explained that the non-significance of price factor in the case of food crops might even arise from the limitations of his study. The study by Dharm Narain was unique as it contained simple devices such as tabular analyses and geometric charts. However, the approach of Dharm Narain was severely criticised for neglecting very important socio-economic and technical factors which, along with land area. determine the actual physical supply of agricultural output. On the whole, the results have revealed that Indian farmers are significantly responsive to price incentives and commercial stimuli.

Some studies have recognised the significance of risk factor in the analysis of supply repsonse issues. The study by Acharya and Sengupta (1966), for example, considered the acreage substitution relation as an important aspect in the dynamics of supply. They examined the response of relative acreage to relative prices in the case of two substitute crops, namely, autumn rice and jute. Acharya and Sengupta analysed the acreage and price data for the 8 districts of Bihar and 9 districts of West Bengal. They fitted the harvest price as an independent variable and the acreage as the dependent variable. In most districts, they observed insignificant price ratio coefficient. The price sensitivity of acreage substitution was not as high as could be expected. But they found higher degrees of risks in the cultivation of jute as compared to the cultivation of rice. Acharya and Sengupta, therefore, introduced risk factor in explaining the low price sensitivity of acreage substitution between jute and rice. With the introduction of risk factor, the results of the study were found to be consistent as in the case of the theory of investment under risk conditions.

In the revised version of the study, Sengupta and Amitava Sen (1969) re-examined the question of acreage substitution, through econometric analysis, for the same crops and for the same States of Bihar and West Bengal. This time, Sengupta and Amitava Sen employed

production, instead of acreage, as the dependent variable. They fitted prices and net return as independent variables, both lagged by one period. Weather was also included as an independent variable. On the basis of detailed analysis, they concluded that the unpredictable behaviour of production would be explained by different degrees of risks that the farmers encounter in the cultivation of substitute crops. In other words, the differential risks encountered by farmers fully explained why the higher value crops, or the crops that yield better returns, were not necessarily preferred over the less-priced crops or the crops that yield lower returns. (Several other studies have also examined the relative acreage response to relative prices for pairs of individual substitute crops or groups of substitute crops. The more well-known among them are the studies of the National Council of Applied Economic Research (1962), John (1965), Dharm Narain (1965), Sawhney (1968), and Mukherji and Mukherji (1969). In view of the time and space constraints, we prefer not to review all of them here. However, the studies and conclusions of Dharm Narain (1965), Acharya and Sengupta (1966) and Sengupta and Amitava Sen (1969), which we have briefly reviewed, adequately represent the set of supply response studies on substitute crops).

Among the studies that compared the supply response of food crops with the supply response of cash crops at the State-level, the study of Rajagopalan (1967) is of special significance because it recognises public procurement of foodgrains as an important explanatory variable of supply response behaviour. Rajagopalan selected three types of farming regions in Tamil Nadu and examined the supply responsiveness of three subsistence food crops (rice, bajra and ragi) and three cash crops (groundnut, cotton and sugarcane). The study analysed the data for the period 1939 to 1961. For each of the three regions, the principal substitute crop considered was different. The fitted explanatory variables included the lagged absolute price, lagged relative price (deflated by the price of substitute) and lagged substitute crop price. His separate estimations of supply response coefficients, for different crops and for different regions, indicated that the price elasticities of acreage were insignificant for most food crops. But the coefficient of ragi and groundnut price ratio was significant. The effects of income on the acreage changes were analysed to find whether food crops could be considered as normal or inferior goods. The study also examined whether the increasing industrialisation and the consequent demand shifts also affected the supply responsiveness of farmers in different regions.

The study found strong regional differences in the supply response behaviour of farmers. After detailed analysis of data, Rajagopalan concluded that regional differences in supply responsiveness arose mainly becuase of differences in the degree of industrialisation, differences in the sources of irrigation, differences in the degree of dependence on rainfall and differences in the application of Government policy of procurement in different regions. It is very important to note here that the study of Rajagopalan for Tamil Nadu was one of the earliest to recognise the significant role of Government procurement policy. The crop-specific and region-specific results of the study have direct implications for the formulation of Government pricing and marketing policies

and for the implementation of Government programmes. (We will be discussing some of the policy implications of the results and conclusions of the supply response studies in Section IV of this paper).

The National Council of Applied Economic Research (NCAER) has made several significant contributions on various aspects and problems of Indian agriculture. But in one specific study, the National Council of Applied Economic Research (1969) examined more directly the supply responsiveness of foodgrains. The study analysed the secondary data collected from a number of sources. It examined the supply response behaviour of farmers at two levels: (i) at the all-India level; and (ii) at the State-level. Output data derived from the crop-cutting experiments were used in all estimations. In view of the significance of per unit area in determining the aggregate output, the study adopted the area approach and measured the area response to price changes both for the short-run and for the long-run periods.

Through multiple regression equations, the study estimated the area response for the four selected crops of rice, wheat, jowar and gram for the period 1951-52 to 1964-65.The study assumed that variations in the use of inputs by the farmers have followed the variations in the area under cultivation in equal measure. The coefficient of price variable was positive in ten important rice-growing States for which data were analysed. The coefficient of price variable was also positive in the seven major wheat-growing States. In five out of seven States, the coefficient of price variable was positive for jowar. Out of the seven States, the price variable for gram was positive in four States and negative in three other States. The study found the responsiveness of area and output for the four selected crops varying as between crops and States. Although area was found to have responded to relative price variations in most of the results, it was not statistically significant.

The NCAER study, like the earlier ones, established the positive relationship between area response and price variable. But the results of the study were based on weak procedures of analysis. (The weaknesses and limitations observed in the study also apply to most of the supply response studies carried out in the early stages). Only the more visible limitations and more well-known criticisms are noted here. (i) Area under the crop was considered as proxy for the level of output. But the level of output is determined by several variables, including the area under crop. Estimation of output response, solely based on area response, measures the price elasticity of supply only less accurately. (ii) Another major weakness of the study is its assumption regarding the uniform levels of variations in the inputs-use and the area under cultivation. The validity of this assumption could be questioned as more intensive use of inputs cannot be ruled out, at least, in the case of medium and large farmers. (iii) As indicated already, the NCAER study was based on the results of crop-cutting experiments. All the limitations and criticisms that are attributed to the crop-cutting experiments apply to the NCAER study because of its data-base. The aggregate and macro-level estimations of supply response, for the country as large and varied as India, subsume the significant role played by climatic, geographical, social, economic, political and governmental factors operating

at several disaggregated levels. A single measure of supply response, for the country as a whole, completely conceals the nature and significance of a number of variables operating at different regional levels.

In their detailed econometric study, Maji, Jha and Venkataramanan (1971) examined the determinants of supply responsiveness of the three major crops (wheat, maize and rice) of Punjab State. The State-level data for the period 1948 to 1965 were analysed within the framework of the Nerlovian area adjustment model. Like the well-known study of Behrman (1968), Maji, Jha and Venkataramanan considered risk factor as one of the explanatory variables. (The risk factor, in their study, refers to the production risks chiefly arising from "uncertainties of agriculture"). Like Behrman, they also tested the hypothesis of risk aversion by farmers. According to risk aversion hypothesis, a rational farmer would aim to maximise the expected utility by optimising the expected return for a given level of variance in the expected return. The level of variance, experienced in the expected return, constitutes a measure of risk that the farmer is willing to undertake in the cultivation of a crop. In the supply response functions for the three crops, Maji, Jha and Venkataramanan fitted harvest prices, the absolute and relative prices of alternative crops, relative yield and a trend variable as the other explanatory variables.

The results of the study showed consistently positive and significant price parameter estimates for all the three crops. Different price formulations gave different ranges of short-run price elasticities. The short-run price elasticities ranged from 0.1 to 0.7 for wheat, 0.3 to 0.6 for maize and from 0.1 to 0.5 for rice. It should be noted that, in a sense, the study by Maji, Jha and Venkataramanan for the period 1948 to 1965 becomes an updating exercise of the study by Raj Krishna (1963) for the period 1914 to 1945. Both the studies have revealed an overall positive and significant supply repsonsiveness for the State of Punjab.

Some supply response studies have focussed on the allocative rationality of farmers with respect to cereal crops and commercial crops in the context of very limited scope for acreage expansion. The study by Madhavan (1972) for Tamil Nadu State is an excellent example of that kind. Madhavan examined the supply responsiveness of four food crops (rice, jowar, ragi and bajra) and four commercial crops (sugarcane, cotton, groundnut and gingelly). The study analysed the data relating to changes in area under the eight crops for the period 1947 to 1965. Madhavan used a variant of the Nerlovian model in which the crop acreage was expressed as a function of lagged crop price (deflated by the price of a competing crop), lagged yield, lagged acreage of the crop and its competitor and a rainfall index compiled for the sowing period.

As the competing crops were only a few in Tamil Nadu, Madhavan included only one alternative crop in each regression. The degree of significance of the included variables in influencing the acreage allocation decisions of farmers differed from crop to crop. The price coefficient estimates turned out to be statistically significant for all crops except rice. In view of the marked improvement

in the yield rate, between 1947 and 1965, even the supply response of rice crop should be considered as significant. On the nature and significance of rice regression results, Madhavan observed: "In the determination of area under rice, yield per acre and rainfall are significant. This is what one would have expected, because the policies pursued by the Tamil Nadu Government were in the nature of inducing farmers to adopt improved methods of cultivation and were aimed at achieving self-sufficiency in foodgrains in general and rice in particular, the demand for which has increased both due to growth of population and shift in consumption in favour of rice. Rainfall is a significant factor because nearly 50 per cent of the area under rice is irrigated from the rain-fed tanks". (The doctoral research of Madhavan (1969) also has examined, the close association between the area under rice cultivation and the quantity and distribution of rainfall during sowing season for the State of Tamil Nadu).

Madhavan found the variable of "yield per acre" as a significant factor in the regression analysis of each and every crop. Among the analysed crops, rice, Jowar and groundnut responded more to variations in yield per acre; sugarcane and gingelly responded more to price movements. The acreage elasticity estimates, with respect to price, were found to be high whenever the analysis had both the dependent and competing crops from the commercial crop-group. And, whenever the analysis had both the crops from the cereal crop-group, the acreage elasticity estimates were found to be low. After carefully analysing relevant data, Madhavan concluded that in bringing about transformation of agriculture and substantial increase in foodgrain production, not only market price and Government price policy but also an input subsidy policy should play significant role in Tamil Nadu. The study, on the whole, underlined the utmost importance of increasing the yield per acre, as the scope for further acreage expansion in Tamil Nadu is very limited.

Some supply response studies have brought to focus the significant role of institutional factors in the determination of supply responsiveness. The study by Ashok Parikh (1972) provides an appropriate example of such studies. It used the all-India data collected and analysed by Dharm Narain (1965). Ashok Parikh adopted the basic Nerlovian model and fitted into the supply functions lagged acreage, prices (deflated by a general price index as well as prices of competitive crops), yield per acre, total area under all crops, a weather index and a time trend variable. The results of the study indicated that short-run price elasticities for rice and wheat for different regions varied very widely, ranging from significant negative values to significant positive values. In most models of subsistence crops, Ashok Parikh found insignificant price coefficients. However, in the case of cash crops, very high positive price responsiveness was observed for the period 1900-1939. Ashok Parikh attributed the low and insignificant values of supply response of subsistence crops to the socio-economic institutional factors found in Indian agriculture.

The study by Ashok Parikh suffers from several limitations and shortcomings. But we note here only a few of them. In his study, Parikh used the time period from 1900 to 1939 which Dharm Narain analysed earlier. In the pre-Independence period, (even upto the 1950s), Indian agriculture

suffered from low degrees of technological penetration, commercialisation and monetisation. The levels of irrigation and market development were also very low. (The well-known study by George Blyn (1966) provides ample evidence to the overall backwardness of Indian agriculture during 1891 to 1947). Considering the period of analysis by Ashok Parikh, it would be unreasonable to expect positive and significant supply response behaviour, especially for subsistence crops. Another important limitation of the study is the indirect derivation of the dominant role of institutional factors. In his study, Ashok Parikh did not directly fit any quantified institutional factors into the analysis of supply functions. He arrived at the conclusion of dominance of institutional factors purely on the basis of low explanatory powers of other variables included in the examination. Such indirect and untested derivations raise strong doubts about the dependability of the results and conclusions of even the otherwise analytically-superior studies.

The supply response studies conducted during the fifties and the sixties had examined mainly the relationships between price and acreage, and between price and output, or both. Only in the seventies and eighties, several researchers had concentrated on the more specific aspects of supply response behaviour. For his doctoral research, Tyagi (1974) examined the specific aspects of the nature and the basis of farmers' future price expectations. Tyagi attached greater importance to the functional relationship between the expected prices of a crop and the acreages allotted to that crop.

The study by Tyagi was mainly based on field data collected through an in-depth investigation of farmers' expectancy behaviour. Primary data were collected from Garhmukteshwar block of Meerut district in western Uttar Pradesh. Three villages were selected for the intensive study on expectancy behaviour of farmers. From each village, 30 farmers were selected. While collecting the data on expected prices, sufficient care was taken to get precise and clear information on the timing of marketing, the market in question and the grade or quality of agricultural product. The collected field data related to only two crops, viz., wheat and sugarcane. Time-series data on plot-wise land-use pattern for the selected farms were collected from different official sources for the 15-year period from 1955-56 to 1969-70.

The analysis of market price data preceded all other investigations. From 1955-56 to 1969-70, market prices for wheat and gur indicated a clear upward movement. Significant variations, however, were found in the price levels of both gur and wheat from one farm harvest period to another. Market prices tended to move upward more sharply in the post-harvest months than during the harvest months. In the specific context of market price movements, Tyagi examined the price expectancy behaviour of different size-classes of wheat and sugarcane farmers. It was observed that the expected prices by different classes of farmers had different ranges but the actual prices fell within those ranges at the expected time. Prices of different farm commodities, for a given point of time, did not move in the same direction. Even for the same crop, different farmers had different and conflicting expectations about the future prices. The study found no evidence to support

the hypothesis that only the leaders among farmers formulate the expected prices and other farmers simply follow them. Further, the expected prices were not found always in the direction of observed past price trends. Sometimes, the expected prices by some classes of farmers took the opposite direction to observed past price trends. The image date for future expected prices always related to the next harvest period of the same crop.

The detailed analysis of expectancy behaviour of selected farmers indicated that the past observed price trend played a more significant role in the determination of expected future price. Most farmers tried to project the past observed price trend into the future. Some farmers, under certain circumstances, anticipated the prices to move in a direction opposite to the observed past trend. Such unusual price anticipations were observed whenever the farmers felt that prices had already reached a sufficiently high-level or a sufficiently low-level. The expected future price was visualised with reference to the last farm harvest price adjusted for the price movements in the past. All selected farmers did not base their expectations on the same variable. Farmers differed significantly with respect to the processes followed in the anticipations of likely trends and the ways in which they aggregated the effects of past observed changes in prices.

On the basis of price expectancy behaviour, Tyagi classified the selected farmers into 10 groups and developed 10 equations. After testing the equations for their validity, they were used for estimating the expected prices for a period of 15 years. The expected prices, so generated, were used for estimating the supply responses of wheat and sugarcane farmers. The estimates of supply elasticities of different expectancy groups varied from 0.16 to 0.67 for wheat and from 0.35 to 0.74 for sugarcane. All the elasticity coefficients were positive and significant. The estimates generated from the expected prices for each group of farmers gave higher supply elasticities, compared to the estimates made on the basis of average price of the preceding three years or the farm harvest price lagged by one year. (It is very important to note here that the estimated elasticities of Tyagi for wheat were significantly higher than those of Jai Krishna (1967) and the National Council of Applied Economic Research (1969) which we have reviewed already). The results of the more specific study of Tyagi indicated the possibility of the Nerlovian models underestimating the coefficients of supply response. Thus, the study by Tyagi provided clear and positive support to his hypothesis that farmers in underdeveloped countries repsond quickly, normally and efficiently to relative price changes.

The study by Tyagi also examined the degree and extent of influence of some of the socio-economic variables on the expectancy behaviour of farmers. The degree of influence of each of the following eight socio-economic variables was specifically analysed. They were: (i) changes in operational holding; (ii) age of farmers; (iii) length of pursuit of agricultural occupation; (iv) length of experience as decision-maker; (v) knowledge about market trends; (vi) level of education; (vii) nature of participation in agricultural operations; and (viii) level of outside contact. The results of analysis indicated that the three variables of age of farmers, length of pursuit of agricultural occupation and

length of experience as decision-maker exerted greater influence on the price expectancy behaviour of farmers.

John Thomas Cummings (1975) carreid out a very comprehensive study on the supply response behaviour of farmers of the Indian sub-continent, including Pakistan and Bangladesh. Cummings examined nine crops for the period 1949 to 1969. In addition to tobacco crop, the supply responses of three cereal crops (rice, wheat and barley), two fibre crops (jute and cotton) and three oilseed crops (groundnut, sesamum and mustard) were analysed. Using a modified Nerlovian model, Cummings examined the supply response data both at the State-level and at the district- levels. The study postulated crop acreage as a function of lagged farm harvest prices, (deflated by a working class cost of living index), a rainfall index, (indicating deviation from the normal rainfall during the period just preceding and during sowings), lagged acreage and a trend variable.

After detailed analysis, Cummings found different kinds of results arising chiefly from the nature of crop, agro-climatic variations, degrees of market-orientedness of farmers and the general level of economic development of the concerned regions. At the State-level, the short-run supply elasticities varied from 0.14 to 0.48 for rice, 0.02 to 0.93 for wheat, 0.14 to 0.89 for groundnut and from 0.07 to 0.80 for jute. Elasticity variations had shown greater fluctuations at the district-levels. In spite of region-specific and crop-specific differences In supply responses, Cummings found the supply response behaviour of farmers, by and large, positive and significant. (The doctoral research of John Thomas Cummings (1974) also provides valuable Information on a number of supply response issues).

In their painstaking and excellent survey, Hossein Askari and John Thomas Cummings (1976) examined the supply elasticities of 75 agricultural crops selected from more than 40 countries of the world. Many important Indian studies on supply response issues were covered extensively. The meticulous survey presented, in comparative perspective, the results and conclusions of over 200 supply response studies carried out upto the mid-seventies. Hossein Askari and Cummings concluded that the relative significance of price and non-price variables depended on the regional differences in the conditions of geography, social structure and crop production.

Another important contribution on supply responsiveness of a subsistence crop came from Madan Mohan Batra (1978). Batra, in his doctoral research, examined the production and prices data of bajra crop for the four selected districts of Gujarat. These districts belong to a drought-prone region in Gujarat. Batra analysed the time series data for the period 1952-53 to 1971-72. The total period of analysis was divided into two sub-periods: (i) the traditional technology period (1952-53 to 1964-65); and (ii) the High Yielding Varieties Programme (HYVP) period (1966-67 to 1971-72). Batra estimated the coefficients of selected independent variables through multiple regression analysis. The results of the study indicated a crucial change in respect of the effect of price on acreage allocation under the crop in the two sub-periods. The price-coefficient in the

acreage response equation had a positive sign under traditional technology but a negative sign under the HYV technology. The coefficients for the price variable were statistically significant in both the cases.

The study concluded that during the traditional technology period bajra was cultivated as a subsistence crop and the price variations had significant impact on the acreage of bajra cultivation. This result disproved the commonly-held belief that prices have insignificant role to play in bringing out changes in the area under a subsistence crop produced mainly for self-consumption. Further analysis of data also showed that, with regard to the allocation of area under a subsistence crop, the changes in income from competing crops were of little relevance to the producers raising the crops primarily for self-consumption. The impact of variations in the preceding year's area under bajra on changes in area under the crop during the current year was found to be positive and highly significant. This indicated that the traditional cropping pattern played an important role in the acreage decision of the producers in the period between 1952-53 and 1964-65.

A comparative study of output response of bajra crop, before the introduction of the HYVP (1952-53 to 1964-65) and after its introduction (1966-67 to 1971-72), brought to light that though area was one of the important explanatory variables in both the sub-periods, its importance in bringing out changes in output had relatively declined with the successful propagation of the HYVP. During the second sub-period, new technology assumed that status in output response equation which area under the crop enjoyed during the first sub-period. Investigations by Batra also revealed that compared to the native bajra crop, the hybrid bajra responded more positively to the use of fertilisers and to the unevenness in rainfall. The inter-district analysis fully explained the specific local conditions for the observed differences in the rate of acceptance of new technology across the selected districts in Gujarat. The study, on the whole, did not confirm the view that farmers in poor countries are subject to cultural restraints that make them unresponsive to normal economic incentives in accepting a new technology. On the other hand, the results of the study by Batra supported the hypothesis that even the producers of the so-called subsistence crops are responsive to economic incentives and changes in profitability.

The early supply response studies had assumed that the farmers' one-stage decision to allocate a particular extent of land for cultivation of a crop determined the entire output response. But the technical study by Narayana and Parikh (1979) argued that farmers take choice decisions like seed variety, level of fertiliser-use and other technical inputs, intensity of labour input etc over the entire crop season. In other words, acreage decision is just one of the choice decisions of the farmers. The acreage decision along with all other choice decisions determine the final output of a crop. Further, the two major uncertainties, namely, weather and price, unfold themselves through the various stages of planting, weeding, flowering and harvesting. In recognition of multistage choice-decisions of farmers, Narayana and Parikh had fitted a two-stage model which accomodated the

possibility of choice-decisions over various stages of cultivation. The acreage decision was fitted into the first stage of the model and in the second stage, the decisions regarding the non-land inputs were considered. Through the use of sophisticated statistical methods, Narayana and Parikh established the superiority of the two-stage model over the single-stage decision model of the Nerlovian-type. The study by Narayana and Parikh, therefore, not only extends the Nerlovian model but also improves its analytical content and framework.

Some studies have brought into focus the influence exerted by the Government policy-induced price changes on the supply response behaviour of farmers. Such studies assume special significance because of the substantial increase in the operation of Government policies and programmes in the developing countries. The study by Peterson (1979), for instance, emphasised the significance of policy-induced price changes on the supply responsiveness of farmers. Peterson observed: "It is sometimes argued that peasant farmers in the less developed countries are least responsive to price than their commercial counterparts in the developed nations. However, partitioning the data between developed countries and the developing countries, running separate regression and applying `F' test, reveal no significant difference in the coefficients between the two groups of countries". In his study, Peterson found evidence to the hypothesis that the long-run aggregate supply elasticity, under favourable agricultural conditions, is greater than one. The study had also shown that unfavourable Government support prices have reduced the agricultural output significantly in some of the less developed countries. Unlike most of the earlier studies, the study by Peterson brought into focus a new dimension to price change. The policy-induced price change influences the supply responsiveness of farmers as well as the "free market prices". We shall discuss the influence of policy-induced price changes on different macroeconomic variables of the foodgrain economy and their policy and programme implications in Section IV of this paper.

Early supply response studies treated the output response as proxy for acreage response. Changes in output were completely attributed to changes in acreage under the crop. The role of "other supply shifters" were never given the significance that they actually deserve. In their joint study, Raj Krishna and Raychaudhuri (1980) examined the determinants of output elasticities during the pre-Independence and post-Independence periods. For the pre-Independence period, the results of Dharm Narain (1965) and others were accepted and used. For the post-Independence period, Raj Krishna and Raychaudhuri had analysed the data relating to production, acreage, wholesale prices, inputs-use, level of irrigation and agricultural technology for the two crops of wheat and rice. They concentrated on the period from 1951-52 to 1975-76.

In this study, Raj Krishna and Raychaudhuri decomposed the price effect into price elasticity of output and price elasticity of acreage. The study found that the short-run elasticity of wheat output, (relative to price movements), had Increased to 0.6 in the post-Independence period from about 0.2 in the pre-Independence period. The elasticity of rice output also increased from 0.35 to 0.45. Raj Krishna and Raychaudhuri attributed the all-India increase in output sensitivity mainly

to increase in yield rates of wheat and rice. In the determination of supply responsiveness, they found the input-output price ratios playing much more significant role than the inter-crop price ratios. The output elasticities were significantly higher than the acreage elasticities for both the crops.

The results implied that during a normal year a 10 per cent increase in the price ratio of rice would induce, ***ceteris paribus***, a 4.5 per cent growth in output. In the case of wheat, Raj Krishna and Raychaudhuri found even sharper results. The all-India price elasticity of wheat output worked out to 0.59 which was 3 times higher than the acreage elasticity. Since Punjab is the most important wheat-growing State, the study estimated different elasticities separately for the State. The price elasticities of acreage, yield and output for Punjab worked out to 0.28, 0.43 and 0.82, respectively. For the country as a whole, the corresponding elasticities were only 0.22, 0.34 and 0.39. Raj Krishna and Raychaudhuri attributed the significantly higher elasticities of Punjab, especially the output elasticity, to the adoption of very Improved technology, avallability of irrigation capacity and the greater commercialisation of agriculture in Punjab State. The output elasticity of 0.82 implied that a 10 per cent increase in the output-input price ratio could bring about a more than 8 per cent increase In the wheat output of Punjab. Raj Krishna and Raychaudhuri found a remarkable degree of supply response in Punjab State, partlculary in the case of wheat.

In a more analytical and more recent study, Sebastian Stanislaus (1985) had examined various aspects of farmers' response to price changes in Tamil Nadu. The study analysed both time-series secondary data and cross-sectional primary data. The time-series for the period 1945 to 1975 were collected and analysed. By personal interview and field survey methods, cross-sectional data from a sample of over 1000 farm households were also collected and analysed. The study covered the three districts of Coimbatore, Salem and Tiruchirapalli in Tamil Nadu State. The data for the seven crops of paddy, sugarcane, banana, cholam, groundnut, cotton and chillies were carefully examined.

In analysing the supply response behaviour of farm products, Sebastian Stanislaus used the following methods of examination: (i) simple ratios and link relatives; (ii) the ranking method of Kamala Devi (1964); (iii) simple regression analysis; (iv) Nerlovian adjustment model as adopted by Raj Krishna (1963); (v) linear programming techniques;and (vi) positive and normative analysis mix.

Through different methods and detailed analysis, the study by Sebastlan Stanislaus identified and explained the relative strengths of different "supply shifters", both district-wise and crop-wise. The explanatory powers of the included variables varied considerably, across districts and crops, depending on the method of analysis employed. The results of the study, in essence, revealed the existence of a positive relationship between price and acreage and between price and output, practically for all the crops and in all the districts. The study made it abundantly clear that the positive relationship would have been much stronger but for the long period of analysis. The period

from 1945 to 1975 consisted of a period of traditional agriculture (1945-1965) and a period of commercial agriculture (1965-75). The somewhat weaker results of the period of traditional agriculture had produced neutralising effect on the stronger results of the period of commercial agriculture. The district-level results of the study indicated that, among the farmers of three districts, Tiruchirapalli farmers had shown most significant price responsiveness. The price responsiveness of Coimbatore farmers was also strongly positive but it was not as significant as that of Tiruchirapalli farmers. Salem farmers had shown the least significant price responsiveness. The study by Sebastian Stanislaus found that in addition to market price, factors such as relative prices of substitute products, irrigation, climate, rainfall, technological progress, changes in the institutional and policy variables, and even the attitudes and general awareness of farmers had exerted significant influence on the supply response behaviour of farmers.

Many supply response studies have concentrated on the production trends of agriculturally advanced regions of India. The special problems of the farmers of agriculturally backward regions have remained neglected for a long time. The doctoral research of Bhagat has made a significant contribution towards filling this gap. In his recent study, Bhagat (1989) examined some of the important aspects of supply response behaviour of the farmers of Chotanagpur region — one of the most backward regions in the backward State of Bihar. The proportion of tribal population to the total population was very high in this region. The nature and extent of supply responses of major cereals grown in the Chotanagpur region were examined for the period 1956-57 to 1976-77. The total period chosen for study was divided into two sub-periods: (i) 1956-57 to 1965-66; and (ii) 1966-67 to 1976-77. The study sufficiently covered both the pre-HYV period and the post-HYV period. The study by Bhagat was mainly based on the analysis of secondary data collected from a number of official sources. Unlike the earlier studies, Bhagat defined the concept of supply response in a much broader framework. According to Bhagat, the farmers' response to price changes, as reflected in the absolute changes in the area allotted to a particular crop, represented just one facet of the total of supply response. In the case of farmers of Chotanagpur region, Bhagat examined the following aspects of supply responsiveness: (i) aggregate acreage response; (ii) cropping pattern response; (iii) cropping intensity response; (iv) input use or productivity response; and (v) behavioural response (attitudinal aspects of farmers).

Bhagat analysed, in detail, different aspects of supply responses of the six districts of Chotanagpur region. The cereal crops considered were: winter rice, autumn rice, maize, ragi, gram, barley and wheat. The regression results revealed that farmers in the region were very much constrained by the subsistence characteristics of the crops and their dependence on monsoon rainfall. During the kharif crops of winter rice, autumn rice, maize and ragi, the subsistence farmers attached greater importance to the gross return from crops as compared to the consideration of price factor. During the rabi season, increased irrigation facilities exerted most important influence on the farmers' decision to plant wheat crop. This phenomenon was observed more frequently in the post-HYV period. Bhagat found higher price elasticity in the case of minor cereals (maize,

ragi and barley) as compared to major cereals (rice and wheat). Similarly, the rabi cereals of wheat, barley and gram exhibited higher price response compared to the kharif cereals of winter rice, autumn rice, maize and ragi. The overall price elasticity in the HYV period was found to be higher as compared to the pre-HYV period. However, the differences were not very marked.

On the basis of the detailed inter-district analysis of farmers' responses, Bhagat arrived at the following major conclusions. (i) The absence of infrastructural facilities in the region failed to motivate the farmers to respond to the economic incentives. (ii) In allocating land among the substitute crops, farmers made sensitive calculations on the differential risk elements. (iii) The non-price factors like the pre-sowing rainfall, irrigation facilities and the traditional cultivation practices exerted greater influence on the crop-substitution decisions of the farmers as compared to the price factor.

Bhagat also analysed the inter-district and inter-temporal variations in the cropping pattern of Chotanagpur region. Results of research revealed that crop diversification in the HYV period had increased in majority of districts. But the increase was not markedly large because the farmers in the region faced a number of agro-climatic and physical constraints that limited both growth and diversification. Except in a few cases, changes in price pattern alone did not explain the year-to-year variation in the overall cropping pattern. In some districts, changes in cropping pattern were effected mainly because of increased irrigation facilities, especially during the HYV-period.

The study by Bhagat, by and large, showed that farmers of Chotanagpur region exhibited only low price responsiveness. Both direct and indirect evidence indicated that farmers were very much willing to respond but they did not have adequate opportunity to respond to price changes. The infrastructural and other physical constraints severely limited the price response behaviour of farmers. The study emphasised the more significant role played by the non-price incentives and stimuli in increasing the agricultural output in a predominantly subsistence economy like the Chotanagpur region. Bhagat concluded that only the removal of physical and infrastructural constraints by the Government and other agencies, through heavy investment and special care, would improve the price responsiveness of farmers of the agriculturally backward regions. The results of Bhagat, like the conclusions of earlier studies, revealed that farmers always wanted to respond to the signals of price mechanism in full measure. Only the peculiar natural and infrastructural constraints of a particular region prevented the farmers in fully responding to changes in market prices.

We have reviewed so far several studies which have examined the supply response behaviour of farmers in India. As already indicated, there are many studies which have, directly or indirectly, examined the supply response behaviour of farmers. In view of time and space constraints, all available studies could not be reviewed even briefly. However, we have mentioned below some of them purely for purposes of documentation. The studies of Madalgi (1954), Bansil (1958),

Parthasarathy (1959), Schultz (1964, 1988), Ramesh (1984, 1985), Jakhada and Majumdar (1984), Kamala Davi (1984), Indian Journal of Agricultural Economics (1985, 1971, 1985), John (1985, 1968), Gupta and Majid (1965), Sukhatme (1985), Desai (1988), Dandekar (1968), Raj (1986), Sethi (1966), Jittendra Mann (1967), Kaul (1987, 1971), Dantwala (1987, 1970a, 1970b, 1976), Sawhney (1988), Khusro (1968), Indian Economic Association (1988, 1971), Bhagawati and Chakravarty (1969), Sharad Chandra Jain (1989), Latita Sud and Kahlon (1969), Mukherji and Mukherji (1969), Pillai (1969), Sipra Dasgupta (1970), Thamarajakshi (1970a, 1970b), Robert Herdt (No Year, 1970), Tyagi (1970, 1979,1986, 1987), Subramaniam, Varadarajan and Ramamoorthy (1971), Ram (1971, 1973), Singh, Singh and Rai (1973), Nadkarni (1973), Narula and Vidya Sagar (1973), Krishna Bharadwaj (1974), Acharya and Satish Bhatia (1974), Banerjee and Mehrotra (1974), Singh, Daroga Singh and Rao (1974), Hanumantha Rao (1975), Krishnaji (1975, 1990), Deepak Lal (1976), Hanumantha Rao and Subba Rao (1976), Rao and Pandey (1976), Shashikala Sawant (1978), Ray, Cummings and Herdt (1979), Barbara Harriss (1979, 1981), Bapna (1980), ICSSR (1980), Jodha (1981), Kahlon Jr (1984), Janvry de Alain and Subbarao (1984), Gajja, Vyas and Jagdeesh Kalla (1984), Venkateswarlu, Rao and Prasad (1985), Kainth (1986), Mellor and Desai (1986), Sidhu (1986, 1990), Kainth and Kang (1987), Ramesha, Ramanna and Lalith Achoth (1988), Nakula Reddy (1989), Ashok Gulati (1990), Satyanarayana Reddy and Bathaiah (1990), Mahajanashetti et al (1990).

The synoptic survey of reviewed studies bring out the nature and characteristics of a number of interacting variables which determine the supply response behaviour of farmers. A wide variety of approaches and conclusions have been observed. Differences in conclusions have emerged mainly because of differences in scope, focus, objectives, analysis of data and differences in methodologies of studies. But the significance of market price in the determination of supply response behaviour is reflected clearly in all studies. Many studies have found the market prices exerting significant influence on supply response behaviour. Some studies have found the role of non-price factors, more particularly of irrigation and technology, more significant than the price variable. Even such studies have recognised the role of market price. The considerations of expected and actual market prices were found in the decisions of all farmers. Market price, therefore, becomes the single most significant factor of supply response behaviour of farmers. In this connection, Schultz (1967) observes: "Since there is as yet no known way of organising and integrating the production activities of numerous farmers among each other and with the rest of the economy except by a system of prices, the requirements of an efficient system of prices should have been high on the agenda." In their 'long and continuous process of rational decision making', farmers' decisions on the targeted level of production constitute just one set of decisions. Most farmers have to make another set of decisions relating to disposal of "surplus produce". The nature, significance, trends, distribution of control and the determinants of "surplus produce" have direct economic implications for the farm-households themselves, the non-farm households, the private foodgrain trade and the PDS in India. In the next Section, therefore, we critically review the relative significance of the determinants of "surplus produce" through a carefully selected set of marketed surplus studies.

SECTION III

Determinants of Marketed Surplus : A Critical Review

The issues relating to the generation of economic surplus through commodity production and financial investment and the problems of re-utilisation of the generated surplus for further economic progress have received the serious attention of many economists from the beginning of economic discipline. Even within the general issues of surplus extraction and surplus utilisation, the issues of agricultural surplus generation and agricultural surplus utilisation are considered more significant because they directly satisfy the basic human needs of food and nutrition. Many studies have examined the issues and problems of marketed surplus of agricultural output with a wider theoretical perspective. These studies have analysed the role, significance and implications of marketed surplus for macroeconomic variables such as agrarian structure, commercialisation of agriculture, capital formation, terms of trade, economic growth and for economic development. On the crucial importance of marketed surplus, Maurice Dobb (1955) has rightly observed: "In the first place there is reason to suppose that it will be the marketed surplus of agriculture which plays the crucial role in underdeveloped countries in setting the limits to the possible rate of industrialisation, and that this marketed surplus does not rise automatically as a result of an increase in productivity."

As early as 1928, the economic significance of markets, marketing facilities, marketing operations, marketed surplus and disposal patterns was brought to the attention of the British Government in India. The Report of the Royal Commission on Agriculture (1928) observed: "The prosperity of agriculturists and the success of any policy of general agricultural improvement depend, to a very large degree, on the facilities which the agricultural community has at its disposal for marketing to the best advantage as much of its produce as is surplus to its own requirement." Different aspects of markets and marketing are among the well-researched themes of Indian agricultural economics. In the later decades, a large number of studies have examined the nature, magnitudes, trends and distribution of marketed surplus among the Indian farmers with a limited focus. These studies have examined mostly the empirical aspects of changes in output, changes in marketed surplus and changes in prices. In view of the assigned scope and focus of this paper, we shall review those studies which have analysed the empirical aspects of marketed surplus behaviour of farmers.

Before examining the determinants of marketed surplus through the carefully selected studies, it is essential to bring out the theoretical distinction between the two concepts of "marketed surplus" and "marketable surplus". The concept of marketed surplus refers to that quantity of agricultural output which is actually sold in the market by the farm household. The kind disposal patterns of the farm households are not taken into account in the estimation of marketed surplus. In other

words, the need for defining ***the real surplus*** of the farm household does not arise. On the contrary, the concept of marketable surplus refers to that part of the agricultural output which is marketed after the allotments of produce by the farm household for seed, kind payments of different types and for domestic consumption. In other words, there is the need to ascertain whether the farm household has produced the output in excess of all its compulsory retentions. For bringing out the distinction between the two concepts, some studies have used the terms "gross marketed surplus" and "net marketed surplus". Gross marketed surplus refers to the actual quantity of agricultural output marketed by the farm household. Net marketed surplus refers to the gross marketed surplus ***minus*** repurchases of foodgrains from the market by the farm household for consumption of its family members.

The two concepts, theoretically speaking, cannot be used interchangeably. In view of the inherent difficulties in precisely estimating "the real surplus of farm households", most of the studies have relied on the estimates of marketed surplus rather than on the estimates of marketable surplus. In order to avoid academic controversies, some studies have used the terms such as "marketed supply", "marketed sales" and "market arrivals". In this paper, however, we shall use the term "marketed surplus" in all our discussions except where there is an attempt to measure the exact quantity of real marketable surplus.

Bhattacharjee (1960) examined the marketed surplus data of six village surveys conducted by the Agro-Economic Research Centre of the Visva-Bharati University. These villages belonged to the relatively surplus areas of the States of Bihar, Orissa and West Bengal. Data relating to the marketed surplus of farm households for the two-year period from 1955-56 to 1956-57 were analysed in detail. The farm households of the six villages, (two villages from each State), were classified into five groups on the basis of their land holdings. The proportion of marketed surplus of each size-group varied widely. However, Bhattacharjee combined the results of six villages to derive some overall meaningful conclusions on the distribution of marketed surplus across different size-groups of farmers. Detailed analysis of data revealed that during 1955-57 the small farmers of the villages, (those operating less than 5 acres), contributed much less than one-fourth of the total marketed surplus of paddy. The relative shares of medium and large farmers (those operating more than 5 acres), were found to be dominant in all the selected villages. The variations in the proportions of marketed surplus of different villages reflected differences in the stage of development of the concerned village.

The question whether dominance of medium and large farmers in the supply of marketed surplus of paddy was a long continuing phenomenon in West Bengal was also examined with the available empirical evidence. For some villages of West Bengal, the Institute of Rural Reconstruction in Sriniketan had collected the marketed surplus data of paddy for the period 1942 to 1945. Bhattacharjee compared the data of the period of 1955-57 with those of 1942-45. The comparative analysis clearly showed that between the early forties and the middle fifties, there

was a tremendous increase in the relative share of marketed surplus of large farmers. During the same period, the relative share of small farmers declined by 25 per cent and that of medium farmers by about 16 per cent. The relative shares of small, medium and large farmers were also analysed on the basis of quantity of marketed sales per acre of land holding. Results revealed that the extent of cash sales of small farmers decreased over this period, that of medium farmers remained more or less the same, while that of large farmers increased considerably. Bhattacharjee concluded that the speculative and precautionary motives of the medium and large farmers contributed a great deal to the problems of frequent price rises and seasonal price variations. As early as 1960, the study underlined the need for initiating a Government price policy that would work as a strong anti-seasonal element for narrowing down the price spread over the months of the agricultural year.

Abdul Majid (1960) examined the relationship between the size of cultivated holdings and the proportions of marketed sales, The "Continuous Village Surveys", conducted by the Agro-Economic Research Centre of the Delhi School of Economics, provided him the data. Of the total six villages examined, three were from western Uttar Pradesh and three others were from Punjab. In terms of soil conditions, climate, cropping pattern and the distribution of holdings, the six villages presented very different production conditions. Abdul Majid analysed the pattern of crop production and size of land holdings by classifying all crops into food, cash and fodder crops. The study also examined the proportions of sales to total production for each size-class of holdings and for each crop-group of the six villages.

The study found varying proportions of marketed sales in different villages. The size of cultivated holdings, distribution of land holdings in different size-groups, ratio of food crops to cash crops, consumption requirements of family, monetary obligations, cash requirements and the availability of other sources of cash income were found to be the main contributory factors for the variations in marketed sales as between the crops, land-holdings groups and between the villages. The analysis of data gave the following major conclusions. (i) In some villages, as the size of cultivated holdings increased, the proportion of marketed value of cash crops to the total production value also increased. In some other villages, as the size of cultivated holdings increased, the proportion of marketed value of food crops to the total production value declined. (ii) The proportion of sales to the total production of cash crops was not significantly influenced by the size of cultivated holdings. It depended more on the nature of the cash crop itself. (iii) In most villages, the proportion of sales to the total production of food crops increased along with the increase in the size of cultivated holdings. (iv) In almost all villages, the higher size-group farmers were more market-oriented than the smaller size-group farmers. (v) In all the villages, variations in the proportions of sales to total production presented a similar pattern. In the lower size-groups, sales proportions were more, but in the next two higher size-groups, (medium size-groups), the proportions were less. In the highest size-groups, the sales proportions to total production were found to be highest.

In his pioneering, detailed and district-wise study, Rao (1960) examined the issues arising from the distribution of marketed surplus over space. Rao brought to light the structure and fluctuations of food surpluses and food deficits of 307 districts in the country. Surplus was defined as the excess of net production over the consumption requirements. The food availability during the triennium 1955-58 was analysed in detail. Out of 307 districts examined by Rao, only 12 districts could be identified as "high surplus" districts; another 19 districts were rated as "medium surplus" districts. The 12 high surplus districts contained only less than 8 per cent of the cultivated area but contributed as much as 33 per cent of the total surplus from all the districts. The 19 medium surplus districts contributed about 27 per cent of the total surplus from all surplus districts. The 31 high and medium surplus districts together gave rise to a surplus of 60 per cent of the total foodgrain deficit of all deficit districts. The extent of foodgrain deficits of some deficit districts presented a highly deplorable picture. The total deficit of the 48 high and medium deficit districts together worked out to roughly 70 per cent of the total deficit of all deficit districts. The year-to-year fluctuations in production and market arrivals created great distress among the people of deficit districts in the country. The study clearly showed heavy concentration of estimated foodgrain surplus in less than 10 per cent of the 307 distircts. Similarly, the estimated food deficit was concentrated in about 15 per cent of the 307 examined districts. The different degrees of precarious food balances of the 228 in-between districts in the country were also analysed in detail. The chief merit of the study lies in highlighting various aspects of food surplus and food deficit problems at the district-level, even as early as 1960.

Supply theory In traditional economics postulates a positive and direct relationship between market price and the quantity of supply . In their controversial study, Mathur and Ezekiel (1961) put forth the hypothesis that market prices and the quantities of marketed surplus (or supply) of foodgrains are inversely-related. They explained the hypothesis thus: "Farmers sell that amount of the output which will give them the amount of money needed to satisfy their cash requirements and retain the balance of their output for their own consumption... If prices rise, the sale of a smaller amount of foodgrains provides the necessary cash and vice versa. Thus, prices and marketed surplus tend to move in opposite directions".

The explanation of Mathur and Ezekiel was based on the assumption that under conditions of backward and less-monetised agriculture, the cash needs of farmers are fixed and compulsory and that their own consumption retention has been only a residual factor. It was further assumed in their study that farmers, in general, save in kind rather than in cash and that the foodgrain output in the short-run remains fixed. The study attached greater importance to the assumption of fixed cash requirements of farmers; and even the family's foodgrain consumption requirement was considered secondary and residual. These assumptions, in due course, were severely criticised by many. For example, Dandekar (1964) criticised that such an assumption could not be made even in the case of small farmers as they generally face net

foodgrain deficit and repurchase the required foodgrains from open markets. Market prices of foodgrains basically affect the small farmers more as consumers than as producers. On the basis of income elasticity of demand for home produce, Dandekar further argued that this assumption could not be made for big farmers also. This is because the income elasticity of demand for home produce of big farmers tends to be zero. The assumption of "low marginal propensity to consume" of the peasants was also questioned in the study of Mathur and Ezekiel. Market price had played the role of income-regulating mechanism with reference to fixed cash requirements. But the levels of cash requirements vary widely across different classes of farmers. Given different ranges of cash requirements of farmers, changes in market prices alone would not help in the measurement of marketed surplus. In addition to market price, the determination of marketed surplus involves complex inter-relationships between several micro and macro variables. The study by Mathur and Ezekiel has, however, neglected the important role played by several micro and macro variables.

In his pioneering and stimulating study, Dharm Narain (1961) estimated marketed surplus across different size-classes of farmers for 1950-51. In the national-level indirect estimation, Dharm Narain examined the data for entire agricultural produce of 1950-51. Published data, mainly from National Sample Surveys (NSS), National Income Committee, Farm Management Surveys (FMS), Rural Credit Survey of Reserve Bank of India (RBI) and Reports of the Agricultural Labour Enquiry were carefully analysed. The operational size of holdings was the only explanatory variable used in the analysis. For analytical purposes, land holdings were divided into 9 size-classes. The marketed surplus was defined as the difference between total agricultural produce and the retentions of cultivating households. The study recognised the following retentions: (a) quantity kept aside for family consumption; (b) quantity maintained for consumption of livestock; (c) quantity allotted for seed requirements; (d) kind payments to artisans and others; (e) kind wages to agricultural labour; and (f) kind rents. The quantity of produce stocked for family-consumption included only the home-grown produce but not the foodgrains purchased from open markets.

The major estimate by Dharm Narain related to the total marketed surplus in the total agricultural produce. The estimated marketed surplus worked out to around 33 per cent of the total produce of 1950-51. Incidentally, Dharm Narain found a remarkable closeness of his estimate of marketed surplus to the Rural Credit Survey estimation of "about 35 per cent of the total production". The study also estimated that in the total value of marketed surplus, the lower three classes of holdings, (those operating upto 15 acres), contributed as much as 54.4 per cent. The larger holdings operating 15 acres and above accounted for the remaining 45.6 per cent. Even within the lower classes, the contribution of lowest 2 classes, (operating upto 10 acres), accounted for 46.5 per cent of the total value of marketed surplus.

Dharm Narain found the proportion of marketed surplus value declining to the total value of agricultural produce upto size-class of 10-15 acres and above. The proportion of value of marketed

surplus rose steadily as size of holding increased. In the study of Dharm Narain, the distribution of marketed surplus value, across different size-classes became a U-shaped curve. But the distribution of marketed surplus value, with respect to the total value of each size-class, showed higher proportions in the case of smaller size-classes compared to the proportions of larger size-classes. While the first estimate referred to the proportion of each class to the total value of agricultural produce, the second estimate referred to the relative proportion of value of each size-class in the total value of agricultural produce. In other words, these proportions clearly indicated the increasing economic power of larger farmers.

The higher proportions of marketed surplus value of the lower size-classes to the total value of agricultural produce were interpreted as indicating their "distress sales". The households of lower size-classes exhibited perverse or inverse relationship between quantity of marketed surplus and total farm output. It was explained that smaller farmers were forced to make "distress sales", because of their fixed cash requirements immediately after harvest. It was further explained that since smaller farmers had marketed far higher proportions than their real abilities would have allowed them in the normal course, they were forced to buy back from the open markets for their own consumption at higher open market prices. In the study of Dharm Narain, the quantity of marketed surplus was composed of: (i) distress surplus with backward sloping character; and (ii) commercial surplus with forward sloping character. While smaller size-classes of farmers supplied mostly their distress surplus, large size-classes of farmers supplied their commercial surplus of agricultural produce.

The pioneering study of Dharm Narain suffers from a number of shortcomings and limitations. The highly roundabout procedures and calculations adopted by Dharm Narain and the diverse sources of data used by him have made the indirect estimates very unreliable. Each data source of the study suffers from a distinct set of limitations. For example, Dharm Narain depended on the FMS data collected from a few districts of Uttar Pradesh and obtained the distribution of value of agricultural produce for the entire country. Similarly, the NSS data used by him were not given according to size-classes of holdings but according to size-classes of total per capita expenditure. A number of other examples could also be given to show that published data used in the study were compelled and manipulated for producing a particular set of results. Given the structure of ownership of land holdings in the country, Dandekar (1964) and others have expressed strong doubts on the validity of the finding that greater proportions of the total value of marketed surplus came from smaller size-classes of farmers. Similarly, the inverse relationship between distress sales and output and the U-shaped marketed surplus curve could also be questioned.

Dharm Narain's indirect estimation of the marketed surplus of the entire agricultural produce ***in value terms*** tended to distort the results in a number of ways. The estimation included low-value millets, high-value cereals and also very-high-value cash crops. Given the definition of marketed surplus, the value of retentions of cereals and foodgrains, kept aside for family consumption, becomes more significant. Retentions in the case of cash crops are usually very small as the cash

crops are mostly produced for sales in the open markets. Further, the number of small holdings is much higher than the medium and large holdings. Since most of the cash crops are high-value commodities and their retentions for family consumption are generally meagre, the proportional contribution by the small holdings appear to be greater in the total value of marketed surplus. These factors, when considered along with the phenomenon of distress sales, make it very clear that the results of Dharm Narain were not based on the reliable marketable surpluses. Further, Dharm Narain adopted the money value of agricultural produce as the main criterion in the estimation of marketed surplus. This forced Dharm Narain to get very distorted and unreal results.

Another serious limitation of the study by Dharm Narain relates to the family consumption retentions. The family consumption retentions, according to the study, included only the home-grown produce but not the quantities repurchased from open markets. The buy-back quantities provided a measure of the extent of market dependence by farmers but the study did not capture this crucial factor in its estimation. Further, Dharm Narain made a number of arbitrary assumptions and objectionable procedures which led to several unreliable and distorted results. Ashok Rudra (1982) criticised the study of Dharm Narain, point by point. Commenting on the exercise of Dharm Narain, Ashok Rudra observes as follows: "He manipulates the data in various ways so as to derive the distribution he wants ... There cannot be any justification for any of these assumptions (and procedures) ...There is no means of assessing the quality of the estimates arrived at by Dharm Narain".

In the examination of real effects of surplus disposal in an underdeveloped economy, Khatkhate (1962) concluded that not only the marketed surplus responded negatively to prices, but even the output response to prices became negligible. He argued that when the economy is characterised by subsistence farmers, prices do not exercise influence on the output because the subsistence farmers are already producing to their maximum capacity. Under such agricultural conditions, the response of marketed surplus to price changes could only be negative because of "stinted consumption paradox".

The studies by Raj Krishna, (1962 and its revised version of 1965), were among the earliest to use the data from a wide range of samples "to identify and measure the effect of other factors" which determine the quantity of marketed surplus in a poor and partially-monetised economy. Data for 23 samples of farmers, drawn from 8 States of India, were analysed. In the studies of Raj Krishna, all disposals, other than the retentions for family consumption, were treated as marketed surplus and that quantity was related to the output of that year. His studies focussed only on the measurement of functional relationship between quantity of marketed surplus and level of output. His studies did not analyse the distribution of marketed surplus, either by size of holding or by size of output, which would have helped in finding the relative importance of subsistence cultivators. Raj Krishna measured the functional relationship for a "complete adjustment period". The complete adjustment period was defined as the one during which the desired planted area equalled the actual cultivated area and the expected relative price equalled the actual relative price.

The functional relationship between level of output and quantity of marketed surplus turned out to be positive and linear for most samples of farmers. The most important findings of Raj Krishna were: (a) there was constancy of marginal propensity to sell over a wide range of output above the minimum subsistence level; (b) the sale ratio increased as the output increased (although at a decreasing rate); (c) the elasticity of sales with respect to output was positive and high (elasticities ranged from 1.04 to 1.60 for wheat and from 1.04 to 1.36 for rice); and (d) the marginal propensity to sell varied widely between different regions, ranging from 0.50 to 0.90. Raj Krishna found positive price elasticity of marketed surplus in the case of 17 samples out of a total of 23 samples of farmers. Only 6 samples had shown significant deviations from linear relationship. The very poor and the very rich samples of farmers often demonstrated non-linear relationships.

The studies of Raj Krishna are not free from criticisms and limitations. Only some of the more important limitations are noted below. The linear relationship found in most samples might be due to the unique definition of marketed surplus. All produce disposals cannot be considered as the real components of the marketed surplus. If kind payments were deducted from the defined marketed surplus, the results would have shown non-linear zones in more number of samples of farmers. It is possible that the restrictive definition of Raj Krishna could have distorted the results considerably.

Another important limitation arises from the difficulties of determining the price elasticity of home consumption. The cross-sectional study of Raj Krishna estimated the output elasticity of marketed surplus and indicated the possibility of deriving the price elasticity of marketed surplus. The derivation of price elasticity became more difficult than originally considered by Raj Krishna as a number of computational difficulties arose in determining the price elasticity of home consumption. In this context, it is important to note that Raj Krishna (1967) himself, in a later study, warned against relying too much on the results of marketed surplus studies, unless and until the price-income and the income-consumption relationships could be reasonably clarified and estimated. In a significant study on marketable surplus and market dependence, Nadkarni (1980) also pointed out the inadequacies and shortcomings of relying on the long-run price elasticity of marketed surplus. He explained that a long-run price elasticity contains the combined effect of a price change on marketed surplus obtained through changes in consumption and changes in output. Nadkarni rightly observed that the effects of price changes that affected the quantity of consumption and quantity of output should not be treated equally, either in terms of time-lag and the relative price involved or in terms of the classes of farmers getting affected. The single measure of long-run price elasticity of marketed surplus could not help in the formulation of policies as the time specificity of neither price nor the quantity of marketed surplus could be defined in a clear manner.

Ram Dayal (1963) analysed the primary data collected from Sanoli village of Saharanpur district in western Uttar Pradesh. The analysis of village data clearly indicated the concentration of marketed surplus among big farmers. Nearly one-half in the total agricultural production and

about two-thirds in the total sales of cereals were carried out by big farmers who accounted for just 25 per cent of the total cultivators in Sanoli village. In the case of pulses, the concentration of marketed surplus was found to be even greater. The big cultivators commanded a dominant share in the total surplus of foodgrains. From the village data, Ram Dayal also observed both distress sales and buying-back of foodgrains by the small cultivators. The study by Ram Dayal became widely-quoted in the sixties and the seventies because of its detailed analysis of marketed surplus data for a single village.

In his well-known study, Dandekar (1964) examined the three-way interrelationships of prices of foodgrains, production of foodgrains and marketed surplus of foodgrains. Dandekar argued that given the structure of landholdings, the small farmers could market and sell only a smaller proportion of their foodgrains. Alternatively, the small farmers might sell their commercial crops in order to buy back the requried foodgrains. It was further argued that since there was a net deficit in the production of small farmers, prices of foodgrains affected them more as consumers of foodgrains than as producers. (The experience of small farmers making distress sales and later repurchasing from the open markets, according to Amit Bhaduri (1974), represented only a superficial commercialisation of Indian agriculture). In this study, Dandekar observed very weak relationship between price changes and the quantities of marketed surplus in the case of small farmers. On the other hand, he found positive and direct relationship between price and marketed surplus in the case of bigger farmers as they operated a larger proportion of the total cultivated area and sold a greater proportion of marketed surplus from the total produce.

The study by Muthaiah (1964) analysed the data of 8 selected villages. Of the eight villages, six belonged to Rajasthan and two belonged to Madhya Pradesh. Jowar and wheat crops were the main crops cultivated in these villages. The proportions of marketed surplus were related both to the area owned and to the income of cultivating households. The study found the marketed surplus of wheat (as a proportion to net produce) steadily increasing from 24 per cent in the size-group of less than 5 acres to 64 per cent in the size-group of more than 100 acres. The corresponding percentages for jowar were 18 and 50, respectively. The marketed proportions of wheat were higher than the proportions of jowar among all groups of farmers. Muthaiah also analysed the relationship between per capita annual income of the cultivating households and proportions of marketed surplus. The results of the study revealed that as the per capita annual income of the household increased, the proportions of marketed surplus to total production also increased. In other words, the direct and positive relations of the owned area and the per capita annual income to the proportions of marketed surplus only reinforced the strong and dominant economic power of the bigger farm households.

Parthasarathy and Suba Rao (1964) examined the production and marketed surplus data for another set of six villages. These villages were selected from the Godavari, Krishna, Pennar and Cauvery delta regions of South India. The data for paddy crop related to the triennium 1958-

1961. Parthasarathy and Suba Rao classified the cultivators of these villages into 4 groups on the basis of land operation. They analysed, in detail, the behaviour of marketed surplus of paddy in relation to production of paddy by size-groups, changes in overall paddy production and the patterns of disposals of paddy. The more important conclusions of the study were: (i) Marketed surplus of paddy was found to be concentrated among the big and medium cultivators who formed a minority in number. This implied that large majority of small and dwarf cultivators accounted only for a small proportion of marketed surplus of paddy. (ii) Commercialisation of agriculture, as evidenced in the changeover from payment of kind wages to the payment of money wages increased the significance of big and medium cultivators, especially in relation to dominance in marketed surplus. (iii) Marketed surplus was found to be positively-related to the level of production of paddy among all size-classes of farmers. In other words, the household demand for foodgrains for self-consumption had not increased as a consequence of increased foodgrain production. (iv) In the case of big farm households, the marginal propensity to market paddy was found to be much higher than among small farm households. The marginal propensity to market varied from 0.68 to 0.81 among the higher size-classes of farmers.

Krishnan (1965) analysed the two-year data from 1959 to 1961. He estimated the price elasticity of marketed surplus by using the coefficients of price elasticity, income elasticity and the proportion of sale of farm produce. After detailed analysis, Krishnan found negative and inverse relationship (0.303) between the proportions of marketed surplus and price changes without involving the assumptions of fixed cash requirements and saving habits. Krishnan argued that in the case of subsistence farmers, the retentions set aside for household consumption were fixed and the quantity of marketed surplus was only a residual factor. The argument of Krishnan was just the opposite of Mathur and Ezekiel. They assumed that the quantity of foodgrains set aside for family consumption by subsistence farmers was a residual factor. But, the studies of Mathur and Ezekiel and that of Krishnan arrived at the same conclusion of inverse relationship between market price and marketed surplus.

Using Indian data, Jere Behrman (1966) developed the model of Raj Krishna (1962, 1965) further to derive the estimates of price elasticities of output, consumption and income of farm families through more sophisticated methods. While Raj Krishna estimated the price elasticities for a long period which allowed for "complete adjustment" of output, Behrman estimated the price elasticities for a short period of one crop year during which only partial adjustment in output could be possible. Price elasticities were also estimated for various periods of partial adjustment. The greater significance of relative price in the estimates of marketed surplus had been emphasised by Behrman which took into account the empirical problems of competing crops in production and substitution possibilities in consumption. The overall conclusions of Behrman were: (a) at the lower levels of sales ratio to output, the price elasticity of marketed surplus was negative (for Punjab wheat); and (b) at the higher levels of sales ratio to output, the price elasticity of marketed surplus was positive (again for Punjab wheat).

In their joint study, Vyas and Maharaja (1966) examined the marketing behaviour of different size-classes of farmers for a set of six villages. Of the six selected villages, three were from Gujarat and three were from Rajasthan. The farmers of Gujarat villages were found to be commercially-oriented because they mainly cultivated cotton crop. On the other hand, the farmers of Rajasthan villages cultivated mostly coarse cereal crops. Vyas and Maharaja also compared the behaviour of marketed surplus of the farmers of agriculturally-forward areas (Gujarat villages) with those of the agriculturally-backward areas (Rajasthan villages). Production and marketed proportions data for the year 1963-64 were analysed carefully. Vyas and Maharaja stratified the farm households according to value of produce so that the corresponding size-classes in the two States became comparable. Since value of produce was the basis of all estimations, the proportion of marketed surplus in the cotton-growing Gujarat villages worked out to more than 70 per cent of the total value of agricultural produce. The same factor (value of produce) brought down the proportion of marketed surplus of the coarse grains-cultivating Rajasthan villages to 49 per cent. Vyas and Maharaja further examined the contributions of marketed surplus of different size-classes of farmers. Based on village data, Vyas and Maharaja estimated that big farmers, who operated only 27 per cent of land-area, contributed 62 per cent of total marketed surplus. The study of Vyas and Maharaja also revealed, like most earlier studies, that the elasticity of marketed surplus, with respect to production of both the superior and coarse cereals was positive and significant among all size-classes of farmers.

Kahlon and Vashishtha (1968) analysed some of the key factors that govern the flow of marketed surplus among the different size-classes of farmers. The 43 selected farm households of Ludhiana district were classified into six groups. The consumption and marketing behaviour of these households were examined on the basis of field data. Detailed data for wheat, gram, maize, cotton, groundnut and sugarcane were collected and analysed. The study identified the following six key factors which determined the proportions of marketed surplus of different farm products of the selected farm households. The key factors were: (i) volume of produce; (ii) size of holding; (iii) consumption habits of people; (iv) size of family; (v) relative prices of different farm products; and (vi) the accessibility of farmers to markets. The most surprising finding was that farm households which operated 10 acres and above contributed more than 96 per cent of the total wheat marketed by the total sampled households. Through detailed statistical analysis, Kahlon and Vashishtha had shown the significant role played by the identified six key factors. The study also observed that the proportion of marketed surplus to total production of any agricultural produce depended on the nature of the crop. No definite relationship was observed between the size of holding and the marketed surplus of cash crops like cotton, groundnut and sugarcane. Since these cash crops were grown primarily for market sales, their marketed proportions to total production ranged from 71 per cent to 92 per cent. Partial correlation coefficient between marketed surplus and volume of production, (when the size of holding remaining constant), was positive and significant for maize; for wheat also it was positive but not significant. Negative correlation was observed between size of family and proportion of marketed surplus. Large households with higher incomes preferred wheat

to maize which affected the proportions of marketed surplus of both wheat and maize. Another important factor also affected the proportions of marketed surplus very adversely. It was the distance between village and marketing centre. The distance of marketing centre from the village and the proportion of marketed surplus were found to be negatively-correlated. Thus, the detailed study of Kahlon and Vashishtha brought into focus the crucial significance of six key-factors in the determination of marketed surplus of both food crops and cash crops.

The study by National Council of Applied Economic Research (NCAER) (1969) also examined certain aspects of the relationship between market arrivals and wholesale prices. Data from the weekly records of the Marketing Division of the Ministry of Food and Agriculture, Government of India, were analysed for rice, wheat, jowar and gram. Data for rice, (relating to 1958-59), for wheat, (relating to 1959-60) and for jowar and gram (relating to 1960-61) were carefully analysed. Data from 94 markets, located in the 13 major rice-producing States were examined. Variations in the monthly arrivals were found to be more in the States of Punjab, Uttar Pradesh, Madhya Pradesh, Kerala and Gujarat. These States, either made only smaller proportions of contributions to the total production of rice, or raised paddy crop only once a year. The monthly variations were found to be less in Andhra Pradesh, Tamil Nadu, Bihar and West Bengal. These States made higher proportions of contributions to the total production of rice and also raised rice crop more than once during a year. The price elasticity of market arrivals was found to be negative in 13 States for rice. The analysis of data for wheat, for the 8 major wheat-producing States, showed that in Punjab and Rajasthan, the variations in market arrivals were higher than in other States.

In the patterns of market arrivals, as between wheat and rice, a clear distinction persisted. While the market arrivals of wheat were seen to have heavily concentrated in the period immediately following harvest operations, the market arrivals of rice were better spread over a longer period. The study, for example, estimated that between 50 and 70 per cent of market arrivals of wheat occurred within 3 months of harvesting. In the case of rice, the same proportions of market arrivals occurred during 6 months from October to March. However, the regional variations in the wholesale prices of rice as well as wheat were not significantly large. The study found a negative price elasticity of market arrivals for rice in all States. For wheat also, it was negative in 6 States, except in Bihar and Maharashtra. But the values of both the positive and negative elasticities were not statistically significant. The estimated values of R^2 (regression coefficient) were very small which meant that variations in prices explained very little of the variations in market arrivals. Based on the mixed and weak results of this study, no firm and meaningful conclusion could be drawn on the nature of responsiveness of marketed surplus for a given price change.

Data for jowar and data for gram, (relating to 1960-61), were analysed for 9 States and 6 States, respectively. The price elasticities of marketed surplus of jowar were found to be negative in all States, except in Gujarat and Karnataka. For gram, negative elasticities prevailed in all States. Thus, most results indicated that market arrivals and market prices were negatively-correlated,

although the negative values were not statistically significant. However, the NCAER study cautioned thus: "In view of the statistically not significant relationships found between prices and market arrivals of the selected foodgrains, one cannot be categorical regarding the role of prices on the marketed supply of foodgrains in India. Not much reliance can be placed on the results obtained in the present study. This study only reveals that further research is needed for proper specification of the behaviour relationships and further data are required on the variables for testing the responsiveness to price changes on the marketed supply of the selected foodgrains. One should clearly bring in such an analysis, the role of expectations of the price movements on the quantities that are marketed by the farmers".

Pranab Bardhan and Kalpana Bardhan investigated, ***inter alia***, some specific questions of marketing behaviour of different size-classes of farmers. In their joint studies, Pranab Bardhan and Kalpana Bardhan (1969, and its revised version of 1971), had estimated both the marketed proportions and the cash-purchased proportions of cereals. They analysed the time-series data collected from various rounds of National Sample Surveys for the period 1952-53 to 1964-65. On the marketed proportions of cereals, they concluded thus: "It seems that over these 13 years, there has not been much of a trend in the marketed proportion of cereals output in India; if anything, there has been a mild declining trend, particularly since the middle of the 1950s. This is in spite of growth of cereals production (official estimates) at an annual compound rate of 2.7 per cent over this period". Pranab Bardhan and Kalpana Bardhan also found a high-level and growing dependence on purchased (market-purchased) cereals even within the agricultural sector. The high-level and growing dependence on market purchases of cereals indirectly indicated the increased concentration of control over marketed surplus. The steadily increasing dependence on market purchases assumes special significance in the context of: (a) increasing proportion of hired-labour within agriculture; (b) different changes taking place in the agrarian structure; (c) changes in the modes of disposal of farm output; and (d) the growing concentration of surpluses only in some regions and States. (The policy implications of some of these issues will be indicated in Section IV of this paper).

Under certain circumstances, neither price nor output levels, nor consumption retentions seem to determine the proportions of marketed surplus. Such trends are observed when the farm households sell the crop after harvest and purchase foodgrains from open markets for self-consumption. The study by Ranjit Singh and George (1969) provides an illustration of this kind. They examined the behaviour of marketed surplus of paddy in Amritsar and Karnal districts of Punjab. Ranjit Singh and George estimated that around 91 per cent of the paddy produced in these districts was marketed. Even small farmers grew paddy, mainly as a cash crop and sold a larger proportion of paddy in markets. They purchased other foodgrains like wheat and jowar for self-consumption. (The results of Farm Management Survey (1967-68 to 1969-70) for the Ferozepur district of Punjab also confirmed the conclusions of Ranjit Singh and George). The lowest size-class (operating 6 hectares and

below) marketed 83 per cent of paddy output. This became the highest proportion of marketed surplus of all size-classes. The average proportion of marketed surplus for all size-classe worked out to 68 per cent. Such higher proportions of sale of paddy among small farmers could hardly be interpreted as "distress sales". This is because farmers in these districts sold a much lower proportion of other foodgrains like maize and wheat. Farmers were found to retain a larger proprotion of these foodgrains for home-consumption. The study by Ranjit Singh and George, therefore, cautioned that in the estimation of marketed surplus, it is very important to examine the question whether a particular crop is produced primarily for home consumption or for market sales.

Using the village-level cross-sectional data, Kalpana Bardhan (1970) estimated the relationship between marketed surplus and production of foodgrains through a linear model. Data relating to 1956-61 were analysed for 27 villages of Punjab and Uttar Pradesh. In addition to output, the quantity of marketed surplus was related to several other variables. The most important of them were: (i) foodgrain production per adult unit of cultivating population; (ii) average price of foodgrains; (iii) value of production of commercial crops per adult unit of cultivating population; (iv) average income of cultivators from sources other than production of crops; and (v) index of concentration of cultivated acreage in a village. Production of foodgrains, prices of foodgrains, average income from milk production and the extent of kind payments for agricultural operations were the other important variables which exerted significant influence on the behaviour of marketed surplus.

While the output elasticity of marketed surplus was found to be positive with an estimated value of 1.8, the price elasticity of marketed surplus was found to be negative with an estimated value of —0.6. These estimated values were derived from the analysis of overall elasticities of all size-classes of farmers. However, the analysis of sub-samples of large farm households produced interesting and significant results. On the basis of analysis of both sample and sub-sample data, Kalpana Bardhan observed: "The cross-sectional price elasticity of marketed surplus, though still negative, apperas to be smaller in magnitude and statistically less significant than in the case of general sample". This meant that since the large farmers contributed a greater proportion of marketed surplus and the output remained an overwhelmingly important determinant of marketed surplus, even the negative short-run price elasticity would not be a significant factor in changing the overall behaviour of marketed surplus.

The study by Agarwal (1970) analysed, in detail, the data on marketed surplus and consumption for a small village in the Etawah district of Uttar Pradesh. Agarwal classified the factors influencing the behaviour of marketed surplus into two categories: (i) factors that affect the volume of production; and (ii) factors that affect consumption for a given volume of production. The 163 households of the village were classified into four economic groups on the basis of their main occupation. Data on the 1965-66 marketed surplus of 76 agricultural households were carefully

examined. Of the total output value of the agricultural year, rabi and kharif crops accounted for 62 and 38 per cent, respectively. Agarwal found that, out of the total output of the village, farmers marketed around 36 per cent of their produce and retained the rest for home-consumption. The study also examined crop-wise and crop season-wise proportions of retentions and marketed surpluses of small, medium and large cultivators. The study revealed that out of the total cultivated area of the village, large cultivators operated only 5 per cent but contributed as much as 48 per cent of the total marketed surplus by the village. The medium and small cultivators contributed 34 per cent and 18 per cent, respectively. Agarwal arrived at the proportions of marketed surplus after deducting the consumption retentions and the kind payments made for service personnel like barbers and dhobies and the kind repayments of farm loans. In the detailed village study, Agarwal found a direct and positive relationship between per capita marketed surplus and size of land holding and between total quantity of marketed surplus and size of landholding.

In the late sixties and early seventies, Thamarajakshi made several significant contributions on determinants of prices of foodgrains, behaviour of marketed surplus and on the relationship between the inter-sectoral terms of trade and the marketed surplus. In an important contribution, Thamarajakshi (1971) examined the trends in marketed surplus at the all-India level by using time series data of Central Statistical Organisation (national income data) and the National Sample Surveys (consumer expenditure data). She defined the ex-post, or the actual consumption of non-agricultural sector as the "effective supply", or the real marketed surplus of domestic agricultural sector. However, adjustments for imports, or changes in (Government) stocks, should be made before the actual estimates of marketed surplus. Wholesale prices, production and the marketed surplus of rice, wheat, jowar and gram were carefully examined for the period from 1951-52 to 1965-66.

Thamarajakshi estimated the aggregate marketed surplus at the national-level for each and every year. For the initial year (1951-52), the estimated marketed surplus worked out to 11.53 million tonnes; for the mid-year (1958-59), it was 18.32 million tonnes. For the terminal year (1965-66), the estimated marketed surplus came to 18.33 million tonnes of foodgrains. (Foodgrains constituted only rice, wheat, jowar and gram). The estimated marketed surplus reached higher levels of 21.61 million tonnes in 1955-56 and 21.57 million tonnes in 1961-62.

In 1951-52, the estimated marketed surplus worked out to 25 per cent of total foodgrains production. It touched a maximum of 34.5 per cent during 1955-56 but declined to 22.3 per cent during 1965-66. The study by Thamarajakshi had, therefore, shown a declining proportion of marketed surplus despite a more steady growth in foodgrains production. During this period, the output of foodgrains rose at 2.4 per cent per annum while the marketed surplus had grown only at 2.3 per cent per annum. Through a log-linear function with index number of foodgrain prices and index number of output as independent variables and the index number of marketed surplus of foodgrains as dependent variable, Thamarajakshi derived several important results. For example,

the study had shown that a 1 per cent change in foodgrain prices would lead to a 0.6 per cent change in marketed surplus in the opposite direction. The study also found the marketed surplus of foodgrains being negatively-related to price of foodgrains and positively- related to output of foodgrains. This study of Thamarajakshi, however, suffers from the major weakness of using the absolute prices of four foodgrains. The indices of relative prices of foodgrains would have given a set of more accurate results, especially with respect to negative relationship between price and marketed surplus.

(In a well-known study, Thamarajakshi (1969) earlier examined the relationship between changes in marketed surplus (owing to price changes and output changes) and changes in the inter-sectoral terms of trade. In view of the assigned focus of this paper, we prefer not to review the studies on terms of trade. However, we shall examine such studies, for our subsequent paper: "Market Prices, the Agricultural Price Policies, Food Subsidies and the Objective of Equity in India").

In his detailed study, Sharma (1972) carried out an indirect estimation of marketed surplus of foodgrains. He analysed a mass of secondary data, collected through household schedules of the 1961 Population Census. After careful examination of 1960-61 data, Sharma presented a detailed two-tier results. Findings were made separately for the country as a whole and for the 15 States individually. Analysis had shown that the proportion of marketed surplus to output indicated negative relationship in the case of holdings even upto 5 acres, both at the national level and at the State-levels except for Andhra Pradesh, Kerala and Tamil Nadu. In the higher size-classes (above 5 acres), the proportion of marketed surplus to output was positively-related at both levels except in Gujarat and Maharashtra States where non-foodgrain crops dominated the cropping pattern.

The study of Sharma had introduced two new and interesting procedures in the determination of marketed surplus. (i) Sharma took into account only net production of foodgrains as the basis for calculating the proportion of marketed surplus. (The earlier studies have used gross output, or value of gross output, as the basis). (ii) Sharma also fixed a minimum desirable level of consumption as the cut-off point for the determination of consumption retentions. The study observed positive relationship between marketed surplus proportion and size of holdings. Sharma estimated the proportion of marketed surplus at 37.4 per cent of net production of foodgrains when data for all classes of farmers were analysed together. However, in four States, the proportion of marketed surplus exceeded the mark of 50 per cent of net production of foodgrains. Marketed surplus accounted for 51.4 per cent in Andhra Pradesh; it was 55.9 per cent in Madhya Pradesh. In Tamil Nadu, the proportion of marketed surplus worked out to 55.2 per cent. But, for the composite Punjab State, the proportion of marketed surplus touched a record high of 66.9 per cent. The study of Sharma, like several earlier indirect estimates, suffers from a number of deficiencies and limitations. (Since we have already discussed the major deficiencies of indirect estimation of marketed surplus while examining the study of Dharm Narain, we prefer not to discuss them again). But the shortcomings of indirect estimation need not conceal the merits of Sharma's research. The

treatment of a mass of secondary data and their detailed analyses both at the national and at the State levels constitute the two chief merits of this interesting study.

Bhargava and Rustogi (1972) compared the concentration of cultivated area with the concentration of marketed surplus among different size-classes of farmers. They collected and analysed paddy data from the IADP Assessment Surveys (1967-68) for Burdwan district in West Bengal. Marketable surplus was defined, "as the quantity sold out during the year and the quantity kept apart (for later disposal)". In Burdwan district, about 90 per cent of the cropped area was allocated to foodgrain crops; of which, paddy area alone accounted for about 85 per cent. Pulses and wheat were the other important food crops grown in the district. The average size of holding in the district worked out to 2 hectares. As much as 55 per cent of cultivators had holdings less than 2 hectares. About 33 per cent of cultivators had holdings between 2 and 4 hectares. Only about 12 per cent of cultivators had holdings of more than 4 hectares. In the district, 55 per cent of small cultivators operated only about 30 per cent of total cultivated area while 45 per cent of the remaining farmers operated about 70 per cent of the remaining cultivated area.

Through detailed regression analysis, Bhargava and Rustogi examined the relationship between proportion of marketed surplus and total production of paddy. Production of paddy was fitted as independent variable in the regression. On the basis of land operations, Bhargava and Rustogi classified the cultivators into four size-groups and examined the production — marketed surplus nexus for each size-group. They estimated that variations in production explained 23, 32, 57 and 64 per cent of variations in marketed surplus of the four size-groups, respectively. For all size-groups of cultivators, the corresponding percentage worked out to 61. The regression coefficients indicated that proportion of marketable surplus was positively-related to production of paddy and to the size of holdings. The marginal propensity to sell paddy, with respect to production, increased with size of landholding. The study estimated that an increment of 10 kg in production led to an increase of 1.2 kg, 2.1 kg, 3.9 kg, and 6.0 kg. of marketed surplus in the case of ascendingly ordered four size-gorups of farmers, respectively. The results of Bhargava and Rustogi revealed that proportions of marketed surplus of bigger farmers were more sensitive to changes in production as compared to smaller farmers. The disposal patterns of paddy indicated that, on an average, 34 per cent of total paddy production was marketed. The proportions of marketed surplus ranged from 9.3 per cent (for small farmers) to 51.3 per cent (for big farmers). On an average, the cultivators consumed about half of total paddy production and the proportion consumed decreased with size of holdings. The proportions kept apart for seed requirements and kind payments (including land rent), on an average, worked out to 2.5 per cent and 13 per cent, respectively. Bhargava and Rustogi also examined another interesting aspect of marketed surplus behaviour. Through Lorenz curve technique, they analysed the disparity between distribution of marketed surplus of paddy and the distribution of cultivated area in Burdwan district. About 5 per cent of area under the crop resulted in negligible amount of surplus; 30 per cent of area accounted for 12 per cent of marketed surplus; and 74 per cent of area accounted for 50 per cent of marketed surplus. Although

marketed surplus of paddy increased with increase in area, this increment was proportionately less than the increment in cultivated area. Further, this disparity was more pronounced at low levels of area than at higher levels as revealed by the deviation of the curve from the egalitarian line drawn at 45 degrees.

As a strong reaction to the results of Dharm Narain (1981), Utsa Patnalk (1975) re-estimated the distribution of marketed surplus by size of holdings and by size of output for the year 1960-61. Utsa Patnaik used the same data-base, (different published sources), as Dharm Narain but she adopted a number of improved methodologies which gave her study sharply divergent results, as compared to the results of Dharm Narain. She also introduced certain corrections to the data-base before using them in her re-estimates of marketed surplus. For example, while Dharm Narain used the size-classwise per hectare yield figures of a single year, (1954-55), Utsa Patnaik adopted a 3-year average method In the analysis of data from Farm Management Studies (FMS). This method provided her with a much more normal data-base. Again, corrections were also made to National Sample Survey (NSS) consumption data used by Dharm Narain which were known to be overestimates, especially for the upper expenditure classes. These improvements and corrections implied greater quantities of retentions by farm households which considerably reduced the estimated marketed surplus. It was pointed out that the estimates of consumption of landless labourers and livestock, originally made by Dharm Narain, were also over-estimates which again reduced the estimated marketed surplus.

Utsa Patnaik re-estimated the relative proportions of marketed surplus for different size-classes of farmers. According to Utsa Patnaik, small farmers, operating upto 15 acres, contributed only 44.4 per cent of total marketed surplus. (Dharm Narain estimated the contribution of small farmers at 54.4 per cent of total marketed surplus). No perverse relationship was observed among different classes of farmers as the proportion of marketed surplus increased steadily from 20 per cent in the lowest size-class, (upto 1 hectare), to 63 per cent in the highest size-class, (20 hectares and above). Among the ascendingly ordered size-classes of farmers, Utsa Patnaik found no fluctuations in proportions of marketed surplus. Further, the dominant role of small farmers both in output and in marketed surplus, as found by Dharm Narain, was not observed by Utsa Patnaik. The theory of dominant role of small farmers was also not consistent with the observed concentration of both operational and ownership patterns of land-holdings. Utsa Patnaik believed that her estimated proportions of marketed surplus for 1960-61 held good for the year 1950-51, the original year for which Dharm Narain made the indirect estimate of marketed surplus. The in-depth and critical study of Utsa Patnalk has, thus, raised a number of fundamental issues and placed the question of marketed surplus in a more realistic perspective than many of the earlier studies.

The study by Rastynnikov (1975) estimated marketed surplus by using the data from All-India Rural Debt and Investment Survey (1961-62) of Reserve Bank of India (RBI). The farm households were classified on the basis of value of assets held by them. Rastynnikov estimated

the proportions of marketed surplus of different grades of asset-groups. Like Utsa Patnaik and others, Rastynnikov also found a steadily increasing marketed surplus as one moved from the lowest asset-group to the highest asset-group. The lowest asset-group, which owned assets worth Rs.1000 and less per household, contributed only 19.8 per cent of marketed surplus. The highest asset-group, which owned assets worth Rs.20000 and more per household, contributed 41.4 per cent of marketed surplus. For all households together, the value of marketed surplus amounted to 31.4 per cent of total value of farm produce. The results of Rastynnikov largely confirmed the conclusions of Utsa Patnaik.

Two major limitations, however, seem to have distorted the estimates of both Utsa Patnaik and Rastynnikov. In both estimates, none of the size-class had negative marketed surplus as they did not take into account the purchased quantities of foodgrains. Negative marketed surplus seems to be the common factor among all small farm households. Since small farm households have net deficit in foodgrain production, they are often forced to buy-back foodgrains from open markets at much higher open market prices. The second major limitation relates to the valuation procedure adopted both by Utsa Patnaik and Rastynnikov. (Since we have already discussed the problems of distortions arising from the procedure of money valuation of agricultural produce under Dharm Narain (1961), we prefer not to discuss them again).

The study of Rao (1960) paved the way for more intensive examination of the issues and problems relating to spatial and temporal concentration of marketed surplus in India. Brief discussion of a few later studies on the concentration of marketed surplus will be in order. In his thought-provoking study, Krishnaji (1975) analysed the inter-regional disparities in per capita production and productivity. In particular, Krishnaji examined the spatial effects of New Agricultural Strategy on distribution of marketed surplus. He chose three periods and each one covered three agricultural years. The chosen periods were: 1950-53; 1960-63 and 1970-73. For examining the inter-district variations in per capita production and productivity of foodgrains, Krishnaji analysed data for a random sample of 30 districts. Per capita production of foodgrains showed a continuous rise during the period of analysis. Per capita production was 160 kg in the triennium 1950-53 which rose to 190 kg in the second triennium 1960-63. In the third triennium (1970-73), per capita production worked out to 197 kg. During the three periods, inter-district coefficient of variation showed an increase from 0.46 to 0.57. Krishnaji also analysed the variations in per capita production as between the rice region and the wheat region. The per captia production in rice region showed a decline from 182 kg in the triennium 1960-63 to 166 kg in the triennium 1970-73. In the wheat region, on the other hand, per capita production recorded an increase from 277 kg in the triennium 1960-63 to 330 kg in the triennium 1970-73. The study revealed that changes in land-man ratios, (during the period 1950-53 to 1970-73), had not favoured a reduction in the inequalities of per capita production of foodgrains. Despite an overall substantial increase in production, variations in per capita production across the districts had increased considerably. The increasing

Inter-district disparities in the per captia production implied a continuously growing regional concentration of marketed surplus of foodgrains.

The study by Vyas and Bandyopadhyay (1975) examined net availability of foodgrains across States in the country. They analysed the relevant secondary data for 1966 and 1971. In 1966, there was severe food deficit and in 1971, there was comfortable food surplus in the country. Vyas and Bandyopadhyay found sharp differences in per capita availability of foodgrains as between 1966 and 1971 and across different States. The comparative analysis revealed that during the surplus year of 1971, differences in per capita foodgrain availability were greater than during the deficit year of 1966. The inter-State coefficient of variation increased from 35.2 per cent in 1966 to 45.3 per cent in 1971.

Vyas and Bandyopadhyay analysed, in detail, trends in public procurement and trends in inter-State movement of foodgrains. Results of the study strongly indicated growing regional concentration of marketed surplus of foodgrains. The problems of regional concentration and unequal regional distribution of foodgrain availability have direct implications for the operational aspects of food management in India. For solving a number of basic problems of food management, Vyas and Bandyopadhyay recommended formulation and implementation of National Food Budget (NFB) on a year-to-year basis.

Asoke Hati (1976) examined the relationship between marketable surplus of paddy and size of holdings for Hooghly district in West Bengal. Data pertaining to the period 1971-72 to 1972-73 were analysed. Asoke Hati took into account all repurchases of farm households before arriving at the quantities of marketable surplus. The results when plotted on a graph gave a curve with three distinct parts. Each part represented a particular group of land holdings. Marketable surplus was found to be negative for the first part of the curve which included land holdings upto 0.66 hectare. For holdings between 0.66 and 1.98 hectares, the curve flattens at about 5 per cent of marketable surplus. In the case of farm holdings above 1.98 hectares, the proportion of marketable surplus rose at an increasing rate as farm-size increased. The concentration of marketable surplus in larger farm-holdings became very evident.

Data collected and analysed by the Agro-Economic Research Centres, and the Farm Management Surveys (FMS) continue as important sources of information on many empirical aspects of Indian agriculture. Farm Management Surveys provide very important data on cost of cultivation across different size-classes, relationship between farm-size and marketed surplus, patterns of land-use and input-use, irrigation, cropping intensities, wages of agricultural labourers, incomes of farm households and so on. We have already reviewed a few studies which used the FMS data. We discuss below two more illustrations which bring out some important aspects of marketing and marketed surplus. Both studies have analysed the marketing issues of Tamil Nadu. In the marketing behaviour of Tamil Nadu paddy farmers, Nadkarni (1980) found a contrasting picture as between

Thanjavur district and Coimbatore district. Over 80 per cent of the gross cropped area in Thanjavur district accounts for paddy cultivation. In the total paddy production of the State, Thanjavur district contributes nearly one-third of paddy. This indicates the predominant position of paddy cultivation in Tanjavur. In Coimbatore district, paddy has been cultivated along with millets and other cash crops. This means that in the cultivation map of Coimbatore district, paddy is not a predominant crop. But the marketing behaviour of farmers in the two districts presents a sharp contrast. During 1967-68 to 1969-70, only 46 per cent of total production of paddy was marketed in Thanjavur. But in Coimbatore district, the proportion of paddy marketed worked out to 51 per cent of total production during 1970-71 to 1972-73. The variations in marketed proportions became greater with respect to size-classes upto 2 hectares. While small farmers, (operating upto 2 hectares), in Thanjavur district marketed 31.6 per cent of their paddy, the small farmers of Coimbatore district marketed 42.9 per cent of paddy. Nadkami concluded that differences in the marketing proportions might be due to differences in food consumption habits of the two districts. Consumption of millets is widely prevalent in Coimbatore district but, in Thanjavur district, consumption of rice is predominant. Thus, not only market price and total output, but also factors such as cropping pattern, consumption habits, degree of commercialisation of agriculture and level of irrigation exert strong influence on marketing behaviour of farmers. In the case of foodgrain crops, (the subsistence crops), the influence of non-price factors was found to be extremely significant.

By using the FMS data for Tamil Nadu, Kurien (1981) brought to light the significance of scale factor (farm-size) in determining differential production and differential marketing behaviour of farmers. The average farm-size in Thanjavur district worked out to 1.23 hectare but the FMS sample-average came to 2.78 hectares. In Coimbatore district, the corresponding farm-size averages were 3.06 and 5.82 hectares, respectively. Through detailed analysis, Kurien showed the significant role played by farm-size in determining the marketing behaviour of farmers. Kurien recognised the importance of non-price factors but argued vehemently that scale of operation or farm-size was the most differentiating factor of marketing behaviour.

Many studies have recognised the importance of kind payments in determining the proportions of marketed surplus. But a specific study on the kinds, magnitudes and implications of kind payments has remained a relatively neglected aspect of research. In the analysis of kind payments, transfer of produce from small farmers to large farmers plays a significant role. On the basis of an intensive village study in Tamil Nadu, Janakarajan (1986) examined the nature and significance of inter-size-class transfer of produce. Analysis of village-level data revealed that small farm households which did not own Irrigation-well but hired water from the irrigation-well of large farm households, made payments in kind. Similar to owners of land becoming landlords, owners of irrigation-wells became waterlords. Water was sold for payments in kind. The kind payments of small farmers to the waterlords, (mostly in paddy), worked out to 33.3 per cent of the total produce of small farmers. Kind payments of farm households which have leased-in land from other households were also analysed and estimated. Land rent payments in kind accounted for another 15.7 per cent

of the total paddy production. The study brought into focus different kind payments made by dependent farmers and the transfer mechanisms through which the marketed surplus of waterlords became substantial. Small farmers were forced to make kind payments because they did not own the necessary resources and the means of production.

The study by Janakarajan rightly warned that if the transfer (kind) payments of small farmers to landlords and waterlords were not taken into account precisely, the estimates and calculations of production and marketed surplus of different size-classes would be highly misleading. The results of marketed surplus estimates would be highly distorted, if transfer (kind) payments were widespread in a particular region. The study by Janakarajan, like some earlier studies, had shown that small farmers experienced differentiations and discriminations in market prices, whenever they marketed their produce. Differences in market access, discriminations in market interlinkages, differences in ownership and control of means of production and the compulsory transfer (kind) payments paved the way for exploitation of small farmers in the village. In the estimations of marketed surplus across different size-classes of farmers, it is extremely important to analyse the sources of production and the sources of kind payments received by the large farmers.

In his recent detailed study, Tyagi (1990) examined several problems arising from concentration of marketed surplus of foodgrains. The study analysed both temporal and spatial dimensions of concentration of marketed surplus. Tyagi found the wheat and rice surpluses being concentrated in the States of Punjab, Haryana, western Uttar Pradesh, Andhra Pradesh and Tamil Nadu. The study paid special attention to the problems arising from high degree concentration of market arrivals immediately after harvesting season. After detailed examination, Tyagi concluded that spatial and temporal concentration of production and marketed surplus directly contributed to erratic price fluctuations, disorderly public procurement, improper handling and inefficient transportation and the wasteful storage of foodgrains. In his recent survey paper, Annadurai (1992) has also examined the interrelationships of a number of factors and forces that operate in the food economy of India.

We have reviewed so far several studies which have examined the marketed surplus behaviour of farmers in India. As already indicated, there are many studies which have, directly or indirectly, examined the marketed surplus behaviour of farmers. In view of time and space constraints, all available studies could not be reviewed even briefly. However, we have mentioned below some of them purely for purposes of documentation. The studies of Indian Journal of Agricultural Economics (1961), Khan (1963), Vinod Dubey (1963), Sharma (1964), Rao (1965), Goswami and Saikia (1967, 1968, 1970), Sharma (1968, 1969), George (1972), Nadkarni (1973), Krishnaswamy (1975), Shah and Pandey (1976), Pushpangadan (1979), Sampath (1979), Barbara Harriss (1980a, 1980b), Balbir Singh, Kainth and Aulakh (1981), Prabha (1982, 1984), Yoginder Alagh (1983), Reddy (1987), Acharya and Agarwal (1987), Chattopadhyay and Ipsita Sen (1988), Praduman Kumar and Mruthyunjaya (1990), and Sidhu (1990).

SECTION IV

The Private Foodgrain Trade and the Public Distribution System in India : Some Policy implications

Between 1943 and 1949, both the Central and the State Governments in India had gained considerable experience relating to the costs and benefits of Government intervention. This experience of Government intervention seems to have contributed a great deal to the making of the Constitution of India (1949). The Central and the State Governments derive their powers and authorities of governance from the Constitution of India. The constitution of India makes many direct and indirect references to the basic economic problems of the vulnerable sections and suggests several processes and mechanisms for solving them. The Preamble to the Constitution, for example, proclaims to secure social, economic and political justice and to provide equality of status and opportunity for all citizens in the country. The Article 47 under the Directive Principles of State Policy, (Part IV of the Constitution), declares: "the State shall regard the raising of the level of nutrition and the standard of living of its people and the improvement of public health as among its primary duties..." The legislative and executive powers and functions of both the Central and the State Governments have been clearly laid down In the Union List, State List and in the Concurrent List. Both the Central and State Governments are, therefore, not only morally but also constitutionally bound to protect and promote the standard of living of all sections in the population. Formulation of public policies and implementation of Government programmes are the most Important instruments through which the Central and the State Governments seek to achieve the objective of maximum social welfare. The initiation of economic planning in the early 1950s, adoption of the policy of "mixed economy", the schemes for rapid Industrialisation and the via media policy followed in the foodgrain economy are some of the best examples of Government intervention in India.

The evolution of Government policies and programmes, with special reference to the foodgrain economy, has already been outlined in Section I of this paper. Ever since 1943, both the Central and the State Governments continue to intervene in many aspects of the agricultural sector and implement a number of development programmes. Only after careful and elaborate discussion on the identified public problems, both in and outside the Parliament and the State Legislative Assemblies, Government policies and programmes have been formulated and implemented. Identification of social, economic and political problems and their root causes, therefore, becomes a precondition for the formulation of public policies and the implementation of Government programmes. In a declared "Welfare State", all public policies and Government programmes must attempt to satisfy the conditions of social desirability, political expediency and economic efficiency. All public policies and Government programmes must have a set of objectives to be achieved. Maximization of net social welfare continues to be the central objective of all Government policies and programmes. Since the available resources, at any point of time, are relatively scarce, all Government programmes must attempt to generate maximum returns from each unit of the invested resource.

However, the aspects of public policy-making and Government programme implementation in India have not reached the objective levels that they seek to reach. There has always been a big gap between objectives and achievements and between promise and performance. A review of policies and programmes in the country indicates that the initiated policies and programmes suffer from a number of loopholes, deficiencies and limitations. In making the new policies and programmes, both the Central and the State Governments should give high priority for the rectification of these loopholes and deficiencies.

Given the close and direct inter-sectoral and intra-sectoral interrelationships in the economy, a particular public policy or Government programme might generate adverse effects and conflicting implications for other sectors of the economy. A public programme implemented for the benefit of a particular section in the population might result in the generation of adverse effects on other sections in the population. Similarly, public policies and the Government programmes initiated at a particular point of time might become insufficient or inappropriate due to changing trends over time, or due to sharp variations in the socioeconomic and agro-climatic characteristics of different regions. Public policies and Government programmes, however carefully they might have been formulated and implemented, should be subjected to both spatial and temporal analysis periodically. Analysis and review of existing public policies and Government programmes are as important as the new formulation of public policies and Government programmes. Indentification of the emerging socio-economic problems and the development of appropriate public policies and Government programmes for solving them must become the regular and routine aspect of economic planning in the country. Public policies and Government programmes have more significant socio-economic role to play, especially in the protection and development of vulnerable sections in the population whom the market forces and the price mechanism very often overlook and exclude. The principle of exclusion operates in a smooth, subtle and sophisticated manner and with the full and willing cooperation of the vulnerable population. The well-formulated public policies and Government programmes could counter the operation of free market mechanism and ensure the operation of the principles of equality of sacrifice and equality of benefit, (both in real terms), for all individuals in the society. In view of the assigned scope and focus of this paper, we prefer not to go into further details about public policy-making and Government programme-implementation. In the rest of the Section, therefore, we indicate some of the broad implications of the most important conclusions of the supply reponse and marketed surplus studies which we have reviewed in Sections II and III. Among the many policy implications that these conclusions might suggest, we indicate here only those which have direct relevance for food security, namely, efficiency of private foodgrain trade and the effectiveness of PDS in India.

Even in highlighting the issues for policy and programme considerations, we have given greater significance to the issues directly related to PDS than the issues related to private foodgrain trade. The focus on the PDS issues is deliberate and due to the following main reasons. (i) PDS operations are directly carried out by the State Governments and the Union Territories. The most

important operations are public procurement, storage and maintenance of Government stocks, the wholesale and retail distribution of foodgrains and the operations of vigilance and consumer protection. These operations involve huge amounts of expenditures and subsidies both from the Central and the State Governments. The PDS operations, like all other Government programmes, seek to maximise the net social welfare. On the contrary, private traders operate with the main objective of profit maximisation. (ii) The PDS operations are directed and controlled by the Central Government through its authorised agencies like the Commission for Agricultural Costs and Prices (CACP), the Food Corporation of India (FCI) and the Railways. (iii) Given the public sector characteristics and the welfare objectives of PDS operations, the formulated public policies and Government programmes have greater scope of applicability in the Government-controlled PDS than in the operations of private foodgrain trade. (iv) Even a marginal increase in the distribution of foodgrains by PDS reduces the hunger problem of the vulnerable sections substantially. (v) The PDS operations suffer much more from "the limited supplies of foodgrains" than the private foodgrain trade. In other words, the scarcity of foodgrians in the PDS continues as the permanent problem, both during periods of food scarcity and during periods of food surplus. (vi) The personnel employed in the PDS operations could be more easily trained to develop service motivation than the private foodgrian traders who always operate with profit motivation. The differences in the objectives as between the Government programmes and the private trade operations clearly show that public policy-based Government programmes tend to generate beneficial effects and add to the level of social welfare. The important conclusions of supply response and marketed surplus studies suggest several broad and macroeconomic policy implications for the private foodgrain trade and the PDS in India.

The very existence of many policies and programmes on the agricultural and food aspects in India suggests the need for a systematic and critical analysis of them. This is the first and the most important policy implication that clearly emerges from the conclusions of many supply response and marketed surplus studies. The similarities and variations in the existing policies and programmes of the Central Government and the State Governments should be categorised and reviewed thematically and chronologically. The development of each and every policy and programme should be examined critically and the necessary rectifications must be built-in. Each and every public policy and Government programme, therefore, needs to be analysed, reviewed, evaluated and modified periodically. The most important aspect in the analysis of public policy and Government programme is the identification of the sections of gainers and the sections of losers and the re-allocation of greater resources for those policies and programmes which generate greater benefits for the more vulnerable sections in the population. The dilemmas in the choice of policy-options should be resolved by selecting a particular policy and programme option which transfers resources from the richer sections to the poorer sections of the population.

The size and composition of population becomes the most relevant macroeconomic variable in any discussion of the problems of food shortages or problems of food surpluses. Most conclusions

of supply response and marketed surplus studies have direct policy implications for the size of population. The size of population, age structure, rates and trends in the growth of popualtion bear important policy and programme implications for the levels of production and marketed surplus of foodgrains. The Census estimates of 1991 have put the total population of India at 846 millions. The decennial rate of growth for 1981-1991 worked out to 23.50 with a annual compound rate of growth of 2.11 per cent. In relation to the rate of growth of many developed countries, India's 2.11 per cent annual compound rate of growth should be considered very high. There is scope for further reduction in the annual rate of growth of population. The size of population and the per capita net availability are inversely-related, for a given level of food availability. A reduction in the size of population, therefore, produces the same effects as an increase in the levels of production and marketed surplus of foodgrains. Strategies and programmes which control the size of population directly contribute to the increased per capita net availability of foodgrains. Along with their strategies to increase the supply and marketed surplus of foodgrains, both the Central and the State Governments should develop more appropriate and newer family planning strategies for further controlling the rate of growth of population in India.

Many supply response and marketed surplus studies have concluded that changes in market prices have significant influence on the area, output and yield of agricultural crops. An increase in market prices increases the area, output and yield of agricultural crops and a reduction in market prices brings down the area, output and yield per hectare. The marketed surplus studies, in particular, have concluded that an overall increase in production is followed by an overall increase in marketed surplus of foodgrains. Market price, therefore, becomes the single most important factor in the determination of both the levels of supply and marketed surplus. But, the influence of changes in market prices on the consumers is in the opposite direction. Higher market prices provide incentives for producers to target for greater farm production. On the contrary, higher market prices restrict the consumers to purchase smaller quantities of foodgrains. In the case of foodgrain crops, some studies have found, for certain classes of farmers, inverse relationship between market prices and quantities of marketed surplus. Changes in market prices, therefore, become the most important source of conflict between the interests of producers and the interests of consumers. Both the Central and the State Governments should adequately recognise the significance of maintaining balanced market prices for different commodities which, on the one hand, induce the farmers to target for greater farm production, and, on the other, enable the consumers to purchase the required quantities of foodgrains with a given income. In spite of the implementation of many general pricing and marketing policies and programmes, both the Central and the State Governments have not been able to maintain "appropriate open market prices". They should, therefore, develop region-specific and season-specific more stringent pricing and marketing policies for achieving "appropriate open market prices". Appropriateness could be defined in terms of the stabilisation of open market prices. The more stabilised prices are the more appropriate prices. Both the Central and the State Governments should initiate all possible strategies and mechanisms for controlling inflation and for stabilising the open market prices, especially of foodgrains.

The greater significance of non-price factors such as rainfall, climate, fertilisers, irrigation, crop yield, trend variable and technology has come to light from many supply response and marketed surplus studies. In the case of foodgrain crops, the role of non-price factors has been observed to be significant. This means that cash crops have higher price elesticities than the foodgrain crops. The higher price elesticities of cash crops might induce the farmers to reduce the area under foodgrain crops and increase the area under cash crops. In a populous country like India, this kind of change in the cropping pattern would produce disastrous effects in the economy. In order to prevent sharp reduction in the area under foodgrain crops, both the Central and the State Governments should develop appropriate policies and programmes which would ensure inter-crop acreage parity at the regional and at the national levels, both in the short-run and in the long-run.

The reviewed studies have highlighted the concentration of higher productivity and higher marketed surplus of foodgrains in some regions in the country. Such concentration has created the problems of chocking of markets, seasonal price fluctuations and the problems of non-availability of transportation and storage facilities in the regions. These recurring problems suggest: (i) infrastructural facilities such as roads, electricity, banking institutions, transport systems should be developed in such regions through greater plan outlay; and (ii) the agriculturally more backward regions should be developed on a priority basis with special investments. Both the Central and the State Governments should implement suitable policies and programmes for reducing the inter-regional variations found in respect of agricultural and infrastructural facilities.

The conclusions of many studies have shown that even among the foodgrain crops, only wheat and paddy crops have responded to changes in prices more significantly. The supply responses of coarse grains, pulses and oilseeds are found to be less significant. Some studies have concluded that the significant responses of wheat and paddy were mainly due to the New Agricultural Strategy, (the seed-fertiliser-water-technology package), introduced during 1966. These conclusions lead to several policy and programme implications. These conclusions suggest that both the Governmental and the Non-Governmental Organisations (NGOs) must initiate policies and programmes for developing new High Yielding Varieties (HYVs) in coarse grains, pulses and oilseeds. Since irrigation, institutional factors and technology have played very significant role in bringing about Green Revolution in India, both the Central and the State Governments must also initiate newer suitable policies and programmes for further developing the irrigation and technology facilities and taking them all to the non-Green Revolution areas in the country.

Several reviewed studies have expressed great concern over the growing instabilities and fluctuations in production and marketed surplus of foodgrains, particularly since the early 1970s. These instabilities and fluctuations in production and marketed surplus have been passed on to market prices, public procurement, public distribution and the per capita net availability of foodgrains. The instabilities and fluctuations in different aspects of the foodgrain economy greatly disturb the smooth and efficient functioning of both the private foodgrain trade and the PDS in India. Both

the Central and the State Governments should review the existing output stabilisation policies and programmes in the foodgrain economy and initiate new strategies which would minimise the inter-seasonal, inter-year and inter-regional instabilities and fluctuations in the production and marketed surplus of foodgrains.

Some marketed surplus studies have found the proportion of population depending entirely on purchased foodgrains has been growing over time both in the rural and urban areas. This means that the proportion of population depending on own-farm foodgrain has been on the decline. Steady increase in the non-producing population in the urban areas, (mostly the informal sector urban workers), and the gradual growth of impoverished rural population, (mostly the high proportion of agricultural labourers among them), have contributed to the rapid increase in the food-purchasing population in the country. The private foodgrain markets and the PDS retail outlets are the most important sources which meet the foodgrain demand of the non- producing population. The non-producing population, during periods of food shortages, encounter non-availability of foodgrains, sharp increases in foodgrains prices and cuts in food consumption levels. In other words, a growing proportion in the population has been made to accept the food insecurity as inevitable and irrevocable. But the growing food insecurity during periods of food self-sufficiency and food surplus presents a puzzling and paradoxical situation. Since the increased PDS operations and the efficient functioning of the private foodgrain trade could significantly contribute to the reduction of food insecurity in the country, both the Central and the State Governments should evolve newer policies, programmes and strategies for strengthening the PDS and regulating the private foodgrain markets. The PDS operations could be strengthened through greater quantities of public procurement and greater quantities of public distribution of foodgrains. The operations of the private foodgrain trade could be better regulated through more stringent, more specific pricing and marketing policies.

Only very few studies have examined the significance of policy-induced price change. The policy-induced price changes, (namely, the fixation of procurement prices), become the significant explanatory variable in the determination of supply and marketed surplus of foodgrains. The minimum support prices offered by the Government agencies act both as "protection prices" and "incentive prices". (In fact, the procurement prices also act as "protection prices" and "incentive prices" for the food-purchasing population). Procurement of foodgrains from the farmers constitutes the most important public policy and Government operation in the foodgrain economy. Through public procurement and subsidised public distribution of foodgrains, the Central and the State Governments operate the dual market dual price regime for the benefit of both the producers and the consumers of foodgrains. In the determination of appropriate procurement prices for the agricultural products, the CACP has been guided by a number of considerations. The most important among them are: (i) cost of production; (ii) risk factor; (iii) change in input prices; (iv) market prices; (v) demand and supply; (vi) effect on industrial cost structure; (vii) effect on cost of living; (viii) effect on general price level; (ix) international market price situation; (x) parity approach which includes (a) inter-

crop price parity, (b) input-output price parity, (c) parity between raw material prices and finished product prices and (d) parity between prices paid and prices received by farmers; and (xi) trend approach. The standardised and uniform procurement prices, recommended by the CACP, for the country as a whole, are not acceptable to several States. They argue that due to agro-climatic and infrastructural variations, their cost of production becomes much higher than the average cost of production cosidered by the CACP. In order to compensate for the higher cost of production and to induce the farmers to supply greater quantities of foodgrains to the procurement agencies, some States offer "incentive bonus" over and above the recommended minimum support prices. The fixation of procurement prices for foodgrains has immediate and direct influence on the open market prices, quantities of procurement, levels of public distribution, issue-price levels of the PDS and the levels of Central and State subsidies benefiting both the farmers and the consumers. In view of the overall significance of the public procurement operations, both the Central and the State Governments should employ newer and improved pricing and marketing policies and programmes for the removal of contentious and controversial issues raised by many in the fixation of procurement prices for foodgrains.

The conclusions of some studies which examined the distribution of marketed surplus across different classes of farmers imply a number of policy and programme possibilities. These conclusions have shown that in the total marketed surplus of agricultural produce, medium and large farmers control relatively a higher proportion of marketed surplus compared to marginal and small farmers. Both in production and in the proportion of marketed surplus, the dominant shares of medium and big farmers are evident. The higher shares of bigger farmers correspond to their dominant ownership and operation of land and other assets in the rural economy. The relative shares of output and marketed surplus of medium and large farmers have increased over time. This makes the situation very disappointing. The medium and large farmers enjoy dominant economic position and they are also not subjected to agricultural income tax. They are also able to avoid the procurement levies imposed by the Government agencies. (Levy evasion, particulalry by the medium and big farmers, largely contributed to a very slow growth of public procurement of foodgrains, in spite of the phenomenal increase in the gross and net production of foodgrains). Both the Central and the State Governments, therefore, must initiate appropriate policies and programmes for restructuring the procurement levy rates and for extracting greater quantities of foodgrains from the farmers. Since the PDS has been permanently suffering from "the limited supplies of foodgrains", any increase in public procurement and public distribution would contribute to greater food security in the country.

The national-level rate of growth of marketed surplus, particularly of foodgrains, does not show encouraging trend. Marked variations in the proportions of marketed surplus have been observed across regions, seasons, crops and classes of farmers. For the country as a whole, the proportion of marketed surplus for foodgrains has been estimated to range from 35 to 40 per cent of the net production of foodgrains. Only in the case of some States, the proportions

have ranged from 50 per cent to 67 per cent of the net production. Since increased production and increased marketed surplus of foodgrains are crucial factors for capital formation, both in the agricultural sector and in other sectors, greater emphasis should be laid on the policies and programmes which would increase first the production of foodgrains, secondly the marketed surplus, thirdly the public procurement and finally the public distribution of foodgrains. The national-level slow rate of growth of marketed surplus of foodgrains calls for immediate and multi-pronged policies and programmes both by the Central and the State Governments.

Studies that examined the supply response and marketed surplus trends at the district-level, have concluded that there has been wide variations across districts. The district-level and regional-level wide variations in the supply respose and marketed surplus behaviour of foodgrains strongly come in the way of achieving the objectives of National Food Budget (NFB) approach. Only some States which have surplus and highly-surplus districts contribute greater quantities of foodgrains to the Central Pool of the FCI. But the States which have deficit and highly-deficit districts only draw from the Central Pool greater quantities of foodgrains. Under these circumstances, achieving the objectives of NFB becomes extremely difficult. Very often, the Central Government has been accused of taking a partisan approach in the Central Pool allotments of foodgrains. A number of new and pertinent policies and programmes should be initiated for the gradual reduction in the concentration of supply response and marketed surplus of foodgrains at the regional and at the district-levels. Taking into account the agro-climatic and physical factors of the deficit and the highly-deficit districts, the Central and the State Governments should launch new and Innovative policies and programmes for dryfarming, dairy, poultry, horticultural, sericultural and piscicultural development in these districts.

Almost all studies have recognised the significant role of GPPs in bringing about transformation, modernisation and commercialisation in Indian agriculture. The net macro-level impact of these factors could be observed in the tremendous Increase of production, public procurement, public distribution and in the maintenance of huge Government stocks of foodgrains. These macro-level indicators of growth are solid evidence to the high degree supply response and marketed surplus behaviour of Indian farmers. Both the Central and the State Governments have to initiate further a number of policies and programmes for sustaining the achieved growth in the food economy. Sustainability of agricultural growth depends on the formulation and implementation of more specific and more innovative policies and programmes by the Governments. All macro-level indicators of growth may present a number of problems and dilemmas to the Central and the State Governments. The huge Government stocks, for example, provide, at least, three policy options to the Central Government. They are: (i) open market sales by the FCI; (ii) export of foodgrains; and (iii) substantially increasing the distribution of foodgrains through PDS. Globalisation objectives, (either through GATT or through non-GATT channels), may compel the Central Government to opt for export of foodgrains. But, given the poverty conditions in the country, the better policy option would be increasing the distribution of foodgrains through PDS.

Before we conclude this Section on policy implications, two essential aspects need to be highlighted. They are; (i) demand-side factors and (ii) limitations of the conclusions of supply response and marketed surplus studies. In the entire paper, we have argued the case for strengthening the supply-side factors. However, the demand-side factors are as important as the supply-side factors. The most important demand-side factors are: (i) levels of income and (ii) levels of commodity prices. The GPPs, therefore, should also focus on increasing the levels of income and stabilising the commodity prices. Both the Central and the State Governments must initiate more specific and more innovative policies and programmes relating to employment and income generation, poverty alleviation, food subsidies and stabilisation of open market prices. The objectives of food security could be achieved through the PDS more effectively by strengthening both the supply-side factors and the demand-side factors of the food economy.

While formulating public policies and Government programmes, the Central and the State Governments should pay particular attention to some of the lacunae and limitations of supply response and marketed surplus studies. A few illustrations will be in order. The results of price elasticities of micro-level output response and acreage response could be used in formulating policies, if only price and income elasticities of home consumption could be dependably established. The absence of a systematic attempt to constuct an aggregate supply function for the agricultural sector as a whole might come in the way of developing efficient and useful policies and programmes. Most conclusions emanate from short-run analysis and by considering a few crops at micro-level. For developing useful and efficient policies and programmes, both the Central and the State Governments must depend more on the results of long-run analysis which cover the supply and marketed surplus responses for several crops at the macro-level. In developing efficient pricing and marketing policies and programmes, Governments must take into account the absence of reliable data on important aspects such as private inter-state movement of foodgrains, private storage of foodgrains, private sales turnover and evasion of taxes by private traders. In formulating and implementing efficient and useful public policies and Government programmes, both the Central and the State Governments must recognise the significant role played by factors such as price expectations, relative prices of crops, risk aversion behaviour, crop substitution and "other shifter variables" of supply response and marketed surplus behaviour of farmers in India.

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