Chapter - 2

Review of Salient Studies
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This chapter of the thesis contains brief review of the important research studies undertaken in respect of the various aspect of the problem under study. Review of researches provides insight into formulation of objectives and identification of appropriate tools and techniques for analysis. The reviewed studies presented in the chapter cover all aspects and angles of the problem under study, viz. production and productivity trends, components of output growth, acceleration/ deceleration in rates of growth, supply response etc. Though the reviewed researches in the chapter cover the post – green revolution period, however, the main focus is on the studies undertaken during the later years of the period under review.

Dharm Narain (1960) investigated into the price acreage relationship between acreages of competing crop and relative prices with the use of tabular analysis geometric charts. The study undecided the relationship between output and area with weather changes and prices. He observed that the area under food grains was influenced to a greater extent by the change in the weather whereas the area under non - food was influenced to a greater extent by the change in prices. He observed that the element of substance in economy was

supposed to be responsible for this differential behaviour, Khan (1961)² analysed the relationship between the prices and yield reported that the yield of cotton for the current year is related to the prices prevailing two years back that of Jute with previous year and that of cereals with the prices prevailing three years back.

In back ground of these studies based on simple association between change in price and area under specific crop the need for close investigation into the supply relationship emerged, as a result of which studies using sophisticated models were conducted. In most of these studies change in price have been co-related not to the change in acreage on the produced but to the change in acreage on the ground that the acreage is a measure of the size of crop the farmers intended to produce. This has a built in tendency for under calculating supply elasticity, as it takes no account of the farmer’s attempts to vary the intensity of production. The elasticity of supply is the sum of the elasticity of acreage and productivity per acre response to price change.

Dantwala M. L. (1961)³ examined the long term trends in crop yields of 16 major crops during 1920–21 to 1955–56 and sub periods therein. Raj Krishna (1963)⁴ observed that adopted a distributed lag model of Nerlovian type to estimate the parameters of several supply relation of agriculture commodity

in Punjab region before 1946. It was postulated in the model that a farmer tends to achieve a certain level of production but the level of current prices, the prices prevailing in preceding year would influence the planned level of production. Besides, the prices factors such as weather, irrigation would also influence the planned level of production. George (1965) attempted analysis of food and non food grains crops in respect of different sub periods during 1920 – 21 to 1955 – 56. Jai Krishna et al. (1965 & 1967) provided response evidences in two studies confide to wheat in Uttar Pradesh during the period 1950 – 51 to 1962-63. In the first study (1965) twelve price formulations based on wholesale price were used to explain the change in wheat acreage in Uttar Pradesh during the period under study. The study indicated that the inferences, relating to acreage response changes drastically depending upon the estimate of the expected price use. They concluded that the “Pre-conceived notions of both the schools of thought i.e. those hypothesizing high degree of supply response and those hypothesizing negligible supply response can be sustained if the results for different models are looked at individually. In the second study (1967) nine alternating prices expectation models and six different response equations were used. The results of study indicated

that the acreage in wheat has been fairly elastic to change in relative price of wheat and substitute crop during the period under study. They concluded that traditional regression models for estimating the supply response coefficient if properly specified can give as satisfactory, if not superior, results as those obtained by using the adjustment lag models of Nervolvian types. Acharya et al. (1966) studies the rice substitute in a lagged model using harvest price as an independent variable and acreage as dependent variable at disagreed level. The study was related to eight districts of Bihar and nine of West Bengal. They got significant results for only four districts of Bihar and six district of West Bengal vide variation in results was attributed by them to varying degree of risk. Satya Narain (1967) studied the problem of supply response in terms of changes in acreage under sugarcane in two groups of state i.e. Andhra Pradesh, Mysore, Maharashtra, Madras, Uttar Pradesh, Bihar and Punjab. The significant feature of this study was that he introduced stall capacity of sugar factories and price of ‘gur’ as substitute commodity in his analysis. He observed that through the influence of these two factors varied from state to state the stalled capacity of sugarcane factories has important bearing on the changes under area in sugarcane. Beh Raman’s (1968) an attempt

to examine the responsiveness in under developed agriculture analysed the responsiveness of four major annual crops of Thailand during the period of 1937-63.

The result of the study approved the hypothesis that the farmers in economically underdeveloped countries response significantly and substantially to economic intensive in this study no significant evidence was found for the hypothesis that institutional constraints preclude significant response to economic intensive in under developed agriculture. Pillai (1969) extended the supply response analysis by taking into account, besides, area, productivity and production for observing impact of the price movements. Both current and lagged prices were used and all the three variables i.e. area, production and productivity were responsive to the changes in the price. Kaul et al. (1971) attempted to find the best estimates of response of Punjab farmers to price while deciding the acreage allocation for important crops e.g. wheat, paddy, groundnut and desi cotton. By application of Nerlovian type model and observed that the long run elasticities are higher than short run elasticities in each cash particularly groundnut and desi cotton. Mishra et al. (1971) attempted to developed acreage response models in the context of Gujarat with particular response to groundnut and Bajra. The eight models

developed in the study included four adjusted lag models of Nerlovian type, two traditional models to distinguish the direction of price effects and two Nerlovian type models allowing scope for directional differences in the long run price effect. They concluded that the explanatory power of the models are quite satisfactory, it improves considerably if a bare knowledge about the data is made of by introducing dummy variables and that there is no district advantage in preferring Nerlovian type models the traditional ones. The final conclusion of the study was in view of the others the price can be used only in a limited way as an instruments to induce sizeable shift in acreage allocation of these crops. Jha et.al. (1971)\textsuperscript{14} tested the applicability of the Cobweb theorem for area under sugarcane in four districts of Bihar for the period (1934-35 to 1964-65). They attempted two types of models namely traditional Cobweb models and dynamic supply version. Both the model's indicated convergent type of cobweb, the traditional model suggesting a two-year periodicity of the price cycle and the dynamic version indicating cycles of 4 to 5 years durations. Kaul, J.L. et.al. (1971)\textsuperscript{15} observed that the change in yield has been largely responsible for production in Punjab during 1960-61 to 1969-70. Varad Ranjan et.al. (1972)\textsuperscript{16} examined the various opinion in respect of acreage to change in

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prices by estimation of farmer supply response in respect of groundnut in Mudurai district and observed that the farmers of underdeveloped countries are not responsive to price changes. Camak et al. (1972)\(^{17}\) observed that the trend of decline in area under pulse crops can be reserved if the groundnut remodels its price policy. Singh et al. (1974)\(^{18}\) attempted to examine with the help of empirical evidence the effectiveness of Nerlovian adjustment lag model in comparison to traditional models and to find out how the effects of inter-regional characteristic would quantify to develop a macro model. Jha D. et al. (1974)\(^{19}\) observed that India is characterized by extreme diversities in resource endowments and relative factor scarcities, as such the growth. Bhatiya et al. (1974)\(^{20}\) suggested that the basic principle of planning should be an effort to bring about the fullest development of natural resources through—production specialization in regions for which they are specially suited. Singh et al. (1974)\(^{21}\) suggested that the development of irrigation was one the most important factors for increasing food grains production, if regional disparities in food grains production are to be reduced the development of irrigation is the powerful tool to achieve it.

Singh Daulat et al. (1974) observed that the green revolution combined the advantages of its four components, viz. agronomic, chemical, engineering and management and led to crop imbalance. Patil S.M. (1974) observed that the strategy for agricultural growth and equality should be from time to time reviewed in the context of

(a) gross area covered under H.Y.V. multiple cropping and plant protection;
(b) consumption of fertilizers;
(c) gross area irrigated;
(d) institutional investment on minor irrigation;
(e) agricultural pump set energised;
(f) private tube wells installed;
(g) indigenous production of tractors.

Goswami et al. (1974) observed that the farmer decision to grow commercial crop is greatly influenced by economic consideration like price on account of which jute is substitute paddy in New Gong district in Assam. Comings (1975) attempted to study supply responsive of India farmers in Post Independence period by using Nerlovian model with distributed lags aversion normally used in Indian studies and observed greater degree of market responsive on the part of Indian farmers.

cultivators than the conventional wisdom might allow. The crop wise elasticities were positive in respect of wheat, barley and jute in all states but generally elasticities were poor. Ziauddin, P. et.al.(1975)\textsuperscript{26} examined that the growth rates of production, area and productivity of rice, ragi, sugarcane, groundnut in Pondicherry during the period 1960-61 to 1970-71 and observed substantial output growth in rice, ragi and sugarcane decline in area under groundnut and rice. Singh et.al. (1976)\textsuperscript{27} attempted to estimate farmer’s response to relative changes in price allocating their resources among different crops they grow. Taking average rainfall as a variable. They concluded that the farmers are responsive to price and price variability and yield and variability. There is a positive response to the changing level of irrigated area in the season in allocation of land to wheat and rice but negative response to rainfall in the allocation of land to wheat and Bajra. The co-efficient of trend variable was observed to be negative in all the three crops i.e. wheat, rice and Bajra and that the value of Nerlovian co-efficient of adjustment was found to be low. The model applied by the authors was:

$$A_t = 0(Y_{t-1}, P_{t-1}, Z_{t-1}, T_t)$$

Where: 

- $A =$ Area under crops
- $P =$ Relation Price of the crops,
- $R =$ Average rainfall
- $Z =$ One year lagged irrigated area in the Session concerned,

\textsuperscript{27} Bhatiya I.J. and P. Kumar, “Impact of Price and Price variability on acreage allocation in Haryana, Indian Journal of Agricultural Economics XXXI (2) 1976 pp 31-37.
T = Trend period

Sagar, V. (1977)\(^{28}\) reported 2.4 p.p.a. output growth during 1955-61 to 1969-74 in Rajasthan attributed 63.64 per cent to yield 38.45 per cent to area, 7.82 per cent to price and 3.5 per cent yield and cropping pattern interaction with 13 per cent negative contribution of other factors. Cummings (1977)\(^{29}\) examined his presumption that higher prices commands not only more land but better land for a crop. The author estimate brings out the interaction among crops as emphasised in Nerlovian's model. Swaminathan, M.S. (1977)\(^{30}\) recommended economically viable technology and measures for its massive adoption, appropriate land reforms, integrated pricing for input and outputs improvement in storage, processing marketing and distribution for agricultural development. Venket Ramanan et.al. (1978)\(^{31}\) studied the cropping pattern change in the Andhra Pradesh during 1950-75 and stated that the relative changes in area that took place were mainly under individual crops and not for broad aggregates such as total food grains and oil seeds with the exception that there was decline in relative acreage under total pulses the study was based on the analysis of behavioural response of farmers in allocating area under major crop and the impact that their profit maximi-


\(^{29}\) Cumming, Jon Thomos, "Crop substitution and market influence. The case of eheat and barley in North Western India", Indian Journal of Agricultural Economics XXXII (2) April-June, 1976, pp 1-12.


Ziring and risk aversion behaviour has on cropping pattern. The focus was on the effects of price and yield variability have on area allocation under major crops they observed that the farmer act rationally and desiring to maximizing return would expand area under crops whose yield increased, which responded favourably to irrigation and positively to price expectation. Jhala (1979) examined inter regional groundnut supply response and observed that agro-climatic factors seen to exempt a significant inference over groundnut acreage of India that by Indian farmers response to economic intensives is not found very clear and well defined relation with these commercial crops. Singh (1979) examined the conceptual framework and assumption in supply response analysis. In this study the nature of supply responsiveness to price changes under developed countries has been analysed in comparison to developed countries. The author observed that with the incorporation of farmer’s expectations as the dynamic elements to influence supply response relationship as done in Nerlove model. The measurement of the elasticity is more meaningful. Geol, R.C. et.al. (1979) reported the C.G.R. for area, output and yield of Wheat, Rice, Bajra and American cotton in Haryana during the period 1960-61 to 1976-77 was positive and significant. Sukhatma (1980) observed that though to

measure and compare the growth rates of different regions is important but to find out the causes of imbalances and possible remedies is of vital importance. Singh, B. (1980) suggested that the long run agricultural development strategy should concentrate, besides, developing technology to soil local climate and resource endowment structure at improving the objective conditions which determine weather what and how much to produce and to invest. Mahajan, R.K. et al. (1980) compared growth rates in area, production and yield of rice for pre H.Y.V. (1955-56 to 1964-65) and H.Y.V. (1965-66 to 1977-78) periods. They observed that growth rate of area has declined, while, that of productivity significantly increased in post H.Y.V. period. Singh et al. (1980) observed that price variability was an important factor influencing farmers planning decision in respect of the acreage under different crops in dry farming areas in Haryana. Ray (1981) examined the force responsible for generating production grains and estimated the short and long run area and output elasticities with respect to price and weather by application of least square technique. Bhatia M.S. (1981) examined the growth rates in production and productivity of wheat, rice, and food grains in

different states for the period 1960-61 to 1978-79 and 1967-68 to 1978-79 and observed that while the modern technology of wheat has reached almost all wheat growing states, the rice technology has made impact on growth rate of production only in few states. Bhatia M.S.,et.al. (1981)\textsuperscript{41} observed that the states having higher production of irrigating area larger areas under H.Y.S. and higher level of fertilizer consumption per unit of area have higher rates of growth of productivity and also of production. Swaminathan, (1981)\textsuperscript{42} observed that there was no short cut to agricultural development and that the pace and progress in it can be accelerated if a properly orchestrated efforts can be made among all connected with the enterprise. Singh (1981)\textsuperscript{43} observed that the uneven growth rates of individual crops has led to the regional imbalance in the rural prosperity depending upon the crops each region has been cultivating. Bhatia (1981)\textsuperscript{44} observed that while the modern the technology for wheat production has reached almost all growing states. Joshi (1982)\textsuperscript{45} observed that the economics surplus generated by states highly developed in agriculture should be channalised away from specialitve trade in to prod-

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\item[41.] Bhatia, M.S., "Inter-State wise variation in Growth of food grains Production in India", Journal of Indian Society of Agricultural Statistics 33 (2), P. 97. 1981
\item[42.] Saminathan M.S., "Indian Agricultural challenges for Eighties," Agricultural Situation in India 36 (5), pp 348-357. 1981
\item[43.] Singh Daroga., "Imbalance in Agricultural Growth Situation in India", Indian Journal of Agricultural Economics 36(1) pp, 1-26,1981.
\item[45.] Bhatia, M.S., "Land Reforms, Technological Change and Agriculture Growth", Capital, pp. 18-20 &27, 1982.
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uction asset formation. At the same time massive efforts are required at many levels to bring the small peasant into the center of strategy of agricultural trans-formation as the principal agent of growth. Deshpande et.al.(1982)\(^{46}\) examined the supply response in pulses and observed a positive response to the real price and its yield. They observed that though the crop is sensitive to real price, the role of market price in deciding the crop area is limited. Lal et.al. (1983)\(^{47}\) studied the determinants of farmer's sugarcane acreage decision in regions of Uttar Pradesh and reported positive response to acreage in the regions. Gajja et.al. (1983)\(^{48}\) examined fertilizer product price responsiveness of wheat in Rajasthan and concluded that allocation of land under H.Y.V. of wheat should be coupled with positive policy and favourable fertilizer product purity for increasing wheat productivity. Rao et.al. (1983)\(^{49}\) examined growth in pulses in different states and reported positive growth in Rajasthan, Orrisa and Tamil Nadu and negative in Andhra Pradesh and Punjab in area during 1950-51 to 1978-79. Improvement in productivity was recorded in Punjab. Pant (1983)\(^{50}\) reported 2.85 per cent per annum increase in net irrigated area in Madhya Pradesh during 1956-

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57 to 1964-65, i.e. post H.Y.V. period i.e. 1967-68 to 1981-82. Sikdar et.al. (1984)\textsuperscript{51} examined the trends in area production and yield of jute in West Bengal and Bangladesh and observed that year to year changes in the area jute were owing to changes in prices of jute relative to that of autumn paddy. Evenson (1985)\textsuperscript{52} studied the output supply and input demand effects of H.Y.V. rice and wheat varieties in North Indian Agriculture and observed that the Green Revolution in India has been non-neutral in its effect on both output supply and factor demand has favoured supply of wheat and rice at the expense of other crops on the output side. Mishra (1985)\textsuperscript{53} studied the supply response in case of tea and observed that the price factor plays a weak role in influencing acreage allocation for tea. Vaidyanathan (1985)\textsuperscript{54} examined the possibility of achieving 4 to 4.5 per cent growth in agricultural production during 1985-90 and observed that it is not feasible. Rao et.al. (1986)\textsuperscript{55} compared the pre- and post independence period growth rates in area, production and productivity of food grains and observed stagnancy in over all production in pre-independence period. Chand et.al. (1986)\textsuperscript{56} examined the

supply response functions for major crops in Punjab Agriculture and observed that Punjab agriculture has reached a plateau and with the present level of technology further scope for increasing output supply by tampering the price is limited. Chand (1986)\textsuperscript{57} studied the supply implies policy for major crops for Punjab and observed that reliance should be based on technology rather than prices for increasing the output of agricultural commodities of Punjab. Nagbhushanam \textit{et al.} (1986)\textsuperscript{58} studied the supply behaviour of major oilseed crop of Bihar and reported a differential rate of response as regional level at Andhra Pradesh: a positive response was observed in the high growth district of Andhra Pradesh. Dantwala (1987)\textsuperscript{59} suggested that the economists should not evade the question of structural change on the ground that it is for the political scientists or activities to provide the answer. The altered structure should endure the retain benevolent character without a supporting change in the value system. Goswami \textit{et al.}(1988)\textsuperscript{60} are observed that the production and price series of cotton and price series of sugarcane contains a hidden cycle of three years while the production series of sugarcane contains a hidden cycle of three years while the production series of sugarcane contained the cycle of four years and linear

\textsuperscript{59. Dantwala, M.L., "Growth and Equity in Agriculture," Indian Journal of Agricultural Economics, 42, pp. 149-158, 1987.}
line trend during 1966 to 1983 in Haryana agriculture. Sindhu et al. (1988)\textsuperscript{61} examined the growth and area response of commercial crops in Punjab and observed that the importance of traditional commercial crops such as cotton, oilseed, sugarcane and potato have diminished over times and paddy and wheat have emerged as major commercial crops Punjab as a result of which the area under groundnut has shifted to these crops. This has been possible due to adoption of seed, irrigation, and fertilizer technology supported remunerating pricing policy. Lal et al. (1988)\textsuperscript{62} examined the area response of rapeseed and mustard in Uttar Pradesh during Pre-and Post Green Revolution period observed that lagged area of rapeseed, mustard, lagged yield of substitute crop are the vital factors influencing the area under rapeseed mustard and that wheat in view of high per unit yield offsets price rise in mustard. Raju et al. (1988)\textsuperscript{63} reported positive supply response in high growth districts in Andhra Pradesh. The adjustment mechanism indicated less number of years required to realise the price effects when compare to the low growth district. Sagwan (1988)\textsuperscript{64} studied the supply response in respect of potato wheat, maize and rice in seven sub-regions of Uttar


Pradesh. The sub-regions were carried out of twenty-six important potato-growing districts. The estimate of elasticity of potato acreage with respect. Sarma (1989) suggested that it is necessary to shed light in the dynamic context of consultancy changing technology. On identifying the regions therefore in terms of investment utilization or physical environment. Bandopadhyay (1989) observed that in Punjab – Haryana in the production of the wheat there has been outward shift of the production frontier during the Post- Green Revolution period, but this parametric shift in the production frontier was not accompanied by an increase in the rate of growth of production. In contrast in West Bengal there was a district, particularly in the three northern districts of the state. Expect three or four district the remaining districts registered only marginal increase in the rate of growth of production during the Post- to its price was positive and higher than other crops under consideration. Krishna ji et.al. (1991) suggested that in view of the decline in land-man ratio the labour interification must be examined for different regions in the context of the specially uneven growth process and restricted possibilities of migration for work. Jodha (1991) observed that to transform agriculture in Fragile Resource Zone as

sustainable through application of appropriate technology the requirement is reorientations of agricultural research strategies to suit the specific requirements of these areas. This is turned in largely on institutional rather than technological problems. Varghes, et.al. (1993)\textsuperscript{69} observed that the decade wise growth rates of area, production and productivity oilseed crops in Rajasthan were similar in fifties and eighties in respect of Mustard and Groundnut. Kaushik (1993)\textsuperscript{70} observed that during the pre-green revolution period i.e. 1994-50 to 1964-65 the output increase in oilseeds particularly, groundnut is attributed to increase in area mainly whereas during the post-green revolution (1968-69 to 1991-92) period the output increase in oilseeds was mainly due to increase in productivity. The estimates of C.G.R. of productivity in the cases of groundnut, rapeseed, mustard and total oilseeds were 0.91 p.p.a., 3.09 p.p.a. and 1.96. p.p.a. respectively in comparison to the corresponding area growth of 0.58 p.p.a., and 2.25 p.p.a. and 0.49 p.p.a. respectively. Rai et.al. (1994)\textsuperscript{71} observed that since land distribution is an important determinant of agricultural development, the pattern of its ownership should be just and rationale to secure growth with social justice. Between 1970-71 to 1985-86 the area concentration has declined. Singh et.al. (1994)\textsuperscript{72} observed that the aggregate productivity on the

Punjab farms has increased partly because of increase in cropping intensity as a result of increased level of mechanization and increase irrigation facilities and partly because of increased use of farm inputs. Das (1994)\textsuperscript{73} observed that the agricultural development in India, institutional reforms should precede the technological change, or at least, both should go side by side. Institutional reforms and technological change both are necessary. Balishter, et.al. (1994)\textsuperscript{74} observed that in Post-technology period there has been a shift from crop sharing to fixed rent system as about 62 per cent of the total least land is on this system. The shift is due to certainty of production and income due to adoption of new farm technology. Tripathi (1994)\textsuperscript{75} concluded that the average size of holdings and inequality index adversely affected per hectare of food grain. H.Y.V. areas and irrigated area had positive and significant impact on per hectare yield of food grains. The study also indicated decline in the concentration holding. Mukharji (1995)\textsuperscript{76} observed that the Indian agriculture under the new economic policy would remain much more acutely dependent and vulnerable to the internal structural and institutional rigidities, manoeuvres of international finance capital and world market vicissitudes, as a part of typical colonial


economy. Khatkar (1995) observed that after the liberation agricultural domestic capital formation in agricultural sector, both in private as well as public sector, have declined and suggested concentration on high value and labour intensive agricultural allied products. Bhalla (1995) suggested that in view of further deepening of new technology in Punjab, Haryana, West U.P. and its extension to East U.P. The North-Western region continues to be the main producer of incremental output. Efforts to increase output from the north-western region must not be slackened since the region has development infrastructure. The other ragged policy of shifting areas in this regions from high productivity cereals to oilseeds by providing excessive hike in the price of the letter can only lead to resource misallocation and is misconceived. Kaith (1995) suggested that accelerators, viz. evolving genetically superior high yielding seed varieties suitable for different agro-ecological regions, well planned introduction of wheat based farming system through technology support, reinforced by training, extension and input supply mechanism, judicious and balance use of fertilizers with micronutrients and their availability at the village level greater emphasis on use of improved implements and machinery to maximum production efficiency and reduction drudgery of labour, to avert harvest and post- harvest losses, improve water management practices,

79. Kaith, G.S., "need To improve productivity to boost export," The Economics, Times, June 26, P. 21,1995
integrated plant protection measures including weed control with effective supply mechanism for weedicides, proper price and market support linked with the rural credit programme, etc. are required to achieve higher productivity. Barman (1995) observed that the new agricultural strategy based on the principles of cost efficiency, competitiveness and profitable price marks a clear departure from the post agricultural policies. High degree of instability, unevenness and growth across crops and states overtime and shortage of agricultural inputs are some of the notable problems found in Indian Agriculture. Gangwar, et.al. (1995) suggested to take advantage of liberalised economic policies identity agro-climatically and location wise favourable regions/pockets in the country and to make concerted efforts for production of fresh fruits and vegetables through creation of required infrastructure for production transport, storage, processing, packaging of these products. Pandey, et.al. (1995) hoped that the new economic policy in the agricultural sector would bring about professionalism and the dominant role of the private sector will increase the flow of investment into the agricultural sector and long term gains in agricultural production substantially. Shukla et.al. (1995) observed that

the view-point of use of inputs and agricultural developments there exists vast disparities in M.P. and suggested their removal for balanced agricultural development. **Kumar, et.al.(1996)**\(^{84}\) observed that, besides, change in incomes and price, structural change would bring about major shifts in consumption of milk, fruits, vegetables, and livestock product both in the rural and urban areas. The increase in demand for non-cereals and non-crop commodities vis-à-vis cereals will provide incentives to the producers to diversify their production. **Deshpandey (1996)**\(^{85}\) examined the demand and supply analysis of agricultural commodities reviewing different studies undertaken during 1969 onwards. The author observed that perennial crops present specific problems as far as their supply behaviour is concerned. The maturity period is longer hence yield and price expectations are formed much ahead of the expected returns. Apart from this the analysis of this group of crops has to be always crop specific characteristic of crop. **Dhnisa, et.al. (1996)**\(^{86}\) observed that if the production of pulses is to be roused through shifts in cropping pattern in favour of these crops concerned efforts have to be made to bring about technological improvements, particularly varietal developments to increase the productivity level of these crops, as the acreage response with respect to relative price has been found to be low and also further increase in price of pulses will

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hit the poorer section of society and will create serious imbalances in the dietary mix of the majority of low income people. Singh et.al. (1997) reported that in the case of total food grains as well as for all the individual food grains crops, yield witnessed higher growth rates as compared to acreage in the last two decades. This has helped in maintaining a rising trend in total food grain production at the national level. For individual states, the states Bihar, Haryana, Madhya Pradesh, Rajasthan, Tamil Nadu and Uttar Pradesh performed much better than the other states. Even the growth rates of yields were much more impressive than those of production in these states. In the case of non-food grain crops, oilseeds maintained steady trend in growth rates in last two decades. It was also reported that increased use of irrigation water, fertilizers and H.Y.V. seeds could further increase the yield of food grain crops in most of the states. Chopra (1998) observed that the role of institution is economic activity is that of defining the parameters and processes through which agents use technology natural and human resources to increase human as well being. Resources, technology and institutions thus designate development. Development implies a sector increase in the sector of goods and services available. Institutions define the process and the rates by which objectives such as development are attained. Economists typically first define objective functions, constraints and then examine the feasible

set of solution. Kundu (1998) observed that in the induced innovation literature in agriculture, institution is treated as endogenous and is assumed to be induced by technology, resource endowment and cultural attributes of an economy. A successful state induced change in institution may trigger further changes in its wake and process maybe sustainable if the institutional innovations are consistent with the basic resource endowment of the economy. In the West Bengal significant changes in land tenure, redistribution of ceiling surplus land and notable change in market being gradual replacement if share cropping by fixed rent tenancy. These were induced and supported by the technology, resource endowment and cultural factors. The new institution of fixed and farmers income. This has also promoted share of labour compared to land and capital. It can be concluded that the land market in West Bengal has been consistent with the requirements of higher growth and redistribution of output in favour of labour. Singh et al. (1990) reported that the participation of women in crop operations was quite high ranging from 33 per cent of the total work force on small farms to 26 per cent on large farms. The trend of working hours remained almost the same with the decline of men labour days for collection of fire woods and decline of both men women labour days for tending cattle due to rise in the field owning to intensive and extensive and extensive cropping.

continued to work 11 hours a day in both periods. The mechanization of ploughing and harvesting/threshing operations has reduction to level employment of both male and female workers by about one third in 1997-98 as compared to 1985-86. Pillai (2001)\textsuperscript{91} observed that it emerged that input productivity has indeed played an important role in the growth performance in 1980’s early 1990’s in West Bengal and Orissa. While the growth in inputs and total factor productivity have contributed significantly to the output growth in both the states, the performance of West Bengal has been brought about both by efficiency and technology in the presence of variations across seasons and seed varieties. Naik et.al. (2001)\textsuperscript{92} observed that the recent slow down in the grain output raises concerns about the growth of agricultural sector. It has been estimated that India’s demand for food grains in 2020 will be 351 million tones assuming 5.5 per cent growth in per capita income. In economic growth is also accompanied by significant reduction in the proportion of poor people, demand could further increase to 370 million tones by 2020 (Bhalla and Hazal, 1998). According to Kumar and Mathur (1996), food grains demand with 5 per cent GDP growth in the 2010 and 2020 will be 246 million tones and 294 million tones, respectively. Therefore the surging growth of demand for food must be met with largely through technological change in agricultural because of the limited option to expand the land

\textsuperscript{92.} Naik G. et.al., “Trend in Agricultural Output growth and price of agricultural commodities,” Agricultural Situation in India, LVIII (4) pp. 139-142, 2001
area. Kumar et.al. (2001) \(^93\) observed that form for foregoing discussion, it is clear that the yield was the one of the most important factors which affected acreage under the edible oil seed crops in Rajasthan State. Thus, more efforts should be made towards varietal improvement in edible oil seed crop but also lower the instability in the yield, resulting into increase in returns to the farmers. Another important observation stems from an examination of the price risk that the high variability in the farm harvest price of edible oilseed would discourage the farmers to allocate more lands to oilseed crops. Besides, expansion of irrigation facility had also very encouraging on the area allocation. Hence, concerted effort should be made to increase the irrigation potential in the State. Kumar et.al. (2002) \(^94\) observed that the rates of area under high yielding verities, area covered under soil conservation measure, supply of quality seeds institutional credit area irrigation, cropping intensity, production of chemical fertilizer, progress of regulated markets, quantum and value of agricultural exports, etc. are positive and significant. However, the agricultural sector also faces certain pressing problems, which have come to the surface in recent years. The declining prominence to the agricultural sector during structural reforms periods (after 1991), declining share in global agricultural export market, declining public sector investment, mounting cost of production of major crops etc. adversely affected the sectoral

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94. Kumar N. Ravi et.al., “Growth crisis of Food Grains Production in West Bengal,” Agricultural Situation in India, LVIII (ii) pp. 511-516, 2002
growth of agriculture and allied activities which has fallen dramatically from 9.6 per cent in 1996-97 (when the reforms were supposed to show their ‘positive’ impact) to 0.9 per cent in 2000-01. **Sarkar et.al. (2002)** observed that the growth in food grain area, production and yield trends in the State of West Bengal has decreased significantly during Reforms period (1990-91 to 1998-99) and Overall period (1980-81 to 1998-99). Thus is mainly due to the significant decrease of the growth in rice production and yield trends and pulse area, production and yield trends, during Reform period compared to the Pre-reform period. But West Bengal recorded the highest food grains output growth in India during pre-reform period almost due to the highest growth of rice in the country. But its area growth has increased significantly during Reforms era compared to Pre-reform one. Moreover, of the total cropped area of food grains, the cropped area of rice has increased from 84.87 per cent in 1980-81 to 90.29 per cent in 1998-99. Thus the scope of area growth is limited for rice. Further increase in the rice production is mainly possible by increasing its productivity. **Saini et.al. (2002)** suggested that we all should be seriously concerned with agricultural environment and focus on resource-friendly technologies in future strategies of agricultural development as the farmers still lack awareness about the sustainability and conversion of natural

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95. Sarkar, Debnarayan et.al., “Growth crisis of Food Grains Production in West Bengal,” Agricultural Situation in India, LVIII (ii) pp. 511-516, 2002
96. Saini, A.S. et.al., “Natural resource Management and Technological Awareness for Sustainable Agricultural: A cross-sectional Analysis of Stressed Areas,” Agricultural Situation in India, LIX (2) pp. 57-72, 2002
resources. Sujit et al. (2002) observed that the performance of agricultural in India is impressive if one looks at the aggregate figures with respect to output and production. At the same time, inter state differences are predominant which would lead to inequity and unequal distribution of wealth. It is a matter of serious concern. Attempt has been made to reduce this disparity among Indian state by suitable policy, which should focus not only on the productivity side but also post-production activities. It is quite evident that the governments support price is not competitive due to excess supply just after harvesting. In such a situation a proper storage facility would repay their due since fertilizer is found to be the most significant variable in most of these states, it can be used to reduce inequality among the farmers. Agrawal, (2003) reported that there has been a shift in the cropping pattern and an increase in the livestock rearing over the years in Tamil Nadu. The farming decision differed by the size of farms and the extent of irrigation facilities available. There existed a positive association between diversification and size of holding under irrigated situation. Therefore in the development measures, diversified farming approach with improved irrigation facilities may be encouraged. Hemlata, et al. (2003) underlining the strategies for development

suggested that to raise the prospect of agriculture in the country high genetic value seeds should be developed through better breeding policy coupled with bio-technology process, input like fertilizer seed, etc. should be made available at reasonable rate, community hiring machinery centers may be established, farming system must include animal rearing, irrigation potential areas are to be tapped to harvest water and utilize water for irrigating the crops, sustainable pricing structure for agriculture produce must be maintained, agro based industries may be established, economic land holding size should be evolved export oriented products should be encouraged and extension education/training should be thought of for creating awareness amongst allocation of farmers. Gupta et.al. (2003)\textsuperscript{100} examined constraints of Pulses production and suggested adequate supply of certified seeds making available phosphatic and potash sc fertilizer, varieties adopting to moisture stress and resistant to disease support price mechanism, better marking environment, etc. are required for expansion in area and output of pulse crops. Sekar, et.al. (2003)\textsuperscript{101} observed that area under pulses is a significant factor in determining the production of pulses and hence it is important to explore the possibilities for enhancing the cropping intensity by incorporating short duration pulse crops like mungbean into rice – wheat cropping intensity by incorporating short duration pulse crops like mungbean in to

\textsuperscript{100} Gupta, et.al., "Pulse Production : Constraints and Strategies – A State wise Analysis," Agricultural Situation in India, LIX(11) pp. 685-692, 2003
\textsuperscript{101} Sekar et.al., "Statust, Determinants and Availability of Pulses in India," Agricultural Situation in India, LIX(11) pp. 705-708, 2003
the rice-wheat cropping system which are remuneration thereby production of total pulses and per capita availability there of could be enhanced. With shrinking water resources base in India, pulses by virtue of their resilience under limited water may be preferred in less favourable areas. The actual realised yield of pulse is very low as compared to the potentials. Estimated results indicated that an increase of about 0.4 tonnes/hectare from the present level of 0.60 tonnes per hectare would result in per capita availability of 64 grams per day. Hence identification of location specific constraints for this yield gap and elimination is essential. Sarkar et.al. (2004) observed that except the lowest farms size. But, more importantly, according to the scope of efficiency, since, the numerical scores between efficient and inefficient forms are very close to each other the difference between efficient and inefficient forms under the size classes of holding among owners and tenants of our study based on the evidence of a particular region of West Bengal can not, likely, to be established significantly. This might suggest that only high use of technical inputs like irrigation. High Yielding Varity (H.Y.V.) seed, chemical fertilizer, per unit of land does not necessarily bring about maximum possible output for a given set inputs, nor does it only make 'best practice' relationship between input and outputs. It in necessary to provide institutional support to the farmers of technological advanced villages (TAV) by widening access to agricultural extension facilities like

management and supervisory advantages, to the farmers, technical training to the farmers and the like so that the farmers of technological advanced villages (TAV) may use minimum modern agricultural inputs with low cost per unit of area in order to have maximum possible output. Seetharam, et.al. (2004) observed that value-addition through processing of these nutritious cereals should also be explored and popularised to make them popular among consumers. A large-scale awareness campaign about it should be carried out. Moreover, the barrier of low social status attached to these nutritious cereals should be removed by terming them as health foods. To start with, these may be used extensively for mid-day meals programme of schools.

The review of research papers form basis of the model used in this study and presented in Chapter 3, the chapter on research method. The observations made in respect of the researches under taken by economist, on analysis of temporal changes or response analysis cannot be claimed to be complete. However, attempt has been made under this chapter to accommodate various findings and observations in different aspects of problems under the limitations and constraints of the present study.