Chapter 2

REVIEW OF SALIENT STUDIES
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In this part of the thesis brief reviews of the important research studies undertaken on the problem under study are presented. Review of literature provides insight for decision of objectives and identification of tools, besides, techniques for analysis. Attempt has been made that the reviewed studies presented in the chapter cover all aspects of the problem viz. production and productivity trends, development indicators directions and discussions of growth, etc. The reviewed studies in the chapter cover the post – green revolution period.

Kaul, et.al. (1971)\textsuperscript{1} observed that the changes in yield have been largely responsible for production trend in Punjab during 1960-61 to 1969-70.

Camak et.al. (1972)\textsuperscript{2} observed that the trend of decline in area under pulse crops can be reversed if the government remodels its price policy.

Singh (1973)\textsuperscript{3} observed that the development planning contributes to achievement of the main objectives of national


\textsuperscript{2} Camak and Prakas Mehta, "Effect of Area, Yield and Cropping Pattern on Production of Pulses in Punjab." Khadi Gramodyog XVIII/10, 1972 pp.561-564

planning in India, viz. (i) to accelerate development of logging areas, (ii) to reduce inter-regional disparities in development and growth, (iii) to provide the basic dis-aggregation of national planning with respect to agriculture and other sectors of economy, (iv) to facilitate coordination and integration of planning and implementation at various levels, (v) to coordinate agricultural development with over all areas development plans, and (vi) to facilitate wider involvement of people in the process of preparation and implementation of development projects.

Rao (1973)\textsuperscript{4} observed that in development, if the emphasis is to be on the balance development of different regions, then the backwardness of the region can be studied with reference to economic indicators like land utilisation pattern, irrigation potential, the available raw material and the infrastructural facilities like water and power, transportation, marketing and storage facilities and also the linkages with the higher levels of centers. These economic indicators will certainly indicate the level of economic developments of a particular region regarding the production potential, consumption level and the marketing capacity of the areas.

Lavania et.al. (1973)\textsuperscript{5} suggested evolving of the indicators to distinguish between backward and non-backward areas, viz. (i) per capita income, (ii) size of agricultural holding, (iii) average yields, (iv) wage rates, (v) institutional infrastructure, (vi) subsidiary


enterprises to supplement incomes, (vii) educational facilities and extension of services, (viii) government participation in promoting agricultural sector and allied small scale industries, (ix) people's own attitude and determination towards self-help and developmental programmes.

**Singh A.K. (1973)**\(^6\) suggested planning for the economic and social development of a specified geographical area through coordinated expansion of various social and economic services needed for the development of the area.

**Singh D. (1973)**\(^7\) classified indicators of growth into two broad groups, cause and effects. The cause indicators included (i) use of purchased inputs per hectare viz. fertilizers, improved seeds, pesticides and implements, (ii) percentage area under assured irrigation, (iii) cropping intensity and cropping pattern, (iv) annual growth in volume of agricultural credit from institutional agencies, (v) growth in cooperative credit society membership, (vi) gross fixed capital formation in agriculture per hectare of cultivated area, (vii) percentage and condition of tenancy, (viii) agricultural worker per hectare of arable area. The effect indicators included (Agricultural output per farm worker (ii) yield of important crops per hectare (iii) gross domestic product per capita. the marketing and processing indicators included (i) urban population as percentage of rural population (ii) market arrivals of food grains and non food grains per hectare arable area (iii) marketing

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facilities (iv) quantity of commodity processed each year. The miscellaneous indicators included (i) kilometer of road per 1000 square kilometer of land area (ii) illiteracy rate (iii) population growth (iv) health conditions (v) agricultural extension and education programme.

**Diskalkar et.al. (1973)** suggested that the new strategy for development in agriculture should be based division of homogeneous area according to soil and rainfall condition followed by the strategies for creation and exploitation of irrigation resources, supply of agricultural inputs, development of subsidiary enterprises and coordination of different activities.

**Garg et.al. (1973)** observed that the success of the integrated area development largely depends upon the evolution of an improved pattern of growth centres, integrating the urban and rural areas with a view to providing basic economic, social and community facilities with in reasonable substance from the place of living. The locational decision of the growth centres are most important for an accelerated development, because they will be the major determinants of future pattern of growth in the region.

**Bhatia et.al. (1973)** suggested single package of agricultural inputs, Rural electrification, development of roads and similar

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infrastructural inputs electrification, soil testing for balanced fertilizer application, establishment of lending institutions farmers educations in better agronomic management and long range storage and processing planning for accelerated agricultural development.

Bhatiya et.al. (1974)\textsuperscript{11} suggested that the basis 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)\textsuperscript{12} 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, et.al. (1974)\textsuperscript{13} observed that the green revolution combined the advantages of its four components, viz. agronomic, chemical, engineering and management and led to crop imbalance.

Patil (1974)\textsuperscript{14} 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

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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.

Commings (1975)\textsuperscript{15} attempted to study supply responsiveness 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 responsiveness on the part of Indian 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 the elasticities were poor.

Ziauddin, et.al.(1975)\textsuperscript{16} examined that the growth rates of productin, area and productivity of rice, ragi, sugarcane, groundnut in Pondicheri 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.

Shah et.al. (1976)\textsuperscript{17} observed positive output growth in all crops except Gram in Punjab and positive as negative output growths in certain crops in Gujarat, Andhra Pradesh, Uttar Pradesh, Tamil Nadu and West Bengal.

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Sagar, V. (1977)\textsuperscript{18} reported 2.4 p.p.a. output growth during 1955-61 to 1969-74 in Rajasthan was 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.

Swaminathan, (1977)\textsuperscript{19} recommended economically viable technology and measures for its massive adoption, appropriate land reforms, integrated pricing for inputs and outputs, improvement in storage, processing marketing and distribution for agricultural development.

Venket, et.al. (1978)\textsuperscript{20} 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 crops and the impact that their profit maximizing 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 those desiring to maximizing return would expand area under

crops whose yield increased, which responded favourably to irrigation and positively to price expectations.

**Geol, 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.

**Sukhatme (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, (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 where, what and how much to produce and to invest.

**Mahajan, 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 and observed that growth rate of area has declined, while, that of productivity significantly increased in post H.Y.V. period.

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Singh, et.al. (1980)\textsuperscript{25} observed that price variability was an important factor influencing farmer's planning decision in respect of the acreage under different crops in dry farming areas in Haryana. Alfred (1980)\textsuperscript{26} suggested that the first action for improved agriculture in dry areas will have to be a broad programme of land, irrigation and credit reform. This combined with the political mobilization of the majority of farmers to demand their share of administrative, technical and financial resources, is the first step in technological progress. Alagh, et.al. (1980)\textsuperscript{27} estimated and analysed the growth rates for foodgrains, sugarcane, major oilseeds, cotton, jute and mesta pertaining to all India and state level for the periods 1960-61 to 1969-70, 1969-70 to 1978-79 and 1960-61 to 1978-79 and observed that growth rates for the period 1969-70 to 1978-79 were higher, smooth and evenly spread. He suggested stabilisation of prices to allow farmers to take advantage of advanced technological opportunities.

\textsuperscript{26} Alfred S.J., "The scope for a New Surge of Agricultural Development in the Dry Land or Drought Prone Areas of India," Indian Journal of Agricultural Economics, Vol. 35(4) pp. 22-27, 1980
\textsuperscript{28} Bhatia, M.S., "State wise variation in Growth of food grains Production in India", Agricultural Situation in India, pp. 397-384. 1981.
Bhatia, (1980) estimated the rate of growth of foodgrains productions for the periods 1960-61 to 1978-79 and 1967-68 to 1978-79 and observed that it has risen between 2.56 to 2.77 percent per annum in the post-green revolution period i.e. 1967-68 to 1978-79. The state-wise comparisons indicates the highest growth rate of 7.98 percent per annum in Punjab followed by 5.33 percent per annum in Haryana during the total period of study.

Singh, et.al. (1980) estimated growth rates of area and yield of wheat for two sub-periods i.e. pre H.Y.V. seed and post H.Y.V. seed in 1954-55 to 1977-78 and observed the growth rates in respect of the both area and yield during post H.Y.V. to be higher.

Venkatramanan, et.al. (1980) estimated and compared growth rates in area, yield and output of important foodgrain crops for Punjab, Rajasthan, Uttar Pradesh, Bihar, Maharashtra and Andhra Pradesh and concluded that there has been positive growth trend in respect of important foodgrains crops except Jowar, Bajra and Small cereals during 1950-51 to 1974-75.

Alagh, (1980) observed area specificity in agricultural growth during the H.Y.V. period due to development of irrigation infrastructure, aspiration for fast growth, besides, the social

considerations determining the acceptance or rejection of new agricultural practices.

**Bhatia (1981)** examinated 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, et.al. (1981)** observed that the states having higher production having higher irrigating area, larger areas under H.Y.V. seeds and higher level in fertilizer consumption per unit of area have higher rates of growth of productivity and also of production.

**Swaminathan, (1981)** 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)** 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.

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30. Saminathan M.S., "Indian Agricultural challenges for Eighties," Agricultural Situation in India 36 (5), pp 348-357. 1981
Singh, H. et.al. (1981)\textsuperscript{32} examined the growth rates for area, production and yield of rice at national and state levels and observed the rise in production of rice to be 2.61 percent per annum, which is higher than the population growth.

Gupta et.al. (1981)\textsuperscript{33} studied the agricultural growth in wheat cultivation during pre-green revolution and post-green revolution periods and observed that in western Rajasthan the growth rate of area is more and that of productivity less when compared in Rajasthan state as whole. This is obvious on account of fact that western Rajasthan in an arid tract.

Mahajan, et.al. (1981)\textsuperscript{34} compared growth rates in area, production and yield of Paddy for pre H.Y.V. (1955-56 to1964-65) and H.Y.V. (1965-66 TO 1977-78) periods. They concluded that the growth rates of area have declined, while, the same of productivity has increased significantly during the post H.Y.V. period.

Joshi (1981)\textsuperscript{35} concluded that the causes of regional disparities in agricultural growth in the result of variation, or difference in irrigation and fertilizer application rates, besides, the intensity cultivation based on H.Y.V. seeds.

\textsuperscript{34} Mahajan, R.K. and Sharma, V.R.B., “Growth Analysis of State-wise Area, Production and Productivity of Rice in India,” Agriculture Situation in India, Vol. 36 (3) pp. 171-176, 1981
Singh (1981) observed that vicious cycle of poverty, socio-culture obstacles, rates of capital formation and repercussions of internal force were responsible for disparities in growth rates of agriculture.

Rao et al. (1981) reported that decomposition analysis reveals that area was the major factor for increase in rice production in Uttar Pradesh, Madhya Pradesh, Assam, Maharashtra, Rajasthan and Karnataka during pre H.Y.V. period, while in post H.Y.V. period in productivity emerged as the dominating factor.

Deshpande et al. (1982) 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.

Rao et al. (1983) examined growth in pulses in different states and reported positive growth in Rajasthan, Orissa 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.

Alexender, (1982) observed that canal irrigation leads to

increase in productivity thereby making it possible for cultivators to spare produce for sale after fulfilling their consumption needs. **Pant (1983)**\(^ {41} \) reported 2.85 per cent per annum increase in net irrigated area in Madhya Pradesh during 1956-57 to 1964-65, i.e. post H.Y.V. period i.e. 1967-68 to 1981-82. **Rao et.al. (1983)**\(^ {42} \) examined growth in pulses in different states and reported positive growth in Rajasthan, Orissa and Tamil Nadu and negative in Andhra Pradesh and Punjab in area during 1955-51 to 1978-79. **Pant (1983)**\(^ {43} \) estimated 2.85 percent per annum increase in net irrigated area in Madhya Pradesh during 1956-57 to 1964-65, i.e. pre H.Y.V. period and 5.19 percent per annum in post H.Y.V. period i.e. 1967-68 to 1981-82. **Chandra et.al. (1983)**\(^ {44} \) examined vertical growth in agriculture in different regions of Uttar Pradesh and concluded that though the state showed vertical growth in Wheat and Rice, it was not uniform in all the five regions. Regions presented different growth pattern. **Johal, (1984)**\(^ {45} \) identified adequate and growing research

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capacity, extension education through matching delivery and recipient systems, adequate rural infrastructure, conducive agricultural policy, environment and responsive farming capacity as the five determinants of agricultural development. 

**Ali Mansoor et al. (1984)** observed that the H.Y.V. technology, which initially failed in making dent due to social constraints has finally succeeded in taking in 80's and recommended higher investment for input development and extension of appropriate technology.

**Evenson (1985)** 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. It has favoured supply of wheat and rice at the expense of other crops on the output side.

**Vaidyanathan (1985)** 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)** compared the pre- and post independence period growth rates in area, production and productivity of food grains and observed stagnancy in overall production in pre-

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independence period.

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 et.al.(1988)\textsuperscript{60} 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 while the production series of sugarcane contained the cycle of four years and linear line trend during 1966 to 1983 in Haryana agriculture.

Sidhu 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 in 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 rape-seed mustard in Uttar Pradesh during Pre-and Post Green Revolution


periods and observed that lagged area of rape-seed, mustard, lagged yield of substitute crop are the vital factors influencing the area under rape-seed/mustard and that wheat in view of high per unit yield offsets price rise in mustard.

**Sagwan (1988)**[^63] 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 to price were positive.

**Sarma (1989)**[^64] 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)**[^65] observed that in Punjab – Hariyana 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, which registered only marginal increase in the rate of growth of production during the


Post-green revolution period. Response to its price was positive and higher than other crops under consideration.

Sharma, (1990)\textsuperscript{67} observed that the four states, viz. Punjab, Haryana, Uttar Pradesh and Maharashtra have achieved growth rates higher than the national average of 2.72 percent per annum, increase in production has been statistically non-significant in Gujarat, Tamil Nadu and Rajasthan states. This trend is in conflict with the national objective of balanced growth in different states and social justice.

Bhatia et.al. (1990)\textsuperscript{68} suggested afforestation, availability of irrigation in all districts throughout the year, better fertilizer management, promotion of millet, cattle rearing etc. for diversification, growth and stability of agricultural economy in Uttar Pradesh.

Krishna ji et.al. (1991)\textsuperscript{69} suggested that in view of the decline in land-man ratio the labour intesification must be examined for different regions in the context of the specially uneven growth process and restricted possibilities of migration for work.

Jodha (1991)\textsuperscript{70} observed that to transform agriculture in Fragile Resource Zone as sustainable through application of appropriate technology the requirement is reorientations of agricultural

\begin{footnotesize}
\begin{enumerate}
\item Sharma, J.L., "Inter-state Disparities in Growth of Agriculture in India," Agricultural Situation In India, Vol. 45(7), pp. 453-456, 1990
\item Bhatia J. et.al., "Diversification, Growth and Stability of Agricultural Economy in Uttar Pradesh," Agricultural Situation in India, Vol. 45(6), pp. 397-403, 1990
\end{enumerate}
\end{footnotesize}
research strategies to suit the specific requirements of these areas. This has turned in largely institutional rather than technological problem.

**Hanumantha Rao, (1991)**\(^{71}\) observed that the gap between the potential and the actual productivity is quite high in the regions where the use of new technology such as high yielding varieties of seeds and fertilizers generate much greater employment than in the developed regions. There has to be special efforts for evolving technologies suited to dry land agriculture.

**Prasad et.al. (1993)**\(^{72}\) identified ecological, research and socio-economic constraints responsible for slow output growth in pulses and suggested location-specific technological improvement with promising potential to be undertaken to obtain higher productivity levels in pulse crops.

**Ram Salik, (1993)**\(^{73}\) observed that the estimates of the area, output and yield growth rates of groundnut and kharif and rabi oilseeds in Orissa district emphasised on the need to expand the area under oilseeds in addition to productivity improvement efforts.

**Koshti, (1993)**\(^{74}\) observed that the area of operation by

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multinationals has promoted the cultivation of commercial crops, particularly oilseeds and plantation crops, which can adversely effect the structure of agriculture. The production relations are likely to change and move in favour of large-scale farming.

Varghes, et.al. (1993)\textsuperscript{75} observed that the decade wise growth rates of area, production and productivity in oilseed crops in Rajasthan were similar in fifties and eighties in respect of Mustard and Groundnut.

Kaushik (1993)\textsuperscript{76} observed that during the pre-green revolution period i.e. 1949-50 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, rape-seed/ 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.

Das (1994)\textsuperscript{77} 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{78} 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 leased land is on this system. The shift is due to certainty of production and income due to adoption of new farm technology.

Mukharji (1995)\textsuperscript{79} 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, as a part of a typical colonovial economy.

Khatkar (1995)\textsuperscript{80} observed that after the liberation 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.

Kaith (1995)\textsuperscript{81} 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

\begin{itemize}
\item \textsuperscript{81} Kaith, G.S., “Need To improve productivity to boost export,” The Economics, Times, June 26, P.1-21, 1995
\end{itemize}
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 maximise production efficiency and reduction of drudgery of labour, to avert harvest and post- harvest losses, improved water management practices, 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)\textsuperscript{82} 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)\textsuperscript{83} advocated to take advantage of liberalised economic policies identify 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.

Shukla et.al. (1995)\textsuperscript{84} 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.

Dhanisa, et.al. (1996)\textsuperscript{85} observed that if the production of pulses is to be raised 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 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)\textsuperscript{86} 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 of Bihar, Haryana, Madhya Pradesh, Rajsthan, Tamilnadu 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)\textsuperscript{88} 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 well being. Resources, technology and institutions thus designate development. Development implies a sector increase in the vector 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)\textsuperscript{89} 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 in 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


\textsuperscript{89.} Kundu, Ashok, "A Study in West Bengal," Indian Journal of Agricultural Economics, Vol. 50(3) P. - 520, 1998
west Bengal has been consistent with the requirements of higher growth and redistribution of output in favour of labour.

Singh et.al. (1998)\textsuperscript{90} reported that the participation of women in crop operations was quite high ranging from 33 per cent of the total work force on small farmers to 26 per cent on large farmers. The trend of working hours remained almost the same with the decline of men labour days for collection of firewoods and decline of both men women labour days for tending cattle due to rise in the field owning to intensive and extensive cropping. Women continued to work 11 hours a day in both periods. The mechanization of ploughing and harvesting/threshing operations has lead to reduction in 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 on 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 status, the performance of West Bengal has been brought about both by efficiency and technology in the presence of variations across seasons and seed varieties.

\textsuperscript{90} Singh V.K. et.al., "Temporal Change in Participation in Different Farm and Non-Farm Activities in Haryana," Indian Journal of Agricultural Economics, 54(3) pp. 307-308, 1998

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 tonnes 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 tonnes by 2020. Food grains demand with 5 per cent GDP growth in the 2010 and 2020 will be 246 million tonnes and 294 million tonnes, respectively. Therefore the surging growth of demand for food must be met with largely through technological change in agriculture because of the limited option to expand the land area.

Kumar et.al. (2001)\textsuperscript{93} observed that form 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 Rajsthan 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 effect on the area allocation. Hence, concerted efforted should be made to increase the irrigation potential in the State.

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\item 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
\end{itemize}
Kumar et.al. (2002) observed that the rates of area under high yielding verities, area covered under soil conservation measures, supply of quality seeds institutional credit increase in area under 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 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. West Bengal recorded the highest food grains output growth in India during pre-reform period almost due to the highest growth of rice

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

95. Sarkar, Debnarayan et.al., “Growth crisis of Food Grains Production in West Bengal,” Agricultural Situation in India, LVIII (ii) pp. 511-516, 2002
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 Price 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)\textsuperscript{96} 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 resources.

Sujit et al. (2002)\textsuperscript{97} observed that the performance of agriculture 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 in equality 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 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

\textsuperscript{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

\textsuperscript{97} Sujit, K.S. et al., “Agricultural Production and Fertilizer Demand in India-An Econometric Analysis,” Agricultural Situation in India, LIX(4) pp. 167-175, 2002
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 biotechnology process, inputs like fertilizer, seed, etc. should be made available at reasonable rate, community hiring machinery centres 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 farmers.

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Gupta et.al. (2003) examined constraints of Pulses production and suggested adequate supply of certified seeds making available phosphatic and potassic fertilizer, varieties adopting to moisture stress and resistant to disease, support price mechanism, better marketing environment, etc. are required for expansion in area and output of pulse crops. Sekar, et.al. (2003) 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 system which are remunerative thereby production of total pulses and per capita availability thereof could be enhanced. With shrinking water resource 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.

Srivastava, et.al. (2003)\textsuperscript{102} concluded that the decline in the area under pulses is the main reason for decline in production highlighting the need of bringing more area under pulse cultivation. Improving the productivity is also very important to increase pulse production, as there was not much growth in pulse productivity during the study period.

Guledgudda, et.al. (2003)\textsuperscript{103} observed that the export share in the domestic fish production exhibited a fluctuating trend, but its share was lowest (1.64 percent) as noticed during 1997-98. The share of fishery sector in country's total outlays were not even throughout the various plan periods. The total fish production in India was 56.56 lakh tonnes comprising 28.33 lakh tonnes from marine and 28.33 lakh tonnes from inland fisheries during 2000-01. West Bengal occupied a first place in export both in terms of quantity and value, followed Orissa and Karnataka. Since the unit value of the marine output was high, the export earnings realised from fishery sector in total country's export and agricultural export earning showed a steady increasing and decreasing trend over a period of time. The compound growth rates of fishery sector were 8.95, 20.49 and 10.59 percent in quantity, value and unit value terms, respectively. The fisheries are important source of augmenting food supply, raising nutritional levels, generating more foreign exchange, employment opportunities and health for the people of India.


Navadkar, et.al. (2003)\textsuperscript{104} observed that in India, tremendous development has been witnessed through the successive Five Year Plans by developing the irrigation potential. Maharashtra, being a progressive State in the Country, has taken very active steps in the development of irrigation potential. The progress of the net and gross irrigated area was continuous in each decade over the year 1960. The irrigation potential created and facilities developed ever-since deserves a due credit in the sustainable development of agriculture in the State. During the year 2000-01, the irrigation potential created was to the tune of 49.02 lakh hectares, however it's utilisation was just about 34 percent.

Sree Lakshmi, et.al. (2004)\textsuperscript{105} observed that there are no dearth of resources in the country to take up the challenges and opportunities offered by the global trade. This global trade, in turn, benefits India to innovate, improve and compete, which is no longer ready to give concessions and reliefs under any conditions.

Sananse, et.al. (2004)\textsuperscript{106} observed that to know the annual change in the export of basmati rice, simple linear regression

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equation was fitted independently to the export data of quantity expressed value received at current as well as constant prices. It revealed that the per annum significant increase in the quantity exported during post-GATT period was 9.57 thousand. In term of percentage the quantity exported during post-GATT period increased significantly by 9.97 percent. The value received at current prices increased significantly by Rs. 175 crore per annum whereas at constant prices it increased per annum by Rs. 74 crore. In terms of percentage the value received increased significantly by 12.41 percent per annum at current prices whereas at constant prices it increased significantly by 7.52 percent per annum.

Deka, et.al. (2004) observed that the growth of production of banana has been mostly influenced by the growth of area rather than productivity. Further, it may be noted that land is a natural resource and the physical environment determines its availability. Therefore, expansion of area cannot be ascertained, as land is a limiting factor of production. Hence, it is very much essential to raise the productivity levels to meet the growing demand of banana.  

Rama Rao, et.al. (2004) observed that the production gains in groundnut were largely due to the expansion in area


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rather than the increase in productivity. The observed absence of growth in productivity was a result of lack of adequate technological progress and/or poor adoption of yield enhancing technologies. Also, the favourable price situation created through the technology Mission on Oilseeds resulted in expansion of groundnut to marginal areas thereby causing a decline in average yields. It is therefore needed to develop location specific technologies that enhance groundnut productivity.

Verma, et.al. (2004)\textsuperscript{109} observed that the area of banana has increased to 25.76 percent during last decade, while production has registered an appreciable shot up to 16,167 mt. This increase in production has been facilitated by improvement in productivity from 20.3 to 33.5 tonnes/ha. The banana industry is a very important source of income, employment and export earnings for major banana exporting countries, especially for developing countries like India. Research and development in the banana sector is needed to increase productivity and yields as well as to improve resistance of bananas to diseases and pests in order to reduce dependence on fungicides and pesticides use.

Sisodia, et.al. (2004)\textsuperscript{110} observed that the eastern Uttar Pradesh has maximum population density of 776 per sq. km (2001 Census) in the country. Therefore, it has alarming situation of


unemployment and poverty. It also faces chronic food insecurity at household level as considerable flock of the families of this region lacks purchasing capacity. Agriculture sector is biggest one, which accounts for about 56 per cent of total work force. Of the total increase in work opportunities during 1997-2000 as computed by the Planning Commission, New Delhi, the agriculture sector alone accounts for about 48 per cent. This implies that the agriculture sector is a major area of employment generation in times to come. Therefore, future agriculture policy of this region needs to be addressed in the context of increasing agriculture production in general and export oriented agriculture production in particular, employment generation and poverty alleviation.

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 farms 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 Variety (H.Y.V.) seed, chemical fertilizer, per unit of land does not necessarily bring about maximum possible output for a given set of inputs, nor does it only make 'best practice' relationship villages. It is necessary to provide institutional support to the farmers of technological

advanced 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)\textsuperscript{112} 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.

Kaur, et.al. (2005)\textsuperscript{113} concluded that total factor productivity has shown dismal performance in Punjab agriculture, since the eighties. It was negative in two districts during the eighties and in six districts during the nineties. The findings that output growth in all the districts and both in 1980s and 1990s has been quite significantly due to technological change having been adopted by the farmers but the contribution of technical efficiency was much lower and even negative in five districts during the

\textsuperscript{112} Seetharama, "Improving the in vitro availability of Iron from munga bean recipies," Indian Journal of Nutrition and Dietetics, Vol. 41 (1) pp. 1-7, 2004
\textsuperscript{113} Kaur M. and Sekhon M.K., "Input Growth, Total Factor Productivity and Its Components in Punjab Agriculture: District-wise Analysis," Indian Journal of Agricultural Economics, Vol. 60 (3) pp. 472-482, 2005
1980s and as many 10 districts in the 1990s suggests that the resource adjustments required for the adoption of technological changes have not been forthcoming. That is to say the more progressive the agriculture, the more inefficient it has become. This puts great onus on the research workers and policy makers to fine-tune both tops down and bottom up flow of information for generation, promotion and evaluation of specific technologies.

Tripathy, et.al. (2006)\textsuperscript{114} observed that 20.7 per cent of the farmers are affected by non-availability of seeds of desired variety. While 13.9 percent of the farmers are affected by higher prices of seeds, 8.7 percent are affected by unreliable quality, 7.1 percent are affected by transportation bottlenecks and 6.7 percent are affected by inadequate extension services.

The review of research papers form basis of the model used in this study and presented in the chapter on research method. The observations made in respect of the researches under taken by economists, on analysis of temporal changes or agricultural development, etc. 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.