CHAPTER II
A review of important work done on output behaviour and dynamics of land allocation of crops in foreign countries and in India is presented in paragraphs that follow.

We present the review of work done in two parts viz. (1) Studies related to dynamics of land allocation of crops and (ii) Studies related to output behaviour of crops.

(1) Studies related to dynamics of land allocation of crops:

Bowden\(^1\) (1955)

Conducted a study on "The wheat supply function" for the period of 1926-1952 for the United States. He employed a simple regression model using lagged adjusted price as the independent variable in studying farmer's responsiveness to price in the production of wheat. He found that the results were unsatisfactory with \( R^2 \) and that no statistically significant relationship appeared to exist between lagged adjusted price of wheat and acreage planted.

Cochrone\(^2\) (1955) 

Made a distinction between supply relation and supply. He studied supply relation in agriculture for different commodities and aggregates over the period 1920-30 in the United States with a view to estimate the relative elasticities of supply. The simple regression model was used by considering area planted under potato in current year as a dependent variable. Potato price deflated by index of price received for all crops for year (t-1) and year (t-2) weighted equally and yield per acre is current year as dependent variable. The result showed that the co-efficients of independent variables were significant.

Moundlak and Corkle\(^3\) (1956) 

Conducted a study on supply response in spring potato in California during the period 1929-1953 by using regression techniques. They took acreage as dependent variable and lagged price non-price relative profitability and lagged gross returns as independent variables. The conclusion derived was that late spring potato acreage in California depends on prices and return per acre for alternative enterprises as well as late spring potato prices.

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Nerlove (1956)

Has made a substantial contribution in the information and application of price expectation model to estimate acreage response for wheat, cotton and maize. He emphasizes that farmers specially react not to last year's price but rather to price they expect. The formulation that he explores is that farmers revise the price they expect to prevail in the coming year in proportion to the error they made in the preceding price.

Nerlove and Addison (1958)

They estimated long run and short run supply elasticities for twenty vegetables produced for fresh market in U.S. during the period 1919-1955 and the acreage has been taken as dependent variable. The result of supply analysis presented a wide range of coefficients of adjustment. The most significant finding is the reduction in the positive serial correlation in the residual of the estimated function.


Griliches (1960)

He conducted the estimation of the aggregate U.S. Farm supply elasticity using a relatively simple economic model. The supply of farm products was taken as a function of relative price, wealth, the state of technology and other variables. Real price of farm products is introduced as an additional independent variable. All variables are expressed as logarithm of the original value expected for trend. The analysis of the sub aggregate covers a long period 1911-1958 where as aggregate analysis is restricted to the 1920-1957 period. The results indicate that short run aggregate from output supply function is shifting to the right at a rate of about 1.6-1.7 percent per annum with shift accelerating some what in the more recent period.

Twenteon and Quance (1969)

Estimated the aggregate supply elasticity using direct least squares, separate yield and production unit. Components for crops and livestock and separate input combinations to compute the elasticity of farm output with respect to price received by farmers over the period 1921-1966 for the

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United States. The result of aggregate supply elasticity computed in this study falls in the 0-2 range. He further indicates that the supply elasticity is 0.10 in the short run and 0.80 in the long run for decreasing prices, but the supply elasticity is 0.15 in the short run and 1.5 in the long run for increasing prices.

Wiff and Bowalen (1969)

Evaluation the discriptive and predictive relationship of supply approach by deriving supply function from production function for individual firms for a few selected agricultural commodities for the United States over the period 1945-1954. The analysis suggested that output prediction obtained from the desired supply approach do not exhibit a consistent magnitude to direction of bias. Both usual observations and directly estimated supply equations show firms to be less responsive to price changes than indicated by supply elasticities derived from production functions.

Rajkrisna (1963)

He has conducted an analytical study of supply response for important agricultural commodities in the undivided Punjab.


(1913-14 to 1945-46). He uses adjustment lag models of Nerlovian type. The regression coefficients obtained show that acreage under crops, responds to price and that non-price variables, like relative yield, area under irrigation and rainfall have also an important influence on area under several crops. He found significant short-run (one year) elasticities in several cases.

Singh\textsuperscript{10}(1963)

Has conducted a study of the factors for shifts in groundnut acreage over the period 1962-63, for few villages in a single tract. He has given the notion that farmers in India are not motivated to a considerable extent by income consideration in adopting "cash crop".

Ramesh\textsuperscript{11}(1964)

He analysed a dynamic model for foodgrains production and price over the 1946-1960 period. He found that two models are significant. These models used the dynamic relationship between index of production in a year and index of price and index of production during the preceding year. Another model considered that production index is related to price indices during previous years.

\textsuperscript{10} Singh, H.S. "Factors of Shifts in Groundnut area". Indian Journal of Agricultural Economics, 26(1), 1972, pp.67-86.

Kahlon and Dwivedi\textsuperscript{12} (1965)

They examined the influence of wheat price and other factors like rainfall and time factor of acreage on wheat. Time series data from 1950-51 to 1961-62 were used for the regression analysis. They found that wheat acreage responds to change in the price of wheat in an insignificant way over the period of study. Cross elasticity of wheat acreage relative to gram price was significant at 5 per cent.

Kania Devi and Rajagopalan\textsuperscript{13} (1965).

Have also conducted a survey to examine the influence of relative price of groundnut and its competing crops on acreage in north Arcot district in Madras State over the period 1934-35 to 1961-62. The results show that increases or decreases of acreage of groundnut crop is inversely associated with the acreage under its competing crops.

Rao and Krishna\textsuperscript{14} (1965)

They have used several proxies to represent farmers':

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price expectations in their study on acreage response for wheat in Uttar Pradesh (1950-51 to 1962-63). The various prices proxies to represent price expectation included pre-sowing price, post-harvest price, lagged price and the post model price. They found that inference relating to acreage response change drastically with the change in formulation of price expectation models.

Krishna and Rao\(^{15}\) (1967)

Conducted a study with formulation of alternative price expectation models and response equation for deriving acreage response coefficients for wheat in Uttar Pradesh over 1950-1963 period. The results of study indicated acreage under wheat is fairly elastic to change in relative price of wheat and substitute crops. It was further indicated that the three year average of pre-sowing prices of substitute crops, along with the yield of wheat deflated by the yield of substitute crops and rainfall are the most important factors on acreage allocation among wheat and substitute crops.

Satya Narayan\(^{16}\) (1967)

He analysed the secondary data for the year 1950-1963


to identify and measure the impact of relevant economic variables on the acreage under sugarcane. The results indicated that mill price was attractive to the producers and there was significant regulation in cane supply to sugarcane factories. Also changes in acreage under sugarcane were associated with price of sugar as the price of Gur was more profitable than the price of their competing crop.

Shyamal 17 (1963)

Conducted a study to determine the extent to which area under production of jute was influenced by economic factors in West Bengal for the years 1952-53 to 1962-63. The result showed that for most of the year a rise in the area under autumn rice has been accompanied by a fall in the area under jute and vice versa. The variations in the area under autumn rice, however, do not completely off-set the variations in the area under jute. He also found that the price elasticity of supply was greater than the price elasticity of demand. Supply and demand both were found inelastic.

Subbarao 18 (1969)

He examined the acreage and output response to change in relative price of sugarcane in Andhra Pradesh. The study covers a

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period of thirteen years (1952-53 to 1964-65). It has been found that the change in relative acreage under sugarcane are positively associated with change in its relative price. The explanation for the variation in relative acreage improve then the lagged relative yield is included as another independent variable.

Sui and Kahlon 19 (1969)

Conducted a study to gauge the impact of price change on the farmer's decision to allocate land to different crops. The selected crops were wheat and gram for the period 1951-52 to 1965-66 in Punjab. The results were for the State as a whole. The response of wheat acreage to price was significant and the effect of price of Gram on Wheat was insignificant. The coefficient of yield per acre was significant at 5 per cent. The coefficient of price of competing crop was negative.

Kumar 20 (1970)

Studied the response of total planned production to price change on sugarcane. The study concentrates on three


districts in the Meerut division of Uttar Pradesh apart from the state as a whole. The district vis. Saharanpur, Musaffarnagar and Meerut have been selected because of their importance in sugarcane production and sugarcane industry and the period of study is 1951-52 to 1966-67. The study makes use of the "adjustment" model originally formulated by Marsc Harlove by using relative price with one year's lag only. The results are that the farmers in Uttar Pradesh respond momentarily and efficiently to relative price changes.

Maji, Jha and Venkataramanan\(^2\) (1971)

Conducted a study of dynamic supply and demand models pertaining to the major food grains in the Punjab regions over the period of 1948-49 to 1965-66. The study concentrated on the elasticity estimates. The dynamic models of supply used in this study are based on the generally accepted notion that the current decisions are influenced by experience relating to past decision. In this study with a view to obtain some idea regarding farmer's response to the variations in prices, the price variability variable has incorporated in the Nerlovian adjustment lag model. The results show that the short run elasticities with respect to price from different equations ranged from +0.108 to +0.669 in wheat, from +0.283 to 0.562 in Maize, and from +0.113 to 0.493 in rice crop.

Conducted an acreage response analysis with respect to relative price, yield per acre and rainfall for four major cereal crops and four major commercial crops grown in Tamil Nadu. He has employed production function similar to the one suggested by Mukherjee. The estimating equation indicates that the actual planted area of a crop in a given period is a lag-linear function of a constant term, six variables and an error term. The overall success of model in explaining the changes in the area devoted to the crops was judged from $R^2$. The empirical results found that the Tamil Nadu farmers in general seem to respond to relative prices, but the degree of response differs from crop to crop. The acreage elasticity estimates with respect to price are high when both dependent and competing crops are from the commercial crop group, and low when from the cereal crop group. The estimates of coefficients of yield per acre and cross yield per acre have the right signs in almost all the cereal crop equations. Among the cereal crops yield elasticity estimates were consistently higher than price elasticities. Possibly yield exerts a greater influence on groundnut acreage than the price. In the cotton equations an inverse relationship between yield per acre and acreage is suggested. Rainfall in the growing season is a significant factor in influencing the acreage under

rice and cotton, and negative relationship with sugarcane acreage. The results suggest that the transformation of agriculture in Tamil Nadu can not be brought about by price movements alone.

Comings\textsuperscript{23} (1975)

Conducted a study of farmer's responsiveness to eight crops. Number of economic social and political factors were considered. Morloviaty type of model was used to estimate the ultimate result. The response of cereals were higher than oil seed and fiber crops.

Vidya Sagar\textsuperscript{24} (1980)

He estimated the growth of productivity in India agriculture. The result drawn from the study was that in spite of an impressive increase in the use of fertilizers, HYV, as well as the irrigated area under crops, the share of pure yield effect in the total increased in productivity has not increased by more than ten per cent during the period of study.


Chopra, Kusum 25 (1982)

Conducted a study of Pulse Production in India. The study concentrated on production and area allocation of pulses in the country. The supply response model of Harlovian type was used in this study. The results of the study were drawn as in the state where pulse production declined, the area under pulses has shown a decline too.

Pujasaini 26 (1984)

He examined the production pattern, resource productivity and price responsiveness of rice, wheat, maize and sugarcane in the terai and hill regions of Nepal. He found that the area expansion was the main source of increased production for all crops.

Fertilizer contributed positively to crop production in both the terai and hill regions but its impact was stronger in farmer.

Price responsiveness for marketed crops (Sugar cane and wheat) was higher than for subsistence (rice and maize) crops.


Studies related to output behaviour of crops:

Agrawal\(^27\) (1954-55)

Determined MVP of land, bullock labour and human labour for farm business as a whole by fitting Cobb-Douglas function to the Farm Management survey data for the year 1954-55 in U.P. He observed a low MVP of human labour and bullock labour and came to the conclusion that any further addition would lead to a decline in the returns and the productivity of these resources. He suggested that resources should be increased with the increase in the level of the associated inputs.

Raj Krishna\(^28\) (1964)

Estimated the marginal productivities of land, human labour, bullock labour, expenditure on seeds, manure and fertilizers, the use of implements and interest on working capital and irrigation. The data were taken from the Studies in the Economics of Farm Management in the Punjab and pertain to the year 1954-55 to 56-57. By fitting Cobb-Douglas type of function to the data, he observed that the marginal value productivity of land was consistently


more than rent. The MVP of human labour in the first two years was less than the wage rates, but in the third year it was much higher than the wage rate. He concluded that the estimates of MVP were not widely out of line with acquisition costs.

Driver and Desai (1955)

Used regression analysis to determine the MVP of human labour, bullock labour and manure input for the districts of Ahmadnagar and Nasik with data collected by two methods, namely cost accounting and survey method. They could not draw any conclusion, because the regression coefficients were not statistically significant.

Nai! (1965)

Measures the productivity of various input factors by fitting a production function of Cobb-Douglas type for a sample of farms in Ankodia, village of Baroda District. The data were collected by the Agro-Economic Research Centre for the states of Gujrat and Rajasthan and pertain to the year 1960-61. He concluded that the MVP of standarized acres


was much lower as compared to the average per acre payment made by a tenant cultivator in Ankodia. The wage paid to the agricultural labourers however, were found to be considerably lower than the MVP of the wage paid labour.

Chenna Reddy\textsuperscript{31} (1967)

Fitted Cobb-Douglas function to study the production efficiency in South Indian agriculture. He used the data collected in 1957-58 by random sample from 10 villages of West Godawari district. He concluded that in a traditional and technologically stagnant agriculture farmers are aware of efficient use of traditional inputs. He suggested that a rapid and mass development in India can be achieved only by breaking through the traditional state of the arts and introducing modern technology consisting of new inputs.

Das\textsuperscript{32} (1968)

Dealt with the resource productivity of farms in the Sambalpur district of Orissa. He fitted a Cobb-Douglas type of production function to data on yield, human labour, bullock


labour, plant protection expenditure and expenditure on manure and fertilizers. He observed that some of the input elasticities of production were negative and other exceed unity, the former indicating that the MVP of some inputs was negative at all levels and the latter indicating increasing marginal product for these inputs. The trouble arose, because he had pooled the data relation to different high yielding varieties which had different performance characteristics.

Saini (1969)

Has fitted a regression analysis of Cobb-Douglas type to the dis-aggregated farm management data from sample farms in the two districts in U.P. and the Punjab during 1955-56 and 56-57. The data were collected by cost accounting method. This study evaluated the efficiency with which the farmers in U.P. and Punjab use their resources to achieve highest net returns on the farms. The variables used in the analysis were land, human labour, bullock labour, manure and fertilizers and irrigation expenditure. He concluded from his results that land and human labour were the important inputs to which output was highly responsive in the agriculture of these

regions. He found constant returns to scale in both the regions.

Sankhyan and Sirohi\(^3^4\) (1971)

Have fitted the Cobb-Douglas production function and the quadratic production function to the farm data of Himachal Pradesh. However only Cobb-Douglas type function could be selected for economic and statistical considerations. The input factors used in the equations were land, human labour, bullock labour, seed quantity, expenses on manures and fertilizers in rupees. The results obtained from the regression analysis were constant returns to scale. Farms under potato were found to allocate their resources optimally but in the case of maize farms a possibility of re-allocation of resources was discovered.

Chapagain, D.P.\(^3^5\) (1983)

Conducted the study of productivity pattern of major food grains. This study attempted to provide more information about the use of different inputs and their relative


shares in agricultural production, as well as the growth trend of agricultural output and changes in the productivity level, nationally and among regions, over time. During the period of 1961-1974 Nepal's Production of major food grains increased at the rate of 1.35 per cent per year, total factor productivity remained virtually constant in earlier years but improved slightly in latter years.

George, Kurian and Chand-Mohan (1983)

Reported that factors combinations and factor shares in agriculture depend on a number of factors such as resource endowments of the region, the type of crops grown levels of technology used etc. The method of factor proportion in the total cost of production and their shares in the total value of output and its determine how these shares vary among the different regions and to indicate the reasons thereof was carried. In all the study regions the share of labour has significantly increased over the years partially due to higher wages.