INTRODUCTION:

In a predominantly agricultural economy, the overall rate of growth of the economy depends, to a very large extent, on the rate of growth in agriculture. In India, achievement in the agricultural sector will continue to be a determining factor in the achievements of plan targets for many years to come. The success or failure of programmes of agricultural development, in turn, depends decisively on the way farmers react to such programmes, because it is ultimately the farmer with whom rests the final decision concerning the allocation of land and other resources for particular crop enterprises.

One can think of several measures of public policies, which can directly or indirectly influence farmers' decisions. In a free market economy price policy could be considered as one of the potent instruments to affect farmers' decisions regarding resource allocation. For example, while commenting on Mellor's "Towards A Theory of Agricultural Development"¹, Theodore W. Schultz emphatically states,

Since there is as yet no known way of organising and integrating the production activities of numerous farmers among each other and with rest of the economy except by system of prices, the requirements of an efficient system of prices should have been high on the agenda².

¹ John W. Mellor (I-58). The numbers in the parentheses here and in the subsequent chapters denote the serial numbers of the reference work listed in the bibliography of the articles and books given at the end of the dissertation.

² Theodore W. Schultz (I-79).
Many economists agree with Schultz, though in varying degrees, on the role which prices can play in accelerating the rate of development of agriculture.

A positive price policy as a part of growth policy, according to Raj Krishna, has three important functions: (1) to accelerate the growth of agricultural output as a whole, (ii) to accelerate or decelerate the growth of output of individual crops or, in the context of planning, to steer the crop-mix according to targets; and (iii) to secure adequate increases in the marketed supply of food crops in countries where a large part of output is retained by the peasants for home consumption. In India, as a consequence of rapid technological changes which are taking place in agriculture, the relative profitability position of different crop enterprises is undergoing significant changes which, in turn, may necessitate the use of price policy for steering the crop-mix according to targets. However, for making the price policy an effective instrument for inducing desired changes in resource allocation to different crop enterprises, the knowledge of how farmers react to different price changes is essential.

The degree of price responsiveness is basically an empirical question. There are, however, well known and serious difficulties in measuring the degree of responsiveness of

3 Raj Krishna (I-45)
producers to price changes. They arise mainly due to the
difficulties in approximating theoretical formulations of
functional relationships to observed real world situations.
These difficulties are further compounded due to the time lag
between changes in production capacity and changes in output.
Inspite of these problems, the phenomenon of price changes of
agricultural commodities and its impact on supplies of these
commodities has been a topic of investigation in several studies\(^4\),
in the recent past.

Due to time lag between changes in agricultural
production capacity and changes in output, in any attempt to
measure the price responsiveness, the functional relationship
should ideally be worked out between planned output and expected
prices\(^5\). However, due to discrepancy between planned and realised
output and non-availability of any kind of data about planned
output except acreage under particular crop have forced the
workers in the field of supply response, to treat acreage (planted
or harvested) as a proxy for planned output. On the other hand
the necessity of using expected prices has, in turn, given
rise to many postulates about the ways in which farmers formulate

\(^4\) See for example J. Krishna (I-141), Jai Krishna and M.S. Rao
   (I-49), Dharm Narain (II-24), N.C.A.E.R. (II-25), Nerlove
   (II-26), Falcon (I-19), Behrman (II-2).

A review of some of the price supply response studies,
particularly for underdeveloped countries, is attempted
in chapter II.

\(^5\) The farmers are required to commit a sizable amount of inputs
at the beginning of crop season to various crops, the
output of which will come after the end of the season
i.e. he is required to plan on the basis of the prices
which he anticipates to get for the crop products at the
end of the crop season.
their expectations about the future prices.

In formulation of dynamic models, economists have to often consider expectations about future economic variables and in developing their theories are required to hypothesise how these expectations are formed. Formation of expectations about prices is of considerable relevance in the stability of market equilibrium. By now Nerlove's reformation of Cagan's adaptive price expectation model has become a standard tool for estimation of supply functions. As is well known the adaptive expectation hypothesis implies that expected price at time t is the geometrically declining weighted average of all past price changes. Though this model has been widely used in supply responses studies, its validity has never been verified by investigating whether farmers in actual life form their expectations about future prices in the way implied by the model. The formation of price expectations has not been directly investigated into systematically in India though the need to do so has been highlighted by many workers. This is most unfortunate because the most frequently advanced hypotheses are often only

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6 For example see John F. Muth (I-64) and Kenneth J. Arrow and Max Nerlove (I-36)
7 Marc Nerlove (II-26)
8 Cagan Philip (I-7)
9 The need for empirical studies designed to find out how farmers form their price expectations was also stressed in group discussions at the 24th annual conference of the Indian Society of Agricultural Economics in 1964, See P.P. Dutta (I-17), also see Marc Nerlove (I-65)
conjunctures and their merits can be adequately considered only by direct empirical analysis. In fact, very little is known as to how farmers actually formulate their decisions in response to changes inherent in the economic environment in which they operate. The answer to the question as to how expectations are formed is important since parameter estimates are likely to be biased towards zero if wrong variables are used as expectations in supply functions.

Almost all the studies pertaining to the price responsiveness of Indian farmers have been carried out at macro level and are in the nature of statistical analysis of time series; the latter, in turn, forced the earlier investigators firstly to take very long periods and secondly to assume that expectations had been formed in the same way during the entire period covered by their studies. The use of macro level data made it obligatory for researchers to assume that all the farmers within the area covered by a particular study necessarily expected the future prices to move in the same direction. On the other hand whatever little empirical evidence about farmers' expectation of future prices in the other countries is available suggests that there are sizable cross sectional differences in the price

11 All the studies except the two by Gupta and Majid (II-10) & Chandresh Kumar (I-43), make use of State level data. These two studies use district level data.
expectations of different farmers.\textsuperscript{12}

Problem:

By now the volume of empirical facts that have been collected to measure the price responsiveness of the farmers is truly impressive and consequently one may find evidences in support of positive, negative and of non-response hypotheses, without difficulty. What is, however, still conspicuously missing is the enquiry into the nature and basis of farmers' expectations, and a general analytical framework which will link together various facts, reconcile the apparent contradictions, and provide a satisfactory bridge between cross-sectional findings about the expectations and the findings of aggregative time series analysis about price responsiveness. The present work is an humble attempt in this direction.

Objectives:

The study has been conducted with a view to exploring the possibilities of building up models of farmers' expectancy behaviours by carefully analysing the nature and basis of farmers' future price expectations and for using these models for generating expected prices which could be used explicitly for finding functional relationships between expected prices of a crop and the acreage allocated to that crop. The main

\textsuperscript{12} Studies by D.B. Williams (I-99) and W.F. Williams (I-100) clearly show that different farmers anticipate prices in different ways. Also see, E.O. Heady (II-11).
objectives of the study are:

1. To study the nature of farmers' future price expectations.
2. To develop mathematical models for estimating expected future prices from the past observed prices.
3. To test the validity of these models.
4. To study the influence of some of the socio-economic variables on expectations behaviour.
5. To examine the feasibility of using explicitly expected prices in order to discover the extent to which allocation of land to different crops is affected by price changes.
6. To compare the results about price responsiveness obtained by using the models developed in this study with those obtained by using Nerlovian adjustment model and other similar models.

The first objective of the study will throw light on how farmers form their expectations about the future prices on the basis of their imperfect knowledge and what role uncertainty plays in the formation of these expectations. Along with other relevant information it will also provide the basis for building up the mathematical formulations of expectancy behaviours. How near are the expected prices generated from our models of expectancy behaviour to the expectations of future prices actually held by the farmers (in other words, the predictive validity of these mathematical models) will be indicated by the
third. The last two objectives will show that difference one gets in the estimates of supply response when expected prices, generated with the help of extrapolative expectancy models are used in finding the functional relationships between expected prices and acreage shifts, in the place of some adaptive expectation models.

A few relevant hypotheses for each of the objectives mentioned above are spelled out at appropriate places in the discussion. An attempt will be made to verify these hypotheses in a systematic way.

**Methodology:**

In the following pages a detailed description of the procedures adopted to achieve the objectives of the study is being given. However, the description is not complete and exhaustive in the sense that the limitations arising from any particular procedure followed and merits and demerits of a particular procedure vis-a-vis any other alternative procedure do not form part of the present description, although, these have been pointed out and highlighted at the relevant places in the subsequent chapters.

(1) **Data Required:**

The objectives (1) to (3) call for data pertaining to prices expectations, variables entering into the formation of expectations and, the way the effect of different variables is
aggregated to arrive at expected prices. The fourth objective requires, in addition to the above, data about some socio-economic variables such as operational holding, family size etc., which might be expected to have some bearing on the formation of expectations. In addition, information on land use pattern and actual prices of different agricultural products is needed for the objective (5).

Of all the above data, the data pertaining to expectations are rather difficult to collect as expectations are neither fixed nor precise in nature. However, for the present study data pertaining to expectations have been collected by conducting a survey of farmers' expectations about the future prices. In addition, data pertaining to some socio-economic variables have also been gathered in this survey.

(ii) Selection of Sample:
(A) Area:

As stated earlier, the main purpose of the study is to analyse the impact of farmers' expectations about future prices on acreage shifts. In the selection of the area for a study which attempts to find the effect of one single shifter variable on acreage shifts, the choice would certainly fall on an area in which all other shifter variables have either been constant or the changes in them have been minimum. It has been found in many studies that weather conditions and more particularly
rainfall in the pre-sowing months affect the shifts in acreage under different crops most significantly. Similarly, improvements in the marketing facilities for a crop have been found to have significant associations with the increase in acreage under that crop. Further, it has been observed that changes in communication (transport) facilities also affect acreage shifts. Therefore, a suitable area for a study of the present type would be one in which (a) there is fairly assured irrigation and/or rainfall, (b) there has been no structural change in the market in favour of any particular crop, (c) either the transportation facilities have not changed or the main crops of that area are such that changes in transportation facilities would not materially alter the relative profitability of different crops. Further, the objective of studying supply elasticity of the competing crops calls for selection of such area in which the two main crops of the area really competes with each other for land.

The Meerut district in Western Uttar Pradesh satisfies most of these requirements. The district has a net work of canals assuring perennial irrigation. In fact 76.5 per cent of the net area sown is irrigated. In the last one and half decade there has not been any significant change in the marketing

13 See Dharm Narain (II-24)
14 See Meenakshi Malya M. (I-57), also other papers presented at the 22nd annual conference of the Indian Society of Agricultural Economics.
15 Figures pertain to the year 1966-67 (Source: Office of the District Agriculture Officer, District Meerut).
facilities or transportation facilities either in favour of wheat or in favour of sugarcane, the two principal crops of the region. Wheat and sugarcane are grown on land which is by and large equally suitable for cultivation of both the crops and, this feasibility of interchangability of the area under these two crops places them in a situation in which they really compete with each other for land. The data for the present study has been collected from the Garhmukteshwar block of this district.

There have been two important considerations in favour of selecting Garhmukteshwar block: (i) so far (upto the time of the survey) consolidation of holdings has not begun in this block. This was considered to be a favourable point because when consolidation work starts, in the transitional period, i.e., till the consolidation proceedings are over, the farmers start losing their interest in maintaining the soil fertility of their plots as they are not sure as to who will be their owners after the process of consolidation is over. Due to this uncertainty, the acreage of crops in which ratooning is possible i.e. sugarcane, is adversely affected. (ii) the proximity of the block to the Hapur market, a very important marketing centre of the region, is a very great advantage, in that prices of different agricultural products at different times were readily available.
(B) Villages:

From the Garhmukteshwar block three villages namely, Khilwai, Dotal and Janupura were purposively selected. Familiarity of the author with these villages has been largely responsible for their selection. It is safe to assume that if one is fairly acquainted with farmers from whom he is to collect data of the type as used in this study, he is likely to get a better response.

(C) Farmers:

In the selected villages complete census of cultivating households was taken. From each village 30 farm households were selected at random. Hence, the study is based on the data pertaining to the 90 farmers selected at random from the above stated villages. It was decided to interview only that person from a selected household, who took entrepreneurial decisions. If in a selected household more than one person made entrepreneurial decisions than that person was interviewed whose decisions might be affecting most the agriculture production plans i.e. whose decisions are given more weightage or who actually controlled the agriculture. In most of the cases it was head of the household but in some cases the decision-maker was different from the head of the household.

(iii) Data Collection:

Data pertaining to socio-economic variables such as operational holding, family size, education etc. and also about
the future prices expected by the respondents, were collected by canvassing a comprehensive and well structured schedule. The schedule could be divided into three parts, each part dealing with a particular category of information.

(1) **Part One**: In this part information pertaining to demographic details of the family, land and land use pattern for the previous three years, and details such as total output, quantities of different crops marketed, period of sale and the prices at which sold for the previous three years was collected.

(2) **Part Two**: In this part information on the actual and expected relative profitability position of wheat vis-a-vis sugarcane in the previous year and in the coming year, expected prices, most likely price and the subjective probabilities attached to each individual expected price was collected.

(3) **Part Three**: In this part there were questions seeking information about the ways through which the farmers had arrived at the expected price. Obviously, this part could not be made completely structured though the main question around which the respondent was to be probed, were provided in the schedule.

Thus, the information pertaining to expectancy behaviour of the farmers was collected by interviewing the farmers. In the interview with each selected farmer an attempt was made to know as to how he had reached or how he would react to a
variety of possible situations exemplified by different permutations and combinations of the variables and their direction and magnitudes which form the basis of his expectations. Details of these interviews were noted down in the schedule. A copy of the schedule used for data collection is being given in the appendix.

The questions pertaining to expected future prices must be precise and clear about three things viz., the time period, market and, the grade or quality of the product to which the expected prices relate; otherwise the answers to these questions may remain somewhat ambiguous. In the first set of questions in the schedule about expected future prices the latter two i.e. market and the grade of the commodity were not specified at all and the farmers were asked to indicate their anticipated prices for the coming year; again, the exact time period i.e. the month or week was not specified. However, in the end the farmers were asked as to which time period, for which market and to which grade of the commodity their expectations were related. The plan was that if any farmer reported expected prices for a period other than June - July 1970 for wheat and January-February 1971 for Gur, or if the expected prices were for a market other than Garmukteshwar market or if did they not refer to the average grade of the commodity, the same set of questions
pertaining to expected future prices were once again put to the respondent, this time with the specifications of time, market and grade. However, the need for repetition did not arise as all the farmers gave expected price on the first occasion itself with the same specifications of time, market and grade of the product.

The detailed survey for the study was conducted in two rounds. First round of enquiry was conducted in February - March 1970. The period was specifically chosen because the sowing period for sugarcane, the most important cash crop of the area, begins from the latter half of March and the expectations about the future prices held at beginning of the sowing period plays a crucial role in the decisions about acreage allocations. The second set of data pertaining to expected future prices for wheat and gur (Jaggery) for June - July 1971 and January - February 1972 respectively were collected in the last week of February 1971.

Data on Land Use Pattern:

The time series data of plot-wise land use pattern for the selected farms was collected from three different sources. For the reference year i.e. 1969-70, the data was collected from the selected farmers in the schedule canvassed for collection of data pertaining to expected prices. For the two preceding years i.e. 1967-68 and 1968-69 it was collected from the revenue...
records of Patwari and for the earlier 12 years it was collected from the old Khasra records kept at the tehsil headquarters. In this way time series data of plot-wise land use pattern for 15 years in respect of each selected holding was gathered.

Data on Prices:

Time series data of monthly prices of wheat and gur for a period of 17 years starting from January 1954 to February 1971 were obtained from two different sources. Data pertaining to 6 months i.e. from October 1970 to February 1971 have been taken from weekly Bulletins of Prices published by the Directorate of Economics and Statistics, Ministry of Food, Agriculture, Community Development & Cooperation, Government of India, New Delhi and for the rest of the period i.e. from January 1954 to October 1970 prices have been taken from the Monthly Bulletin of Agricultural Statistics published by the Economics & Statistics Directorate of the Government of Uttar Pradesh. The Prices taken are the wholesale prices of these commodities at the Hapur market in different months of the reference year.

Analysis:

For studying the nature of farmers' expectation of future prices mainly tabular analysis has been used. However, in

16 Patwari. Village level land revenue official, who maintains land records.

17 Khasra. In village Khasra register field numbers are serially given against which Patwari record the crops grown in different seasons in every year.

18 Tehsil. The revenue administrative unit comprising of a group of villages.
addition to the method of comparison of frequencies in different cells, \( x^2 \) test has been used to test various hypotheses pertaining to the nature of farmers' expectations of future prices.

The answers recorded during the course of interviews with the farmers for knowing their expectancy behaviours have been analysed with a view to determining :-

(i) Variables entering into the formation of expected future prices.
(ii) Relative importance of these variables.
(iii) Method of aggregation of effects of different variables. Aggregation procedures adopted in different situations depended on the magnitudes and direction of the different variables.

On the basis of this analysis, farmers have been classified into different expectancy group, and, then, functional relationship between the expected future prices and the variables entering into the formation of these expectations are developed for each expectancy group in such a way that the coefficients of different variables assumes the values as found in (iii) above.

19 The basis of formation of expectancy groups has been discussed in detail in Chapter VI.
The predictive validity of the models developed in this study have been tested by examining the difference between the expected prices generated from the models and the expected prices actually stated by the farmers during two rounds. If the difference between the two, the expected price generated from the model and the actually stated expected prices was found to be statistically insignificant the predictive validity of the model was taken to be established.

For measuring the degree of price responsiveness functional relationship between the expected future price and the acreage under that crop has been established. Adjustment lag models and autoregressive linear regression models have mainly been used for estimating the price elasticity of supply. In all the different types of functions used in the study expected prices estimated from the expectation models have been used explicitly as independent variables. All the different functions have separately been estimated by least square procedure for each expectancy group and the elasticities of supply response have also been calculated separately for each expectancy group.

To compare the results of the two approaches of estimating supply response, one using expected future prices and the other using actual realised price of some previous period, the elasticities of supply response have been estimated from different functions using both the types of prices, viz., the
expected generated from model developed in this study and those calculated from models 'commonly' used in supply response studies. For the latter purpose two different types of price specifications have been employed * viz., (i) Farm harvest price lagged one year (ii) average of the three years prices, in the pre-sowing months. Finally, attempt has been made to find unbiased and consistent estimates of supply elasticities on the basis of expected prices generated from the models developed in this study by estimating supply functions of the different expectancy groups jointly through generalised least squares estimation procedure²⁰.

The Plan of the Study:

The study has been divided into nine chapters, each of which discusses one specific issue. A brief resume of each chapter is given below:

Chapter I: Introduces the problem under investigation, specifies the objectives of the study and the methodology adopted for the study.

Chapter II: Critically surveys the existing literature on farmers' expectation behaviour and price responses, and points out the important gap therein.

Chapter III: Introduces the area from which the farmers are selected and presents demographic, social and economic profiles of the selected farmers.

20 Aitken (I-1)
Chapter IV: Analyses the prices of wheat and sugarcane in the sixties, specially the variations over the years and fluctuations within a year.

Chapter V: Examines the nature of farmers' expectations of future prices and attempts to bring out common points in them.

Chapter VI: Analyses the expectancy behaviour of the selected farmers and shows how the weightages given to different variables change with changes in their magnitudes and directions.

Chapter VII: Develops mathematical formulations (models) of the expectancy behaviour and examines the predictive validity of these models and identifies socio-economic correlates of expectancy behaviour.

Chapter VIII: Estimates the supply elasticity by using the expected prices generated from the developed 'expectancy' models; and compares the estimates of supply elasticities worked out by using expected prices with those estimated by using prices in some previous periods as proxies for expected prices.

Chapter IX: Brings together the important conclusions that can be drawn from this study.