INTRODUCTION

'The landscape we see today is a collection of the legacies from the past ..... It has become what it is and it is usually in the process of becoming different .... Let us then not study a static picture but a process that is continuing and seemingly never ending' (Darby, 1967, p. 36 and 41). The same is true of the agricultural landscape and for that matter, of the agricultural land use of an area which is constantly changing with time. The present is an ultimate outcome of the past. Therefore, for a comprehensive understanding of the existing patterns of land use, a look into the past is imperative. However, this does not mean that one should get lost into the tracing of origins of various phenomena. But going into the past upto the extent it is helpful in understanding the present is inescapable. It provides a more comprehensive and multi-dimensional view of the present. It brings to light the trends and problems of agricultural land use more explicitly and offers a better framework for rational planning of our agricultural land which is vital, limited and is coming under greater and greater stress.

Agricultural land use in the Bist Doab recorded continuous changes during the past. But the changes which took place in it during the last few decades coinciding mainly with the planned development era of the country are most conspicuous and faster. At the beginning of this period in 1951, the Bist Doab had 58.1 per cent (529, 872 hectares) of its area under net cultivation which rose to 79 per cent (710, 256 hectares) by 1980. This increase of 21 per cent (180, 384 hectares) in net area sown during a span of 30 years is largely the result of the reclamation of culturable waste land and extension of regular cultivation on fallow land. As a result of this change, almost all
the potential lands of the region were pressed under the plough. The cropping pattern of the Bist Doab experienced remarkable change during the study period. Crops which became more remunerative in due course of time established their supremacy over the less remunerative ones. Extension of irrigation, introduction of improved and high yielding seeds in selected crops and creation of assured market for them, use of chemical fertilizers, insecticides and weedicides, and mechanization of farming largely brought these transformations. The development of irrigation, in fact, played a key role in extending the frontiers of cultivation and in transforming the cropping pattern of the Bist Doab. The net irrigated area in the region increased from 39.6 per cent (209,640 hectares) in 1951 to 63.3 per cent (449,552 hectares) in 1980. In terms of absolute hectarage, it doubled during the same period. Not only expansion but irrigation recorded intensification. Modes of irrigation witnessed almost total change. The Persian Wheel wells were replaced by more efficient, power operated tube-wells and pumping sets. Their number shot up from 20 in 1951 to 76,016 in 1980. A major share of the increase in irrigation in the region was brought by these means. Introduction of the Bist Doab canal system too played its part in this regard. Improvements in agronomic practices, mechanization of farming, increase in yields and corresponding increase in capital with the farmers are the other important changes which took place in the region during the study period. However, the changes in and the prevailing patterns of agriculture strikingly vary from area to area within the Bist Doab. The analysis of such variations is of special interest to geographers. Not only at the regional level, spatial variations in agricultural land use do exist even at local level. Out of a set of explanatory variables
operating at micro level, distance is the most important. A German farmer J.H. Von Thunen was the first person who investigated the role of distance in spatial location of agricultural activity in the city-region context in 1826. Since then a number of scholars tested this concept at different scales in different parts of the world. The purpose of the present study is to: (i) investigate the areal variations in the changes in agricultural land use in the Bist Doab during 1951-80, (ii) examine the spatial patterns in agricultural land use at the end of the study period in 1980, and (iii) analyse the role of distance from the market town, the village settlement and the source of water (tube-well) in the spatial organization of agriculture. In addition, the problems and potentialities of agricultural land use have also been explored.

The Study Area

The present study pertains to the Bist Doab*, which constitutes an east-central part of Punjab state of India (Map 0.1 and 0.2). The region is bounded by the Beas river in the west and the Satluj river in the south (Map 0.3). The Katardhar range of Shiwalik hills makes its eastern boundary. It is roughly triangular in shape and encompasses the Hoshiarpur, Jalandhar and Kapurthala districts of the state. Extending from 30° 57'N to 32° 05'N latitude and 74° 57'E to 76° 31' E longitude, it constitutes 17.8 per cent (8920 square kilometres)** of the total area of Punjab. With nearly four-fifths of its area under net cultivation and more than three-fourths of its

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* Bist Doab refers to an interfluvial tract of the Beas and the Satluj rivers. The word Bist was coined by combining the first two alphabets of the old names of each of the two rivers. Doab is a Persian word. It is a combination of two words - Do meaning two and ab meaning waters or rivers. Thus the land between two rivers is called Doab.

** Statistical Abstract of Punjab, 1980.
people engaged in agriculture, the Bist Doab is predominantly an agricultural region. This region, similar to the state of Punjab, experienced significant changes in its agricultural land use since Independence.

**Previous Investigations**

The study of changes in agricultural land use of the Bist Doab as an individual region and as a part of the state, evoked the interest of a number of geographers. The first attempt in this regard was made by Gosal and Ojha (1967). The authors made a detailed geographical study of the changes in agricultural land use of Punjab during 1951-61. On the basis of assessment circle-wise data, they analysed the changes in land use, cropping patterns and irrigation in the state during the first two Five Year Plans. Singh (1975) did a similar but more extended and elaborate work on Punjab. He furnished a detailed geographical analysis of the changes in land use, irrigation, cropping pattern, size of landholdings, land tenure system and livestock patterns during the first three Five Year Plans. He also studied the changes at village level by taking case studies of a few villages from different agricultural regions of the state. Another noteworthy work on Punjab was done by Randhawa (1974) in which he studied the impact of Green Revolution on the people of the state. He highlighted the role of various economic, social, human and technological variables in the development of agriculture. All the above mentioned works, however, deal with Punjab as a whole. The Bist Doab, which forms a part of Punjab could not be brought under exclusive focus in these studies. Singh (1979), however, devoted his attention exclusively to the Bist Doab. By taking 360 randomly selected sample villages, he scrutinized
the changes in agriculture in the region during 1951-68. He also took a few villages as case studies to explain the agricultural location in relation to market. Mehta (1970), too conducted her study on the Bist Doab. Her work, however, deals with demographic changes in the region during 1951-61. The present study deals exclusively with the Bist Doab, whereas earlier scholars, barring few, focussed their attention on the state as a whole. Secondly, it aims at the exploration of the changes in and existing patterns of agricultural land use at macro (assessment circle), meso (village) and micro (farm) levels, whereas the studies conducted earlier investigate these aspects mostly at the first two levels. Thirdly, it extends over a longer time span than the previous studies. Thus, this study is more exhaustive and up-to-date than the previous attempts.

The Approach

Studies in agriculture are not the exclusive concern of geographers. Economists, agricultural scientists and historians too study agriculture. The approach of each of them, however, is different. An economist confines himself to the study of production, consumption and distribution of agricultural commodities and prescribes the means of maximizing profits with given inputs. An agricultural scientist studies various aspects of agriculture, such as agronomy, plant pathology, entomology etc. as a phenomenon per se. A historian concentrates upon the development of agriculture through time. But an agricultural geographer is always concerned with the study of spatial variations in agricultural phenomena. Even when he has to study the temporal trends in agriculture, he does so through the element of space. Therefore, his focus is mainly chorological rather than chronological.
Period of Study

The period selected for the present study extends from 1951 to 1980. It coincides with the first five 'Five Year Plans' and five Annual Plans of Independent India. This is the period during which agriculture, not only of the Bist Doab but of the whole of Punjab, recorded momentous changes.

The country as a whole attained self-sufficiency in the production of foodgrains during this period. The selection of 1951 as reference year has relevance, since it marks the beginning of the planned development era. However, the process of agricultural development remained slow during the first three Five Year Plans. Major emphasis during 1951-1966 was laid on stretching the base of irrigation and cultivation. Check on floods, reduction in waterlogging, enactment of various land reforms etc. were ingredients of agricultural strategy during this period (Singh, 1975). The process of development was ignited with the introduction of Green Revolution technology during mid-sixties.

The year 1966 is considered a break-point in the agricultural history of the region and it roughly divides the study period into two halves: the pre-Green Revolution period, extending from 1951 to 1966; and the post-Green Revolution period, stretching from 1966 to 1980. The latter half is characterized by phenomenal development of agriculture with greater emphasis on its intensification. Greater use of high yielding varieties of seeds, distribution of chemical fertilizers on credit, adoption of scientific methods of farming, provision of liberal loans and extension services, construction of village link roads, extension of better marketing facilities, electrification of villages and establishment of agro-industries are some of the special features of this period which especially accelerated the development of agriculture. The choice of 1980 as a terminal year, however, is simply governed by the availability of up-to-date data at the time when this work was undertaken in 1981.
Sources of Data

The present study relies upon secondary as well as primary data. The secondary data concerning irrigation, land use and cropping pattern were personally collected from the revenue records available at various tahsil and district headquarters. Such data are recorded in registers known as lal kitabs, which are maintained by individual villages, assessment circles, tahsils and districts. For the present study, only assessment circle-wise and village-wise kitabs were used. The primary data concerning field-wise location of crops in selected villages were taken from the khasra girdawri available with the concerned patwaris (village level revenue officials). Field maps (Shajras) of these villages were also procured from the same officials. Selected farms were marked on the village maps through personal visits to the chosen villages. Some additional data regarding number of tube-wells, pumping sets, tractors, implements etc. were taken from the office of the Director of Land Records stationed at Jalandhar. Besides, District Statistical Abstracts published by the Economic and Statistical Organization of Punjab and the District Census Handbooks brought out by the Punjab cell of Census of India, were also consulted.

The data used in the present work are fairly reliable as the entries in revenue records are based on figures provided by the patwari who himself surveys the village allotted to him and is well acquainted with the ground realities. Likewise, the primary data generated through intensive field work is dependable.
Methodology

The present work was conducted at three different spatial scales: (i) the assessment circle*, (ii) the village, and (iii) the farm.

For the first level analysis, the requisite data were collected for all the 35 assessment circles of the Bist Doab (Map 0.4). The gathered data were then processed and mapped. Choropleth technique of mapping was used, for it portrays the spatial variations more clearly. An average of data for three successive years at any point of time was used to avoid anomalies created by year to year fluctuations in weather. That is, the average of the data for 1950, 1951 and 1952 was taken to represent 1951. Similarly, the average of 1965, 1966 and 1967 represented 1966 and that of 1979, 1980 and 1981 was used to represent year 1980. Maps were made comparable by using the same class interval and same number of categories for 1951, 1966 and 1980. While making categories, mean and median values of series of data were taken into account. The patterns which emerged on maps were analysed. The analysis, of course, was supplemented with simple quantification and empirical observations. This level of study dealt with regional variations in the changes and existing patterns of agricultural land use. Regionalization of agriculture in the Bist Doab was also done at this level.

An assessment circle, however, is a fairly large unit. The study conducted at this level failed to bring forth the role of a number of other variables which operate at the level of a village and a farm. Among these,

* An assessment circle is a group of about hundred villages which have sufficient homogeneity of agricultural productivity so that all of them could be uniformly assessed for revenue collection. There are 35 such circles in the Bist Doab.
distance is one and the most important. Its role on spatial location of agriculture with respect to market city, village settlement and the source of water was investigated. Statistical techniques such as percentages, correlations and some measures of dispersion were employed for the purpose. Apart from maps, a number of graphs and diagrams were prepared wherever needed.

Organization of Material

This study has been organized into seven chapters. Its first chapter deals with the physico-socio-economic background of the study area. Such an account is a pre-requisite for proper understanding of agricultural land use and changes therein. Second chapter is devoted to the study of irrigation. It has played a key role in the transformation of agricultural land use and cropping patterns in the region. The changes which took place in this element of agriculture during 1951-80 along with its existing patterns have been discussed in detail in this chapter. The study of spatial variations in changes in various land use categories and in their prevailing patterns has been the subject matter of third chapter. It brings forth the resource base for agriculture in the region. The analysis of changes in and existing patterns of crops raised in the Bist Doab has been brought under focus in the fourth chapter. In fact, cropping pattern is the central element in any study dealing with agriculture. In the fifth chapter, an attempt has been made to divide the Bist Doab into agricultural regions. Synthesis of individual elements of agriculture into agricultural regions perhaps is the major task of a geographic enquiry. Case studies of a few villages have also been included into this chapter. The study of spatial organization of agricultural land use around towns, village settlements and tube-wells has been taken up in the sixth chapter. This
part of the work aims to test the role of distance from the market city, village settlement and source of water in the spatial location of agriculture. The seventh and the last chapter presents a summary of conclusions drawn from the study.