SITUATION

Situated in the northwestern part of India, Punjab, with 81 per cent of its total geographical area under cultivation, 63 per cent of its working force engaged in agriculture and nearly 62 per cent of its gross income derived from this sector of economy, is agriculturally the most progressive and prosperous state of the country (Map 1). With the largest amount of food surplus in a country of acute food shortages, Punjab is rightly designated as the bread basket of India. Agricultural health of the state is vital not only to its own prosperity but also to the country's interest at large. Further progress in the state's agriculture at an accelerated rate requires sound planning, which itself is to be based on a comprehensive knowledge of the existing conditions, recent trends, problems and potentialities of agriculture. The present work purports to contribute something to this requisite understanding.

Although Punjab has had a dynamic agricultural record, the changes which have taken place in its agriculture since Independence have been particularly remarkable. No other state of the country has witnessed changes in agricultural land-use comparable to those of Punjab during the first three Five Year Plans (1951-66).
There has been a marked tendency towards expansion of cultivation by bringing every possible culturable waste land under the plough and rationalization of cropping patterns on commercial lines. Also, there has been intensification of farming largely through increased use of fertilizers and extended irrigation. The changes in agricultural land-use within the state, however, strikingly vary from area to area which especially stimulate a geographic study.

Previous Investigations

Despite the immense academic and applied interest which Punjab's agriculture evokes, only a few studies have so far appeared in this field. Gosal and Ojha presented a detailed geographical analysis of agricultural land-use in Punjab highlighting the changes in irrigation, land-use and cropping patterns during 1951-61. However, some other important aspects of agriculture, such as size of landholdings, land tenure systems and livestock patterns did not fall under the purview of their study. Mavi's

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doctoral dissertation on 'agricultural land-use and pressure of population' provides an elaborate but static picture (based on averaged data for 1952-57 years) of the agricultural geography of the southern half (Malwa Region) of Punjab. Dayal attempted at regionalization of Punjab on the basis of cropping patterns. His effort was confined mainly to statistical grouping of areas of similar crop associations. Randhawa has given an exhaustive account of various physico-socio-economic variables responsible for establishing a sound base for the green revolution and the impact of this revolution on the socio-economic life of the state's people. Scholars at Agricultural University of Ludhiana also devoted their attention to various aspects of Punjab's agriculture. A special mention may be made of a study presented by Kahlon and others depicting the changes in Punjab's agriculture during 1951-66. In this study, as in most


of the other such works, data are used for the state as a whole or for its broad components, in this case, districts. Little effort was made to differentiate various parts of the state in terms of their agricultural patterns and trends. The present work has been undertaken with a distinct purpose of understanding, in spatial perspective, the existing patterns of and recent trends in all the significant aspects of Punjab's agriculture, such as land-use, irrigation, cropping patterns, farm sizes, land tenure systems and livestock types. Besides, regionalization of the state based on the characteristics of agriculture and the changes therein has also been attempted. Not only that, a few villages from each agricultural region have been examined as case studies for understanding in full detail the state's agriculture up to the local level. Thus, the present work is more exhaustive and spread over a longer period than any other geographic work so far produced on Punjab's agriculture.

Geographic Approach to Agriculture

Since economists, agricultural scientists and historians also study agriculture, it is essential to distinguish a geographer's approach to the analysis of agriculture from those of the other scientists dealing
with the subject. While an economist views agriculture as one of the sectors of economy; an agricultural scientist focuses his attention on agriculture as a phenomenon per se with reference to entomology, plant pathology, agronomy and the like; a historian is interested in tracing the history of agriculture through time; an agricultural geographer looks at agriculture as an area characterising and area differentiating element. His purpose is to describe and interpret the spatially variable nature of agriculture as an integral part of the character of areas. He examines changes in agriculture through time also, but these are consistently viewed in spatial perspective. A geographer, through his areal approach, therefore, makes a contribution of his own in the study of agriculture.

The Period of Study

The present study is spread over a period of fifteen years extending from 1951 to 1966, which coincides with the period of the first three Five Year Plans of India. At the time of partition of the country in 1947, the progressive and agriculturally developed part of the Punjab (West Punjab) went to Pakistan, while the food deficit and underdeveloped eastern part (East Punjab)
facing intense population pressure, remained in India. On the eve of partition, the Indian Punjab not only faced an uphill task of state's social and economic uplift, but also a complicated problem of rehabilitating millions of refugees uprooted from West Pakistan. With determined developmental efforts of the government through the various Five Year Plans and whole hearted participation of the people, Punjab experienced a quick transformation in its agriculture unmatched by any other state in the country. Eventually, food deficit Punjab became the biggest food surplus state of India.

The year 1966 also has a special significance in the post-Independence history of Punjab's agriculture. Prior to 1966, agricultural change was in the form of expansion of cultivated area by way of extension of irrigation, check on floods, reduction in waterlogging, enforcement of land reforms etc. After 1966, relative emphasis shifted from expansion to intensification of agriculture through the use of high yielding seeds, increased use of fertilizers, greater application of science and technology, more of mechanization and tubewell irrigation. The year 1966 marks the beginning of the

popularly known 'Green Revolution', the foundation for which was laid in the earlier period. Thus, the 1951-66 period provides a meaningful time segment for the study of changes in Punjab's agriculture. At the time of undertaking the present project in 1968, the requisite data were available only up to 1966-67, which further proved to be a limiting factor in the selection of the study period.

The present work is based on data by individual assessment circles, numbering 120 in the whole of the state (Map 2). An assessment circle is a group of villages (nearly 100 on an average) which are sufficiently homogeneous in agricultural productivity to admit a common set of revenue rates. The factors of soil quality, physiography, incidence of floods and soil erosion, availability of irrigation and distance from the towns were taken into consideration by the British Government while determining the boundaries of assessment circles in late 1870's.

A village could have been chosen as the basic unit of study because of its higher degree of homogeneity and smaller size than that of an assessment circle, but their large number (12,188 in 1971) is formidable for any study covering the whole state. On the other hand,
tahsils and districts, because of their large size and great heterogeneity of agricultural conditions, could not be adopted for this purpose. Thus, partly because of practical reasons and partly because of the homogeneity in agricultural productivity, the ultimate choice for basic areal unit of study rested upon assessment circles.

In the case of Patiala, Sangur, Bhatinda and Kapurthala districts, agricultural data were not available by assessment circles. These districts being under the rule of local princely states till Independence had not been organised into assessment circles. Thus, there was no alternative but to use data by tahsils in the case of these districts.

Source of Data

The data on land-use, cropping patterns and irrigation were personally noted from the unpublished revenue records, known as Lal Kitabs, which are available at tahsil and district headquarters of the state. Such kitabs which are maintained on village, assessment circle, tahsil and district levels, furnish a rich wealth of

7 Tahsil is the smallest administrative unit in the state. A few tahsils grouped together form a district, the administrative unit of the next order. In 1966, Punjab had 11 districts organised into 37 tahsils.
agricultural statistics. Data pertaining to livestock were gathered from livestock census reports published by the Punjab Government. Such data were available only at tahsil level and that too for the years 1956 and 1966. Data pertaining to size of landholdings and land tenure systems were available from the Census handbooks of various districts of the state. Compiled on 20 per cent sample basis these data were again available only at tahsil level and for the year 1961 only. Some additional data regarding farm implements, use of fertilizers, number of wells and tubewells were collected from the office of the Development Commissioner, Punjab. The author also conducted personal surveys of some selected villages in different parts of the state, to acquire closer knowledge of agricultural land-use.

The reliability of data pertaining to agricultural land-use and allied aspects is fairly high. The Patwaris (village level government officials), to whom the job of collecting facts regarding agricultural land-use is entrusted, are mostly native to the area in which they work. They stay in villages allotted to them, remain closely associated with the village life and are in full grip of the prevailing conditions. It cannot be denied that the accuracy of the data, as Spate and Learmonth\(^8\) pointed

out, depends largely upon the integrity and efficiency of these officials. Sometimes discrepancies appeared between the data published by the Government at district and state level and the data computed by the author himself. In such cases, the author adopted his own data as these were arrived at by calculations from original manuscripts.

Methods and Techniques

The discussion in the present work is based primarily on the patterns emerging on the maps showing various aspects of agricultural land-use and changes therein. In the preparation of maps, choropleth technique was largely employed as it effectively brings out the areal variations. Wherever relevant, other methods such as dots, graduated circles, isopleths etc., were also used. Since this study deals with agricultural land-use changes during 1951-66, three sets of maps showing the conditions existing in 1951, 1966 and the changes during 1951-66 were prepared. Cross-sectional mapping for the intervening years was not considered necessary as in the case of Punjab no single year during 1951-66 appears critical for all parts of the state. For the sake of comparability, the class intervals and number of categories on 1951 and 1966 maps were kept the same. The categories and their intervals were decided upon by keeping
in view the median and mean values and critical breaks on the frequency graphs. All the maps have been drafted in black and white for the convenience of reproduction.

It is a well known fact that agricultural patterns in the monsoon lands are susceptible to the vagaries of climate, especially those of rainfall from year to year. Therefore, the agricultural data for any single year are likely to be disturbed by factors which may be called the mere whims of rainfall or of other elements of climate. To overcome this situation an average for three-year period was calculated to get a normal picture for any single year. That is why, the average of 1950-51, 1951-52 and 1952-53 for 1951 and the average of 1964-65, 1965-66 and 1966-67 for 1966 was taken. Fortunately the boundaries of assessment circles during 1951-66 mostly remained the same. In a few circles where change took place, data for 1951 and 1966 were adjusted to make them comparable.

Organization of Material

The present study has been organised into 9 chapters. The first chapter is devoted to physical, cultural and economic aspects of Punjab, furnishing the necessary
background of the study area. The second chapter details upon the patterns of and changes in land-use. Agricultural use of land is essentially a part of overall land-use pattern which can be better viewed only in the context of land-use as a whole. Moreover, before embarking upon any study in agricultural land-use, it is most pertinent to establish the available agricultural resource base. The third chapter deals with irrigation and its development which played a key role in transforming the cropping patterns and in the expansion as well as intensification of cultivation. Thus, it deserves a detailed analysis before a discussion on the cropping patterns could be taken up. Changes in cropping patterns is the subject matter of the fourth chapter. In any investigation of agricultural land-use, the crops after all constitute the core of the whole study. Keeping in view the importance of livestock as a source of supplementary income and their indispensability as a source of power for agricultural operations, the next chapter is devoted to this aspect of agriculture. While pursuing this study, the relevance of livestock to agricultural land-use has been given due emphasis. The sixth chapter examines size, shape and fragmentation of farms and land tenure
systems. These are a few of the agricultural elements which play a significant role in determining the agricultural land-use in the state. The seventh chapter attempts at a regional synthesis of all the outstanding attributes of agriculture. The eighth chapter deals with case studies of a few villages taken from each of the agricultural regions arrived at in the previous chapter. The concluding chapter presents a summary of conclusions emerging out of the study.
Punjab
Regional Setting
1966