In the preceding chapters, the temporal-spatial patterns of different elements of agricultural land-use were the main focus of study. However, to have an integrated view of the agricultural land-use and its changes in different parts of the state, it is necessary to synthesize all these elements in areas. This requires the formulation and comprehensive discussion of the agricultural regions of the state.

The most challenging problem for regionalization in any area is to select suitable criteria for the purpose. Attempt at agricultural regionalization on the basis of environmental factors affecting agriculture, such as climate, soil types and landforms was customary in the past. However, a regional scheme, as Whittlesey advocated, must be based on the elements of agriculture itself, rather than a few factors affecting it. The criteria chosen for agricultural regionalization for the whole earth may not be relevant for its parts, or those for one region may not be suitable for another. The selection has to be made in the context of the area.

---

under study and the purpose of the regional division.
In the present work, since the focus is on change, agricultural regions have been demarcated primarily on the basis of changes in the important elements of agricultural land-use. Magnitude and type of change in land-use and cropping patterns, percentage of area under cultivation, proportion of net area sown receiving irrigation and size of landholdings are the criteria on the basis of which Punjab has been divided into five first order agricultural regions. To add more meaning to these regional divisions from the view-point of planning, due consideration has also been given to the problems confronting agriculture. The five first order regions thus arrived at, have been further divided into secondary regions on the basis of prevailing cropping patterns. However, where local level variations were not sharp, the first order regions were kept as such. The boundaries of these regions were not strictly drawn on quantitatively established criteria. Rather, necessary empirical approximations were resorted to get a simplified regional scheme. The regional divisions thus established, show a fair degree of correspondence with other attributes of agricultural land-use, such as degree of mechanization and commercialization, methods and intensity of cultivation and livestock patterns. On the basis of the criteria
Punjab Agricultural Regions 1966

I SIWALIK HILLS & FOOTHILLS PLAIN: Agriculturally stagnant, inadequately irrigated and having small landholdings.

II FLOOD PLAINS: With remarkable changes in agricultural landuse.

III UPLAND PLAINS: Intensively cultivated and irrigated with a trend towards diversification of agriculture.

IV SOUTHEASTERN PUNJAB: Showing marked transformation both in landuse and cropping patterns.

V SEMI-DRY SOUTHWEST: Extension in cultivated area insignificant, cropping patterns changing with increasing emphasis on cotton, gram and wheat; large landholdings; higher degree of mechanization; irrigation vital.
mentioned above, Punjab has been divided into the following five first order agricultural regions (Map 132).

I. The Siwalik Hills and the Foothill Plain:
   Agriculturally stagnant, inadequately irrigated and having small landholdings.

II. The Flood Plains:
   With remarkable changes in agricultural land-use.

III. The Upland Plains:
   Intensively cultivated and irrigated with a trend towards diversification of agriculture.

IV. Southeastern Punjab:
   Showing marked transformation both in land-use and cropping patterns.

V. The Semi-dry southwest:
   Extension in cultivated area insignificant, cropping patterns changing with increasing emphasis on cotton, gram and wheat; large landholdings; higher degree of mechanization; irrigation vital.

I. The Siwalik Hills and the Foothill Plain:

Covering about 12 per cent of Punjab's area, this agricultural region broadly coincides with the Siwalik hills and the cho-infested foothill plain. Only about 19 per cent of its net area sown (as against the state average of 52.9 per cent) receives irrigation. Deep sub-soil water, which is beyond the financial means of the poor peasants to exploit, and non-feasibility of canal irrigation under the prevailing terrain conditions
largely account for this fact. However, with increasing distance from the hills, groundwater situation gradually improves. As a result, a limited amount of well and tubewell irrigation has been developed. This region is not only the least irrigated, but also is the least cultivated part of the state. Only 55 per cent of its area (as against the state average of 76.3 per cent) is under cultivation—thanks to its hilly and choke-infested topography.

Small size of landholdings averaging 8 acres (as against the state average of 13.7), is another notable feature of this region. A long history of settlement, dearth of cultivable land and larger proportion of Saini and Rainut population mainly explain this phenomenon. Associated with smaller, exposed and less irrigated farms of this region, is the low degree of mechanization and commercialization and the consequent poor economic status of the farmers. Its subsistence and underdeveloped agricultural economy also is at the root of its low degree of industrialization and urbanization.

Considerable emphasis on the cultivation of wheat-gram is a distinguishing character of this part of the state. About 19 per cent of its total cropped area (as against the state average of 8.0 per cent) is devoted
to this crop alone. In the context of limited irrigation, mixed cultivation of these two crops is an insurance against uncertain rains. Maize is another outstanding crop of this region. It occupies 18.3 per cent of the total cropland, in comparison to the state average of 8.2 per cent. No other part of the state concentrates so heavily on maize. Well-drained, humus-rich, alluvial soils located in belts away from the influence of the seasonal streams and hot-wet climate during its growing season (July-September) furnish excellent conditions for its cultivation.

This region is facing near stagnation in agriculture. Hilly terrain, severe soil erosion, lateral expansion of seasonal streams, deep underground water and small landholdings have proved detrimental to its progress and prosperity. Increase in maize acreage from 13.7 to 18.3 per cent is the only notable change recorded in this region during the period under study. Such a positive trend in maize cultivation was largely induced by the increasing demand of this cereal and was facilitated by the favourable environment prevailing in the region for its culture.

When closely examined, this region may be divided into two parts; (a) the hilly tract; and (b) the foothill plain. The hilly tract is relatively more problematic. Severe dissection of its bare hilly terrain has not only restricted the extent of irrigation and cultivation, but
has also done considerable damage to the farm land. That is why, the farmers of this sub-region are the poorest of all the areas of the state. On the other hand, the foothill plain has less of soil erosion and more of irrigation. The extent of cultivation here is also larger than in the hilly tract. In some pockets where well irrigation is practised and where the soils are favourable, potato cultivation is done in this plain area.

In brief, the hilly terrain, the chho-infested relief of the plain, limited irrigation and small landholdings are the root cause of the backwardness of agriculture in this region. Here, the pressure of population on land is intense. As a result, this region has recorded considerable out-migration.

II. The Flood Plains:

In contrast to the region already discussed, the flood plains of the Sutlej, the Beas and the Ravi, have experienced remarkable changes in agricultural land-use during the period under study. In these tracts, fallow land and culturable waste land have declined from 18.7 to 6.2 and 15.9 to 13.5 per cent respectively. As a consequence, net area sown has increased from 46.3 to 61.2 per cent during the same period. Construction of a dam across the Sutlej at Bhakra and channelization of the Ravi and the Beas by building bundhs (artificial levees)
along their courses have brought about considerable reduction in the frequency and intensity of floods. Many areas thus freed from water in the flood plains were reclaimed and brought under cultivation. The process of reclamation, however, is yet not complete.

About 51 per cent of the net area sown in these tracts, as against more than 70 per cent in the adjoining upland plains, receives irrigation. Here, irrigation is needed mostly for the winter crops. However, with reduction in the frequency of floods during recent years, sub-soil water has been going down. As a result, irrigation is becoming an increasing necessity. Wells and tubewells are the major means of irrigation in these areas.

The stress on wheat cultivation is the most outstanding feature of this regional type. This crop alone covers about one-third of the total cropped area of these tracts. Each occupying about one-tenth of the total cropped area, rice and maize, are the other important crops of this regional type. With the reduction of floods and increase in irrigation, more profitable wheat, rice and maize have gained while bajra, gram, wheat-gram and oilseeds have gone down in relative position. Rationalization and consolidation of cropping patterns in favour of traditional but more paying crops in the environmental framework is the general trend.
This regional type consists of three distinct zones:

(a) southwestern section of the flood plain of the Sutlej;
(b) the flood plain of the Beas and the northern section of the flood plain of the Sutlej; and (c) the flood plain of the Ravi. The sub-region 'a' and 'b' are similar as far as emphasis on wheat cultivation is concerned, but differ in their kharif crops. Cotton is the major kharif crop of the former but rice and maize that of the latter. Canals dominate the irrigation scene in this zone of semi-dry climate. On the other hand, wells and tubewells are almost the exclusive means of irrigation in the northern section. Located along the international boundary with Pakistan, the flood plain of the Ravi (c) has recorded only a gradual change in land-use unlike 'a' and 'b' sub-regions. The waterlogging conditions prevailing in this tract, as also the element of insecurity arising from proximity to the international border, impeded the reclamation of culturable waste lands in the flood plain of the Ravi.

In sum, areas included in this regional type have experienced expansion of cultivation consequent upon flood control measures taken during 1951-66. Wheat, maize and rice, which dominated the cropland use of these tracts in 1951, have consolidated their position further. Although, the flood plains have come up well in terms of agricultural development during the period under review, they still lag
behind the adjoining upland plains in the other sectors of socio-economic progress. Floods and waterlogging are still affecting the well-being of the areas included in this regional type.

III. The Upland Plains:

Embracing nearly one-fourth of the state's area, the upland plains constitute the largest of all the agricultural regional types of Punjab. They include the upland plains of the Upper Bari Doab, the Bist Doab and northern Malwa. Their contiguity is broken by the flood plains of the Sutlej and the Beas, dividing them into three separate units. They are characterised by flat topography, fertile loamy to sandy-loamy soils and a large reservoir of good quality sub-soil water close to the surface.

With about three-fourth of its area under cultivation, of which nearly two-third receives irrigation, the areas belonging to this regional type are agriculturally the most developed. Being already widely cultivated, these plains recorded only an insignificant gain in the proportion of cultivated area during 1951-66. However, area under irrigation increased from 60 to 66 per cent. Extensive irrigation facilities already existing in 1951, and their further expansion during 1951-66 have played a key role not only in intensifying agriculture but also in
diversifying it.

Higher agricultural productivity of these tracts, has enabled them to support larger number of people per unit area and has stimulated industrialization and urbanization. Since most of the people depend on agriculture for a livelihood, pressure on its cultivated land is severe. As a result, landholdings are small (average size varies from 5 to 15 acres) and are declining further with growing population. Although, small and dwindling farms are a handicap, yet they did make a positive impact in the form of intensification and diversification of agriculture. Increasing importance of poultry, dairy and piggery is largely the outcome of this trend. Despite small farms, this region shows a fairly high degree of mechanization. Better economic conditions of the farmers, investment of foreign capital remitted by the emigrants and tendency to plough others' land by tractors on payment largely explain this phenomenon.

Covering nearly 28 per cent of the total cropped area, wheat is by far the leading crop of this region. The well developed irrigation system, remunerative nature of the crop and its long tradition account for the emphasis on wheat cultivation in these plain areas. Maize, rice, cotton sugarcane and groundnut are the other important crops raised in these tracts. Considerable emphasis on sugarcane and
groundnut cultivation is their special feature. About one-half of the state's sugarcane and groundnut acreage is concentrated over here. All but one of the five sugarmills of Punjab, around which cane area concentrates, are located in this regional type. Groundnut cultivation is largely associated with the dune infested sandy belts. Traditional but more profitable crops, such as wheat, maize, rice, cotton, and groundnut have improved their position in the total crop complex of the region while gram, bajra, pulses and oilseeds have gone down. The additional factors of high rates of literacy, dense network of roads and railroads, greater degree of industrialization and urbanization and innovative farmers have also contributed significantly to the progressive nature of its agriculture.

This region may be further divided into the following three sub-regions:

a) Upper Bari Doab Upland Plain
b) Bist Doab Upland Plain
c) Northern Malwa Upland Plain

With 83 per cent of its net area sown receiving irrigation, the Upper Bari Doab Upland Plain is the most irrigated part of this region. Canals, wells and tubewells are the exclusive means of irrigation. Introduced as back as in 1859, the canals have an upper edge over other means
of irrigation. Though early introduction of canals has brought agricultural prosperity to this area, it has also created a serious problem of waterlogging at places. Such a development has given fillip to paddy cultivation. That is why, about one-third of the rice acreage of the state and nearly four-fifth of the region, is concentrated in this interfluvial tract. Expansion of fodder cultivation is another notable feature of this sub-region. Growing population of dairy cattle as a result of the establishment of Verka milk food plant and increasing urbanization largely account for this trend. This sub-region is well known in the state for milk production. Such an emphasis on dairy farming necessitated the daily transportation of fodder from the fields to the village settlement for which ponies, horses, or donkeys are generally employed. Raising of at least one such animal for this purpose by almost each farmer is a typical feature of this sub-region. However, with increasing road length and motor transport this tradition is gradually breaking. Southwestern tip of this sub-region comprising most of the Patti tahsil, slightly differs from the rest of it in cropping patterns. As a result of its semi-dry climate, deep and brackish groundwater and dominance of canal irrigation, cotton ranks second to wheat.

Bist Doab upland plain, on the other hand, is not only somewhat less irrigated (64 per cent) but is also
differentiated by the dominance of well and tubewell irrigation. Also, the two sub-regions display some dissimilarities in cropping patterns. Wheat ranks first in both. But maize enjoys the same superior position in the Bist Doab as rice does in the Upper Bari Doab. Greater emphasis on potato and groundnut cultivation in the Bist Doab is another differentiating feature. Small landholdings associated with dependable well and tubewell irrigation have induced the farmers to resort to intensive potato cultivation. Dona tract of Kapurthala, Nakodar and Jullundur tahsils are known for groundnut cultivation. On the other hand, this crop is almost unknown in the Upper Bari Doab. More emphasis on poultry and piggery than on dairy also differentiates this sub-region from the Upper Bari Doab.

The northern Malwa upland plain, though broadly similar to the Bist Doab upland plain discussed above, is distinguished by its higher agricultural productivity. Initiation of the package programme for a comprehensive agricultural development in Ludhiana district, which constitutes most of the area of this tract, is largely responsible for its higher output from the fields. This district stands first in Punjab in the consumption of chemical fertilizers and per acre yields. Greater emphasis on groundnut cultivation is an important feature of this sub-region. About three-fourth of the groundnut acreage
of all the upland plains is concentrated in this tract. This crop ranks first or second, in five out of a total of 13 assessment circles of this sub-region. Belts of sandy soils located along the old flood plain of the Sutlej, limited irrigation and larger net profits from this crop largely explain its importance.

In conclusion, alluvial plain topography, well developed system of irrigation and high proportion of cultivated area in the upland plains furnish a rich agricultural resource base. Wheat, maize, rice, cotton, gram, sugarcane and groundnut were the major crops of this region in 1951 which have ever since consolidated their position further. These plains are distinguished by their progressive nature and irrigation based semi-commercial intensive agriculture. Small landholdings, greater degree of urbanization, higher rates of literacy and efficient means of transport are among the factors which have facilitated the process of intensification and diversification of agriculture. This region represents the average conditions and trends of Punjab's agriculture.

IV. Southeastern Punjab

Located in the southeast, this region covers nearly one-fifth of the state's area. Included in it are the districts of Sangrur and Patiala, and parts of the Kharar tahsil.
Reclamation of large tracts of culturable waste land, which were the legacy of the feudal system prevailing in the pre-Independence era, is the most outstanding feature of this region. Instead of developing such lands, the native princes retained a large part of these for game. However, after Independence the government took a number of steps to improve their lot. New roads and canals were extended to end the isolation of these areas. As already stated, the attitude of the government against the feudal system of land occupancy during the post-Independence era created a feeling of insecurity among the landlords. The danger of confiscation forced them to sell their lands at cheap rates. Low prices of land, coupled with the extension of roads and canals, provided an incentive for the hard-pressed-for-land cultivators of the north to migrate to these promising areas. This initiated a process of reclamation of waste lands and extension of regular cultivation of fallow lands of this region. As a result, the proportion of net area sown rose from 66 per cent in 1951 to 83 per cent in 1966. No other part of the state experienced such a great spurt in its cultivated area during this period. This region is distinct in having relatively large landholdings, higher degree of mechanization of agriculture and more commercial type of farming than most areas of the state. Nearly, one-half of the net area sown of this region receives irrigation. Canals and wells/tubewells contribute almost equally on this front.
Occupying nearly one-fourth of the total cropped acreage, wheat is the leading crop of this region. Wheat-gram, maize, cotton, gram, groundnut and rice are the other significant crops raised. Rice is largely concentrated in the flood plain of the Ghaggar and its tributaries, and in areas affected by waterlogging in Sangrur district. Cotton gains prominence in the western sections which are relatively dry, while groundnut stretches itself over the isolated dune sites in most of its central section. Extension of irrigation exerted a positive influence on the cropping patterns. Shifting emphasis from less rewarding gram, pulses, oilseeds and barley to more paying wheat, cotton, maize, rice and groundnut is largely the outcome of the development of irrigation.

In spite of the remarkable positive changes mentioned above, this region could not attain the same level of agricultural development as the upland plains. Occasional floods in the Ghaggar and its tributaries, emergence of waterlogging in parts, inadequate irrigation and relatively low level of literacy and road development have been handicaps in its agricultural progress and prosperity. Even so, the region has experienced transformation from a predominantly feudal type of agriculture to peasant cultivation - a change which is in the process of making a visible impact on its agricultural personality.
V. The Semi-dry Southwest

Covering Bhatinda and southern Ferozepur districts in the southwest, this region accounts for about 23 per cent of the state's total area. It is marked by semi-dry climate, occasional occurrence of sand dunes, sandy-loamy soils and deep as well as brackish groundwater.

Very high (88 per cent) extent of net cultivation is a prime feature of this region. In the context of low and highly variable rains, even the marginal lands of this region have been pressed under the plough to extract whatever is possible. Almost exclusive dependence on canal irrigation is another distinguishing character of this region. Since groundwater is deep and brackish, well and tubewell irrigation could not make any headway. The canals irrigate nearly 98 per cent of the total irrigated area of this region. In general, there is inadequacy of canal water which is further accentuated by the percolatory nature of the soils.

About one-half of cotton and bajra, and two-third of gram acreage of the state are concentrated in this part. Covering about one-fifth (19.3 per cent) of the total cropland of this region, cotton emerges as by far the most outstanding cash crop. In no other part of the state this crop is concentrated so heavily.
Semi-dry climate and well drained soils associated with canal irrigation furnish excellent conditions for cotton cultivation in this region. Large size of landholdings, from which enough of land can be spared for a cash crop like cotton is another contributory factor to this situation. The proportion of cotton acreage has increased from 12.0 per cent in 1951 to 19.3 per cent in 1966. Increasing demand of cotton from the fast expanding cotton textile industry in the country, introduction of better yielding fine quality American varieties of cotton (narma) in the early fifties and augmentation of canal water supply after the construction of Bhakra Dam largely explain this positive trend in its cultivation. Each occupying about 21 per cent of the cropped acreage of this region, wheat and gram rival for first position. Semi-dry climate, well drained light soils, low water requirements of gram have been instrumental in giving a boost to gram cultivation in this area. Under such conditions, gram is more remunerative than many other crops of the rabi season. That is why, area under gram has recorded increase, while in all other areas it experienced decline. Drought resistant baira also is quite important in this region.

The large size (average size varies from 15 to 23 acres) of landholdings, unequalled by any other part
of the state, is another differentiating feature of this region. Associated with large farms is the greater degree of mechanization (nearly two-fifth of the state's tractors are concentrated here) and commercialization. With 50 livestock heads per 100 acres of cultivated area (as against the state average of 76), this region has the lowest density of livestock population in the state. None the less, about one-half of the state's sheep and camel population is concentrated in this semi-dry region.

In sum, high proportion of cultivation, exclusive dependence on canal irrigation, large landholdings, high degree of mechanization and commercialization, heavy concentration of cotton, gram, bajra, sheep and camel are the most outstanding characteristics of this region. Area under cultivation achieved its near saturation level by 1951 leaving only limited scope for expansion later. However, with increase in the supply of canal water, more profitable wheat, cotton, and gram have gained at the cost of mixed culture of wheat-gram, barley-gram and other less paying crops. Semi-arid conditions, brackish groundwater, inadequate water in the canals, and loss of canal water through seepage are some of the serious problems confronting the farmers. Otherwise, this is the most promising area of the state.
Among the various states of India, Punjab is distinguished by a considerably developed, highly dynamic and prosperous agriculture. This, however, is not true of all its parts. Some of its areas are considerably developed, some are in the process of development, while others are not making much headway in agriculture.

More favourable for cultivation and facing intense pressure on its fully exploited land resource, the upland plains (III) are the most developed parts of the state. In the context of their small and shrinking landholdings, and well developed irrigation, these tracts are undergoing intensification and diversification in agriculture. Rationalization of cropping patterns aiming at maximum net profits within the environmental framework is another notable trend of theirs.

By contrast, the hilly and cho-infested foothill plain (I) is the least developed part of the state. It is marked by low proportion of cultivated area, limited irrigation, low productivity, and traditional methods of cultivation and subsistence type of farm economy. Severe soil erosion, hilly and cho-infested topography, deep groundwater and small size of farms seriously impede its agricultural growth.

The flood plains (II) on the other hand, have undergone transformation in their agricultural land-use,
especially in terms of extension of cultivation. These parts are coming up in their agricultural development with progress in the flood control measures. The scope for further expansion of cultivation in these tracts is still wide. Despite fast progress, the flood plains are no match for the adjoining upland plains in agricultural development.

Southeastern Punjab (IV) is similar to the flood plains as far as expansion of cultivation is concerned, but is different in the causes of this change. The large scale reclamation in this tract has been due to the change from feudal to democratic political set up. Being a region of fairly large farms, it is relatively more commercial and mechanized than the flood plains. In agricultural development, it lies in between the flood plains and the upland plains.

The semi-dry southwest (V) is the most extensively cultivated, but the least populated part of the state. Its farming is the most mechanized and commercialized. Although, it is not experiencing any increase in cultivated area, it has undergone important changes in the form of rationalization and consolidation of its cropping patterns in response to increase in irrigation and changes in price structure of the various crops. Aridity and inadequacy of water for irrigation are the limiting factors for its agricultural progress. In fact, otherwise, it is the most
promising area of the state.

The above discussion clearly brings out that all these five agricultural regions are at varying levels of agricultural development. They show diverse growth rates and trends, have different potentialities and face divergent problems. The regional scheme as evolved here should form a useful basis for agricultural planning in the state.
Punjab
Location of Villages Selected for Case Studies