CHAPTER 1
PUNJAB: A PHYSICO-SOCIO-ECONOMIC BACKGROUND

Reorganised in 1966, Punjab\(^1\) (29° 33' to 32° 32' N and 73° 54' to 76° 56' E) has become a symbol of agricultural dynamism and prosperity in the country. Roughly triangular in shape, it covers an area of about 19,450 square miles (50,376 sq. kms). It borders with Pakistan to the west, while the states of Jammu and Kashmir, Himachal Pradesh, Haryana and Rajasthan adjoin it on its north, northeast, south and southwest, respectively. (Map 3).

Present Punjab is only a segment of the vast pre-1947 Punjab, which extended from the Jamuna river in the east to the Indus river in the west. The partition of the Indian Sub-continent in 1947 resulted in the division of the erstwhile Punjab (the real land of five rivers) into two parts - the West Punjab and the East Punjab. Far more developed and agriculturally progressive the western part (West Punjab) went to Pakistan, while the eastern part (East Punjab) which was agriculturally backward and deficient in food remained with India. On the eve of reorganisation of the states of India in 1956, Patiala and East Punjab States Union (PEPSU) was merged with East Punjab resulting in its areal expansion from 37,028 to 47,106 square miles. However,

\(^{1}\) The name Punjab was derived from two persian words: Panj (five) and ab (water) meaning the land of five rivers.
the state shrank in size consequent upon another 
reorganisation on linguistic basis on 1st November, 1966.
Its southern Hindi speaking areas were detached to form a 
new state of Haryana and its hilly districts were merged 
with the adjoining state of Himachal Pradesh. The newly 
organised Punjab, the state under present study, which 
extends from the Ghaggar river in the southeast to the Ravi 
in the northwest, is only about two-fifth of what it was in 
1956 and hardly one-seventh of its pre-partition size. In 
this pruning process, Punjab has become considerably homogeneous 
in its physiography, climate, economy, culture, etc. However, 
if viewed at zonal and local levels, the state still shows 
notable areal variations (Map 4). An investigation into the 
details of these spatial variations would be helpful in 
understanding agricultural land-use and changes therein 
in the State.

THE LAND

Barring small areas covered by the Siwalik hills 
in the northeast and sand dune tracts in the south and 
southwest, Punjab is practically a flat featureless plain. 
Sloping gradually in the northeast-southwest direction, the 
Punjab plains range from 600 to 1000 feet in height above 
sea level. The Siwalik hills, however, exceed even 3000 
feet in elevation at places (Map 4). For a convenient
Punjab
Landform Regions

I. Flat Upland Plain
II. Upland Plain with occasional occurrence of Sand Dunes
III. Flood Plains
IV. Cho-infested Foot-hill Plain
V. Siwaik hills
understanding of its physiography, Punjab may be divided into the following five terrain units (Map 5):-

1. Flat upland plains.
2. Upland plain with occasional occurrence of sand dunes.
3. Flood plains.
5. Siwalik hills.

1. Flat Upland Plains

Flat upland plains, spreading over the Upper Bari Doab and the Bist Doab² occupy about a fifth of the state's area. Slightly higher than the adjoining flood plains, these are flat and featureless excepting some local minor irregularities. Their extremely gentle gradient generates drainage problems in some of its parts. Flat topography and fertile alluvial soils of this terrain unit are highly suitable for agriculture. No wonder these are the most intensively cultivated, widely irrigated and agriculturally the most productive parts of the state.

2. Upland Plain With Occasional Occurrence of Sand Dunes

Lying between the Sutlej and the Ghaggar, this terrain unit accounts for about half of the state's area.

² The inter-fluvial tract lying between the Ravi and the Beas is termed as the Upper Bari Doab and the one which lies between the Beas and the Sutlej is known as the Bist Doab.
It is broadly similar to "flat upland plains" in terrain characteristics except that some sand dunes advancing from the Thar desert in the west have been superimposed on the otherwise fertile alluvial soils. These dunes are found either isolated, or in belts lying mostly along the old courses of the river Sutlej. Their local relief varies from less than 10 to more than 50 feet. The occurrence and size of these dunes gradually declines from west to east. In fact most of such dunes (tibas) have been levelled to enable irrigable cultivation. Such a phenomenon is more true of eastern and northeastern sections of Malwa than the western parts. These levelled sandy areas now appear like upland plains. Nevertheless, several of the bigger sand dunes, especially in the west, still exist. Most of them are physically not irrigable because of their irregular relief and height above canal water surface. The barani (unirrigated) dune fields of this terrain unit are generally devoted to the draught resistant crops like bajra, gram and oilseeds while more fertile and irrigated lands are put to the superior crops, such as cotton, wheat and sugarcane. Most of the sandy tracts associated with dune sites in the northeastern sections of this terrain unit, where rainfall is relatively heavy and

3 The River Sutlej used to flow through this terrain unit during pre-historic times. It has been shifting its course gradually to the west till it reached its present position.
irrigation less developed, are largely devoted to groundnut cultivation.

3. **Flood Plains**

Occupying about one-sixth of the state's area, the flood plains of the Ravi, the Beas, the Sutlej and the Ghaggar rivers constitute a unique type of terrain unit. Running along both sides of these rivers, the flood plains form irregular linear strips ranging in width from 4 to 12 miles. Because of the westward shifting tendency of the rivers, the flood plains are narrower on the western sides of the river beds and are generally separated by an escarpment from the neighbouring upland plains. However, on the east of the river beds, these are wider and merge gradually into them. Frequent floods during the rainy season, and partly marshy conditions continue to be the salient features of this terrain unit. After the completion of Bhakra Dam on the Sutlej in 1958-59, the menace of floods and waterlogging in the flood plain of this river has been considerably reduced. The channelization of the Beas and the Ravi by building artificial embankments along them also brought about similar improvements in their respective flood plains. This development has brought about stability in agriculture, reduced the extent of fallow land and has resulted in extension of cultivation to new lands. Excessive moisture in the newly deposited alluvial soils of these tracts often renders irrigation unnecessary. Such wet soils are more
suitable for cultivation of rice, wheat and sugarcane than other crops such as cotton, gram, oilseeds, etc.

4. Cho-infested Foothill Plain

Situated at the foot of the Siwalik hills mainly in Gurdaspur, Hoshiarpur and Ropar districts, this tract covers about 8 per cent of Punjab's area. As its name indicates, this terrain unit is infested with a large number of seasonal streams (choos). Sloping in east-west direction, it varies in elevation from 900 to 1500 feet. Swiftly descending hill torrents from the adjoining hills frequently break their banks, bring floods, spread sand on the good cultivated land and result in considerable soil erosion. Although some of these streams have been channelized during recent years, yet a large number of them still flow unbridled resulting in heavy damage to good agricultural land. Limited irrigation, low proportion of net area sown, backwardness and low efficiency of agriculture in this tract are mainly associated with the terrain characteristics.

5. Siwalik Hills

This terrain unit covers nearly 3 per cent of the area of Punjab. Pleistocene in origin, the Siwalik hills are largely composed of clay, sandstone and conglomerates. These range in elevation from about 1000 to 3000 feet above sea level. The sparseness of vegetation and intense rains on the soft strata of these hills have caused large scale dissection and erosion,
giving them the appearance of a bad land topography. The dissected hilly terrain and severe soil erosion, besides restricting the proportion of cultivated area, have also proved detrimental to the development of agriculture in this tract.

Thus, Punjab by and large is a flat plain where hills occupy only a small part. However, if viewed closely, the plain offers some variety in the form of upland plains, low lying flood plains, plains strewn with sand dunes, and areas infested with seasonal streams. Facing a serious problem of dissection and exposure, the hills and its adjacent foothill plain face virtual stagnation in agriculture. The flood plains, as a result of flood control measures, have recorded fast expansion in their cultivated area. The upland plains, being ideally suited to cultivation, have undergone intensification and diversification in agriculture.

Drainage

Three large perennial rivers, the Sutlej, the Beas and the Ravi, are the precious gifts of nature to the state. Originating in the high Himalayan glaciers, the Sutlej and the Beas, traverse long distances through the mountainous state of Himachal Pradesh before entering the Punjab plains at Nangal and Mirthal, respectively. Both the rivers confluence at Harike
in Amritsar district in Punjab. The Black and White Beins are two of their tributaries which flow through the Bist Doab before joining them (Map 4). Beyond Harike, the Sutlej flows for some distance along the Indo-Pak international border in the southwest before entering Pakistan. The Ravi also originates in the Himalayas, demarcates the international boundary between India and Pakistan in the northwest for some distance and finally enters Pakistan.

The three perennial rivers mentioned above belong to the larger Indus system. Their discharge fluctuates with seasons; being the maximum in the summer monsoon season and minimum during winter. This has necessitated the building of costly dams and barrages across these rivers to regulate water supply for feeding irrigation channels and power houses the year round. Bhakra canal system from the Nangal barrage, Sirhind and Bist Doab canal systems from the Ropar headworks on the Sutlej, and the Upper Bari Doab canal system from the Madhopur headworks on the Ravi, are the blessings of these rivers. Punjab's leading position in the country in the proportion of irrigated area is primarily due to these canal systems. Besides being the source of water for feeding irrigation channels, these water bodies have also become the major source of cheap hydro-electric power.

The Ghaggar, roughly forming the boundary between Punjab
and Haryana, is an important seasonal river. Markanda, Tangri, Saraswati, and Patiala-wali-Nadi are its important tributaries. The river, along with its tributaries, is frequently flooded during rainy season and plays havoc with the agriculture of the adjoining tracts. Besides, a large number of seasonal streams, locally known as choes, descend from the Siwalik hills. These seasonal streams terminate in areas of porous soils after flowing over the foothill plain for a few miles. Rarely any of them join together to find a way to the nearest rivers. As already mentioned, these streams have brought devastating effects on the agriculture of the areas through which they pass.

In brief, Punjab is bestowed with three large perennial rivers. Although frequent floods in them, especially in the past, have proved harmful to agriculture in their adjoining tracts, yet they have become a great source of irrigation water and hydro-electric power for the development of agriculture in the state. More than half of Punjab's irrigation water is supplied by these rivers. Swift hill torrents in the northeast, frequent floods in the Ghaggar and its tributaries and occasional floods in the flood plains of the perennial rivers continue to hamper the development of agriculture in these areas.

Climate

Because of its interior sub-tropical location, Punjab is characterized by a semi-dry to sub-humid climate. The climatic
Punjab
Normal Temperature and Rainfall Conditions
year of the state may be divided into two distinct seasons: summer and winter. Punjab's summers are very hot and winters fairly cold. With an average temperature of 92°F, June is the hottest month of the year. Mercury frequently touches 115°F mark in the afternoons of this month. This hot spell is broken by the burst of the monsoons coming generally during the first week of July. With the onset of rains, temperature comes down by 10 to 15°F. It fluctuates around 80°F during the monsoon season (July to September). Winter makes a beginning in November and continues upto March. With an average temperature of 53°F, January turns out to be the coldest month of the state. It gives an annual range of temperature of 39°F. Sometimes, mercury falls down to the freezing point at night during this month. This results in frost, which is extremely harmful to vegetable, fruit and sugarcane crops, in particular. Winter season receives rainfall of about 6 inches (nearly 15 per cent of the annual average) from the western disturbances, which originate over the Mediterranean Sea. These rains are very useful for winter crops. Associated with summers and winters are the two agricultural seasons of kharif and rabi respectively.

Although temperature markedly varies from season to season, yet it is more or less uniform over different parts of the state at a given time (Map 6). That is why, it remains insignificant a factor in causing spatial variations in Punjab's agriculture during any crop season. Besides, at no time of the
Punjab
Mean Annual Rainfall

- International Boundary
- State Boundary
- Isohyets

Miles
10 5 0 10 20 30

Kilometres
10 5 0 10 20 30 40
Punjab
Variability of Rainfall

Note: Based on data for the period 1951–66
year and in no part of the state, it ever comes down to the extent of hampering plant growth seriously. On the other hand, rainfall plays a critical role in moulding the state's agriculture areally. Punjab receives an annual average rainfall of about 25 inches, the major proportion (80 to 85 per cent) of which comes during 18 rainy days of the summer monsoon season. Rainfall in Punjab is not only concentrated in time but also in space. Only about 10 per cent of the state's area receives rainfall of over 35 inches, another 30 per cent of the area receives between 25 and 35 inches, and the remaining 60 per cent below 25 inches. The Siwalik hills are the rainiest part of the state from where rainfall gradually decreases with increasing distance towards the west and the southwest (Map 7). Excepting the rainy season and that too only in the northeast, soils remain deficient in moisture during the whole of the year. In addition to its inadequacy and seasonal concentration, its variable nature is another serious handicap to agriculture. The coefficient of variability of rainfall is as high as 50 per cent in the southwestern part of the state declining to 25 per cent in the northeast (Map 8). Thus, the amount and variability of rainfall in Punjab are inversely correlated to each other. This phenomenon accentuates the problem of dry areas. Under the prevailing rainfall conditions, irrigation is indispensable for stable agriculture in the whole of the state. However, its need is more severely felt in the southwestern zone where rainfall
is the lowest and its variability the highest.

In Punjab temperature remains sufficiently high (except for short spells during December to January) throughout the year to maintain unhampered plant growth. Rainfall, on the other hand, is highly variable, inadequate, and concentrated, both in time and space. These characteristics of rainfall necessitate irrigation for stable and efficient agriculture. Marked seasonal variations in temperature, and both seasonal and areal variations in precipitation, however, furnish excellent conditions for growing a variety of crops in the state.

Sub-soil Water Depths

In Punjab, where rainfall is inadequate, seasonally concentrated and highly unreliable, and the available canal water is not sufficient to meet the irrigation needs of all areas, the amount, quality and depth of water in the aquifers are of immense significance for agriculture. The scope for developing small irrigation schemes in different parts of the state varies in accordance with the groundwater situation. Large sections of the Upper Bari Doab, Bist Doab and eastern and northeastern Malwa, where good quality sub-soil water ranges from less than 5 feet to a maximum of 20 feet in depth, offer ample scope for the development of well and tubewell irrigation. On the other hand, southwestern Malwa and
PUNJAB
SUB-SOIL WATER DEPTHS
OCTOBER, 1951

SOURCE: LAND RECLAMATION, IRRIGATION AND POWER RESEARCH INSTITUTE, PUNJAB
MAP 10

PUNJAB
SUB-SOIL WATER DEPTHS
OCTOBER-1961

SOURCE: LAND RECLAMATION, IRRIGATION AND POWER RESEARCH INSTITUTE, PUNJAB
southern Upper Bari Doab have deep (more than 30 feet) and brackish sub-soil water which is not fit for irrigation. Hence, canal irrigation is the only answer. The Siwalik hills and their adjacent gho-infested foothill plain are also marked by inadequate groundwater within reasonable depths. However, at greater depths it exists in abundance. Since canal irrigation is not practicable in this dissected and undulating region and local peasantry does not have finances to invest in deep tubewell boring, the installation of deep tubewells by the government alone can help solving the problem of irrigation over here. Thus, for tapping this asset in a rational manner, emphasis should be laid on the development of small irrigation schemes in the private sector in areas where groundwater is close to the surface and in public sector in the foothill plain where water-table is very deep.

Groundwater level in the state has risen by 5 to 10 feet during 1951-66. In 1951, only 1572 square miles of the area of Punjab had sub-soil water at a depth of less than 5 feet from the surface. Such an area increased to 3603 square miles by 1961 (Maps 9 and 10). Water-table has come even upto the surface in parts of the Upper Bari Doab, Bist Doab and eastern Malwa, causing waterlogging. Inadequate drainage, continuing

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4 If the sub-soil water comes too close to the surface, so as to hamper plant growth, it is considered to be a state of waterlogging.
MAP II
PUNJAB
SUB-SOIL WATER DEPTHS
OCTOBER, 1966

SOURCE: LAND RECLAMATION, IRRIGATION AND POWER RESEARCH INSTITUTE, PUNJAB
process of percolation over a long span from the canals, heavy rains during mid-fifties and faulty construction of roads and canals obstructing natural flow of water thereby increasing seepage, mainly account for this phenomenal rise in groundwater level. With this the prospects of developing small irrigation schemes have improved. However, it has brought deep seated salts to the surface at places resulting in a severe damage to the good agricultural lands. Noting the fast aggravating conditions on this front, the state government took some remedial measures such as digging of additional drains, construction of new syphons and bridges and emphasized more upon tubewell irrigation. As a consequence, water-table started sinking. In consonance with this the area having groundwater depth of less than 5 feet from the surface decreased from 3603 square miles in 1961 to 2685 square miles in 1966 (Maps 10 and 11). However, some seriously affected parts of the state could not be recultivated for long as the reclamation of such land (Kalar) requires considerable effort, time and money. In 1966, about 1.5 percent (158 thousand acres) of the state's cultivated area was under the influence of waterlogging. Nearly two-third of it was damaged seriously. Amritsar, Gurdaspur, Kapurthala, Sangrur, Patiala and Jullundur are the most affected districts in this regard. Besides, the rise in sub-soil water depths have also played a significant role in changing the cropping pattern in the state.
Vegetation

Excepting in the Siwalik hills, natural vegetation has long since been removed from the face of Punjab subsequent to the extension of settlement and the domain of the plough. Nevertheless, man has planted many useful trees along roads, canals, railway lines and around settlements and irrigation wells. Most of these trees are such as can be utilized in house construction or for making agricultural implements. Shisham (*Dalbergia sissoo*), kikar (*Acacia arabica*), jama (*Eugenia iambolana*), amb (*Mangerfera indica*), neem (*Azadirachta indica*), bokh (*Ficus benghalensis*), pipal (*Ficus religiosa*) and safeda (*Eucalyptus*) are the major planted trees. Pipal and bokh are grown exclusively for shade and are associated with settlements and wells. Safeda is a new addition to the state's flora as a measure against waterlogging and is likely to be used for paper manufacturing. The wood of kikar, shisham, jama and amb is used for making house structures, agricultural implements, furniture and other domestic articles. The wood of kikar and shisham is quite hard and if seasoned properly, has a steel-like durability. However, all these trees put together cover only a negligible part of the total area of the state. There is hardly anything like a forest left in the plains any more.

The hilly tract, active flood plains and areas along seasonal streams are the only places where some traces of
natural vegetation are visible. The hilly tract supports deciduous type of trees and bushes. Some seasonal grasses and bushes in this zone provide rough pastures. Khabbar grass (*Pulaliopsis binata*) which grows abundantly here, is used for making paper, ropes and mats. The belts of wild grasses along river beds and streams also are used for rough grazing. Reeds and kans (*Seccharum spontaneum*) found along drainage lines provide material for thatching roofs, making baskets and for fuel.

**Soils**

Soils of Punjab are derived out of the material deposited by rivers (alluvium). In southern and southwestern parts of the state (adjoining the Rajasthan desert) and in discontinuous belts along the old river courses of the Sutlej and the Beas, these are marked by a sandy cover of varying thickness. Soils in the state are deficient in organic matter, have only medium content of phosphorus and potassium, but are highly responsive to irrigation and fertilization.

Apart from alluviation and wind deposition, the factor of climate, especially rainfall, has been the most important determinant of the soil properties in Punjab. The role of topography, vegetation and sub-soil water depths in soil formation is also significant. In accordance with the variations in these factors, soils in the state vary from area to area. At local level, variations can be seen even within a village. However,
PUNJAB
SOIL - TYPES

LIGHT, EXPOSED SOILS OF THE SIWALIK HILLS AND THE ADJACENT CHO-INFESTED FOOTHILL PLAIN

ZONE OF FERTILE LOAMY SOILS OF THE UPLAND PLAINS

ZONE OF LOAMY AND SANDY LOAMY SOILS WITH SALINE-ALKALINE PATCHES AND DUNE SUPERIMPOSITION.

NEWER ALLUVIUM SOILS ZONE OF THE FLOOD PLAINS

SEMI-DRY, DUNE-INFESTED LOAMY SAND TO LOAMY SOILS REGION

SALINE PATCHES

detailed studies in soils of Punjab are lacking. The work done by Sehgal and Sys 5 is noteworthy and their five fold classification is briefed here (Map 12).

1. **Light, Exposed Soils of the Siwalik Hills and the Adjacent Cho-infested Foothill Plain.**

   This region, covering Siwalik hills and the adjacent cho-infested foothill plain, is relatively the most humid (40 to 55 inches of rainfall) part of Punjab. Because of excessive leaching, the soils of this tract are practically devoid of calcium, though are rich in humus content. These are reddish brown or reddish chestnut in colour and have a pH range of 6.5 to 7.5. They are sandy to sandy-loamy in texture. Excessive dissection and exposure are their main problems. In general these soils are poor and hence bear low yields.

2. **Zone of Fertile Loamy Soils of the Upland Plains.**

   Comprising almost the whole of the Bist Doab, most of the central Upper Bari Doab and northeastern Malwa, this zone constitutes the most fertile section of the state. Developed under 20 to 40 inches of rainfall, these soils vary in texture from sandy-loams to heavy clay-loams and in pH value from 7.5

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to 8.5. Sandy-loams are generally associated with the sites of the sand dunes (tibas). A few pockets of greyish saline soils have developed due to the local topographic conditions and waterlogging, and as such have relatively high pH value. Poor drainage and consequent waterlogging at places is a serious problem. In general, these soils are fertile over which a wide variety of crops are grown.

3. Zone of Loamy and Sandy-loamy Soils With Saline-Alkaline Patches and Dune Superimposition.

Embracing most of the Sangrur district, parts of Patiala district, northern parts of Ferozepur district and the southern tip of the Upper Bari Doab, this soil zone has precipitated lime in the lower B horizon. Rainfall in this zone ranges between 15 and 25 inches. At places, sand dunes have been superimposed on the otherwise fertile soils. These vary in texture from sandy-loams to silty clay-loams. Large patches of saline grey soils have appeared in the localized depressions affected by waterlogging. In general, the pH value of the soils is in the alkaline range, but is exceptionally high (9.5 to 10.0) in the case of saline-alkaline tracts. Waterlogging and hence salinity-alkalinity are the serious problems.


This soil type spreads over all the climatic zones of
Punjab, but is found localized only along the river beds. These soils, being deposited by the inundating rivers, are young and immature. Their texture varies from loamy-sand to heavy clay-loams, and the pH value from 7.5 to 9.5. Excessive moisture in them restricts the range of crops grown. These suit more to the cultivation of rice, barseem (fodder) and wheat.


This soil zone coincides with the semi-arid (10 to 20 inches of rainfall) southwestern part of the state. Having developed under dry conditions, soils here are generally calcarious throughout the column, and are greyish in colour with a layer of precipitated calcium carbonate in the sub-surface horizons. Their pH value ranges from 7.5 to 8.5. A large number of sand dunes of aeolian origin are found superimposed on the sandy-loams to silty-loams. These are generally deficient in organic matter and have medium available phosphorus and potassium.

Thus, the physical resource base of Punjab has manifold implications for its agriculture. The plain topography explains the high proportion of its cultivated area while fertile soils contribute substantially to its agricultural productivity, especially when irrigation is so well developed by harnessing the water resources. Irrigation is, in fact,
sine qua non of agriculture in most parts of the state where rainfall is inadequate, seasonally concentrated and unreliable.

THE PEOPLE

According to 1971 census, Punjab has a population of about 13.55 million (2.07 per cent of India's population on 1.6 per cent of the area), out of which 10.33 million (76.3 per cent) live in over twelve thousand agglomerated villages and 3.22 million (23.73 per cent) in 108 urban centres. Although the percentage of urban population in the state is higher than the Indian average of 19.9 per cent, yet more than three-fourth of its population is rural.

The Sikhs (8.16 million) constitute 60.2 per cent of the state's population. The Hindus (5.09 million come next and account for 37.54 per cent of the total population. About 88 per cent of the Sikh population lives in rural areas and is engaged mostly in agriculture. On the other hand, about 42 per cent of the Hindus are urban by residence. A considerable proportion of them are employed in trade, commerce and services. Christians (mostly converts from the scheduled castes) and Muslims constitute only 1.2 per cent and 0.8 per cent of the population, respectively. The dominant agricultural castes in the state are the Sikh Jats, Sainis, Raiputs, Kamboj, and Labanas. Jats and Raiputs have somewhat larger land holdings, while Sainis, Kamboj and
Labanas are small cultivators.

With an arithmetic density of 698 persons per square mile (269 persons per square kilometer) and nutritional density of 866 persons per square mile (334 persons per square kilometer) of net area sown (against the Indian average of 178 and 394 respectively) Punjab is one of the densely populated states of the country. (Maps 13 and 14). Its plain topography, fertile soils, fairly developed irrigation and consequent high agricultural productivity, and a long history of settlement are mainly responsible for the dense concentration of population.

Among different parts of the state, the Bist Doab and the Upper Bari Doab are more crowded than the Siwalik hills, adjacent foothill plain and most of the Malwa tract. The pressure of population is intense in the Upper Bari Doab and the Bist Doab, which have been experiencing considerable out-migration for the last many decades. By contrast, the Malwa tract, because of relatively favourable man / land ratio (arithmetic density of 176 persons per square kilometer

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and

as against the state average of 269) and offering scope for extension of cultivation on new lands, experienced agricultural in-migration (Maps 15 and 16). Nevertheless, Punjab on the whole has experienced net out-migration during 1951-71. The Punjabis out-migrated mostly to the neighbouring states of Haryana, Rajasthan and western Uttar Pradesh where new lands awaiting cultivation offered scope for settlement. Not only that, the adventurous Punjabi people have also emigrated to distant lands, such as United Kingdom, United States of America and Canada. There was some intra-state migration also from the crowded northern parts to the less populated southern zone and from densely populated upland plains to the promising flood plains. The more enterprising farmers of the north played a significant role in transforming the agriculture of the south, directly by exploiting new lands and indirectly by demonstrating the improved methods of cultivation to the local people in many areas. The process of out-migration was instrumental in relieving somewhat the pressure on land. Besides, out-migrants (especially in service and business) remitted large sums of money to their relatives, a larger part of which was invested in the development of agriculture.


8 Mehta, Swarnjit, op.cit., p. 29.
PUNJAB
Agricultural Workers as Percentage of Total Working Population
1971
DATA BY TAHSILS

PUNJAB
Cultivators as Percentage of Total Working Population, 1971
DATA BY TAHSILS

PUNJAB
Agricultural Labourers as Percentage of Total Working Population
1971
DATA BY TAHSILS

PUNJAB
Scheduled Caste Population as Percentage of Total Population, 1971
DATA BY TAHSILS

Source of data: Census of India, General population Tables, Punjab, 1971
Part JI-A
The 1971 census reveals that only 28.8 per cent of Punjab's population consists of workers. It is mainly because the proportion of young population (41.2 per cent of the state's population is below 15 years) in the state is high, out-migration in the working age group has been considerable and female participation in work is negligible. Nearly 63 per cent of the total working force of the state is engaged in agriculture (42.8 per cent cultivators and 20.0 per cent landless agricultural labourers. Map 17, 18 and 19). Agricultural labourers are mostly from the scheduled castes who constitute nearly one-fourth of the total population of the state (Map 20). Besides, 11.3, 2.3 and 12.0 per cent of the total workers of Punjab are engaged in manufacturing, trade and commerce and in other services, respectively.

Thus, densely populated, predominantly rural, having limited land per head and with considerable stress on its cultivated land, Punjab is impelling out-migration. Redistribution of population within the state for a more balanced pressure on land was another notable feature of the state. However, the movement of the state's folk may be understood in the context of the strong zeal and enterprising nature of the Punjabi people to improve their living standard.

THE ECONOMY

Man, within the framework of prevailing environments
and available technology, tries to evolve an economy which serves him the best. In the case of Punjab, agriculture has come out to be the dominant economic activity largely because of its favourable physical setting, considerable development of irrigation and hard working rural people.

Agriculture

With 76.3 per cent of the total area under net cultivation, 63 per cent of its people directly dependent upon soils and about 62 per cent of its gross income derived (at 1966-67 prices) from this sector, agriculture dominates the economic scene of the state.

With 52.9 per cent of its net area sown under irrigation in 1966, Punjab was the most irrigated state in India. As a result, agriculture in the state has stabilized and intensified. Canals, wells and tubewells, with almost equal importance in terms of irrigated area, are the major means of irrigation. Canals and wells are traditional while tubewells are mostly a post-Independence development.

Growing demand for land as a consequence of fast increasing population and extension of irrigation brought about almost all the culturable waste lands and fallow lands in the state under regular cultivation. Besides, there has been a notable trend towards intensification and diversification.

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9 As this thesis exclusively deals with agriculture: its patterns and trends, only a brief note on this aspect is attempted here.
of agriculture.—Accounting for nearly two-third of the total cropped area, food grains dominate the cropland use. Wheat is the leading food grain crop of Punjab. It alone covers about 25 per cent of the total cropped acreage (40 per cent of the food grain acreage). Embracing 8.2, 8.0, 7.8, 5.9 and 3.5 per cent of the state's cropland respectively, maize, wheat-gram, gram, rice and bajra are the other major food grains. Cotton, groundnut and sugarcane, covering 8.8, 3.7 and 3.0 per cent of the total cropped area respectively, are the outstanding cash crops of the state. Occupying about one-sixth of the total cropped acreage, fodder crops highlight the importance of livestock in the state's farm economy.

Livestock

Accounting for nearly 11.0 per cent of the gross income (at 1966-67 prices) of the state, livestock constitute an important aspect of Punjab's farm economy. Besides supplying meat and milk, domesticated animals furnish most of the power required on the farm. Farming operations are likely to paralyse without draft animals. Every farmer has to keep at least a pair of draft animals and a couple of milch cattle to meet the requirements of his farm house. In 1966, Punjab had a livestock population of about 7.5 million (excluding poultry). Of this, cows, bullocks, bulls, and buffaloes account for 82 per cent, sheep and goats for 14 per cent, while camels,
horses, ponies, donkeys, mules and pigs for the rest. In addition, the state had 1.68 million poultry birds. She-buffaloes as milch, and bullocks as draft animals are the dominant livestock types raised in the state. Buffaloes, bullocks, bulls and cows are kept usually by the cultivators, while sheep and goats, which are considered inferior cattle, are mostly raised by the landless scheduled caste people. Goats and sheep furnish most of the meat supply. Some goats are also kept for milk. Dairy farming, typical of western nations, is practically missing. Milk selling in Punjab is largely a semi-commercial type of activity. People in the villages surrounding urban centres raise more of dairy cattle to meet milk requirements of the urban population. Poultry farming, particularly around urban centres, has witnessed a noticeable development during recent years.

**Industries**

The industrial sector accounts for 10.5 per cent (at 1966-67 prices) of the gross income and employs 11.3 per cent (as against the national average of 9.5) of the working force of the state. Industrialization in Punjab is mainly a post-Independence phenomenon. After partition, Amritsar, Ludhiana and Batala were the only industrial towns of some eminence left with the Indian Punjab. The planned efforts of the state government (by way of distributing liberal loans and imparting technical training) during the post-1947
era responded well by the enterprising people gave momentum to industrialization. Excellent road and railroad network, abundance of agricultural raw materials and increasing availability of hydro-electric power furnished sound basis for the development of small scale industry. The lack of a mineral resource base, however, has remained a snag for the development of heavy industrial complexes. In 1966, there were 3544 registered industrial working units in the state which employed 103,654 workers. Of this, only 63 industrial units are designated as large and 59 as medium. Besides the registered working units, the state also has a large number of unregistered small scale household industries as well.

To a considerable extent, industries in the state are either based on raw materials derived from agriculture or are for manufacturing agricultural implements. Food processing, cotton ginning and pressing, textiles (woollen and cotton), agricultural implements and engineering goods, chemicals, transport equipment, sewing machines and leather goods are the dominant forms of manufacturing carried on in Punjab. Almost all the 80 cotton pressing and ginning

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10 An Industrial unit is small if capital investment in it is below 0.75 million rupees, medium if between 0.75 to 2.5 million and large if above 2.5 million ("Directory: Large / Medium Scale Industrial Units in Punjab", Directorate of Industries, Punjab, Chandigarh, 1968).
mills of the state are located within the cotton growing areas of the Malwa. Similarly, rice shelling concerns are found largely in the rice growing areas of the Upper Bari and Bist Doabs. Food processing of various kinds (sugar refining, milk processing, oil and vanaspati mills, flour mills etc.) are found concentrated in northern and eastern parts of the state.

Out of the 122 medium and large scale industrial units in Punjab in 1966-67, 41 are of textile manufacturing (woollen 31 and cotton 10), 26 are of food processing, 18 are of basic metals and metal products, 14 are of machine tools and agricultural implements and the rest are of transport equipment, leather and rubber products, sewing machines and chemicals. Ludhiana, Amritsar, Jullundur, Phagwara, Kapurthala, Patiala, Bhatinda, Rajpura, and Malerkotla are the chief industrial towns of the state.

Ludhiana. With 29 medium and large scale industrial units, Ludhiana is the biggest industrial town of the state. Its central position among various towns of the state, location on the broad gauge rail route linking it with other parts of the country, and relatively safer situation in relation to troubled international border with Pakistan, mainly accounts for its growing industrial eminence. It is a woollen hosiery centre of national fame.
Cotton textile, sewing machines, bicycles, agricultural implements, machine tools and vanaspati mills are the other important forms of manufacturing located in the town.

Amritsar. Located in the heart of the pre-partitioned Punjab, this city was the most flourishing industrial town during pre-Independence era. However, after partition, the industrial growth of the town has been adversely affected by its proximity to the international border with Pakistan. Inspite of its locational disadvantage, the city along with its industrial satellite of Chheharta, has 24 medium and large industrial units. It is the second largest industrial town of the state. Amritsar is an important woollen and cotton textile centre. Chemicals, basic metals, food processing and transport equipment concerns are also located in the city.

Jullundur is another important industrial centre. It is famous for metal fabrication, basic metals, agricultural implements, electric appliances, engineering and sports goods.

Batala. Located on the Amritsar-Pathankot railway line, Batala is an industrial town of national fame for manufacturing quality machine tools and agricultural implements. Six out of a total of nine medium and large scale agricultural machinery manufacturing units of Punjab are located in this town. Most of the required raw materials are imported. A
sugarmill has recently been added to its industrial complex.

Phagwara with a sugarmill and a textile manufacturing unit, Kapurthala with leather and rubber goods manufacturing, Patiala with food processing, Malerkotla with household industries and Nangal with a fertilizer plant, are other important industrial towns of the state. Bhatinda is emerging as a big industrial centre for cotton textile. A thermal plant in this town is near completion and a fertilizer plant has been given clearance.

Thus, industries in Punjab are essentially small enterprises with emphasis on the manufacturing of engineering articles, agricultural implements, woollen and cotton textiles and food processing. Most of them are either dependent upon agricultural raw materials or are oriented to the needs of agriculture. Punjab is renowned for the export of quality hosiery and engineering goods.

Transport

With 4,292 miles (6,923 kilometers) of metalled road length (22.1 miles of metalled road length per 100 square miles of area) in 1967-68, Punjab was fairly developed from the viewpoint of road transport. Only 12 per cent of the state's villages fall at a distance of more than 2 miles from a road. Roads have played a notable role in

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Punjab
Proximity to Metalled Roads
1951

Areas more than 3 miles away from the Metalled Road
Punjab
Proximity to Metalled Roads
1966

Areas more than 3 miles away from the Metalled Road
commercialization of Punjab's agriculture. Besides facilitating the marketing of agricultural produce, roads opened the countryside to the outside influences and eased the movement of essential materials required on the farm. In addition to roads, the state has also a considerable length of railways.

Bullock-carts remain the dominant means of transport on the farms. However, with increasing road length (from 1,619 miles in 1951 to 4,292 miles in 1966), wooden wheel carts are being gradually replaced by rubber wheel ones, tractors and trucks (Maps 21 and 22). Bulk of the intra-state transport in Punjab is through motor vehicles, whereas the inter-state movement of men and material is mostly by railways. A large proportion of the passenger traffic in the state is carried on by a fleet of public and private buses. The Punjab and the Pepsu Roadways public undertakings jointly handle about 60 per cent (400,000 people daily) of the passenger traffic.

Apart from its internal integrated road system, the state is also effectively linked by railroads and roads with the neighbouring states of Haryana, Himachal Pradesh, Jammu and Kashmir, Rajasthan and also with other parts of India. Inland water transport in the state has remained underdeveloped. The wide seasonal fluctuations in river flow
have proved detrimental to navigation. Unfortunately, the canals also have not been designed to handle navigation.

**Trade and Commerce**

Because of its semi-commercial agricultural economy, Punjab trades mostly in agricultural commodities. Wheat, cotton and cotton products, rice, maize, bajra, pulses, oilcakes, livestock and livestock products are its major items of export to other parts of India. The state also has an exportable surplus of a number of manufactured items, such as bicycles, sewing machines, electric appliances, machine tools, sports goods and footwear. Hosiery goods of Ludhiana are of very fine quality and compete successfully in the world market. By contrast, Punjab is badly deficient in industrial minerals. It has to import large quantities of coal and coke, iron and steel and other basic metals to feed its well developed small scale industrial units. Other significant items of import are tea, salt, tobacco, rubber, sugar, and cement. Thus, the state exports both agricultural and industrial goods, but has to import industrial raw materials.

**Individuality of the Region**

With its distinctively progressive and prosperous agriculture, Punjab is one of the most prized areas of the country. Plain topography, fertile alluvial soils, a well developed system of irrigation, an energetic and enterprising population, relatively higher degree of mechanization and
application of science and technology on the farms, and a well developed road transport network have imparted a sound agricultural base to the state. Punjab is the biggest surplus producer of wheat in the country. It also raises a sizeable surplus of other food grains such as rice, maize and gram. However, erratic behaviour and inadequacy of rainfall; deep, limited and brackish sub-soil water in some parts; waterlogging and floods in a few other sections; and shortage of electric power pose serious problems for the progress of agriculture in the state.

Punjab's agriculture has not only imparted relatively sound economic status to its farmers, but also, among other factors, has given a strong stimulus to its industrial development. The industries in the state are mostly small scale for which Punjab is well known in the country. These are either agro-based or are for manufacturing goods needed for agriculture. Engineering and hosiery goods are also manufactured and exported in substantial amount. Punjab is undoubtedly heading towards an agro-industrial economy.

Despite all this, the accelerating growth of population has been intensifying pressure on land resources. Declining per capita land, aided by a common desire to improve living standards has generated considerable out-
migration. A large number of agricultural families of the state migrated for better prospects to newly reclaimed lands in other parts of India, such as the flood plain of the Ghaggar in Haryana, Terai area of Uttar Pradesh and Ganganagar district of Rajasthan. Some redistribution of population (mostly rural) within the state, from more crowded north to less populated south, was another notable feature. In addition, a large number of educated ruralites have migrated for services not only to other states of India, but also to overseas lands.