

Factors of Land Use

LAND USE is conditioned by the association of two sets of factors (Fig. 2.1)—first, physical factors such as geology, relief features, climate, soil and vegetation which limits the use capabilities of land and secondly, cultural factors which include both economic and institutional factors. Cultural factors represent the length of occupancy of the area, demographic and socio-economic conditions, institutional framework and the technological levels of the people which determine the extent to which the land can be utilized.¹

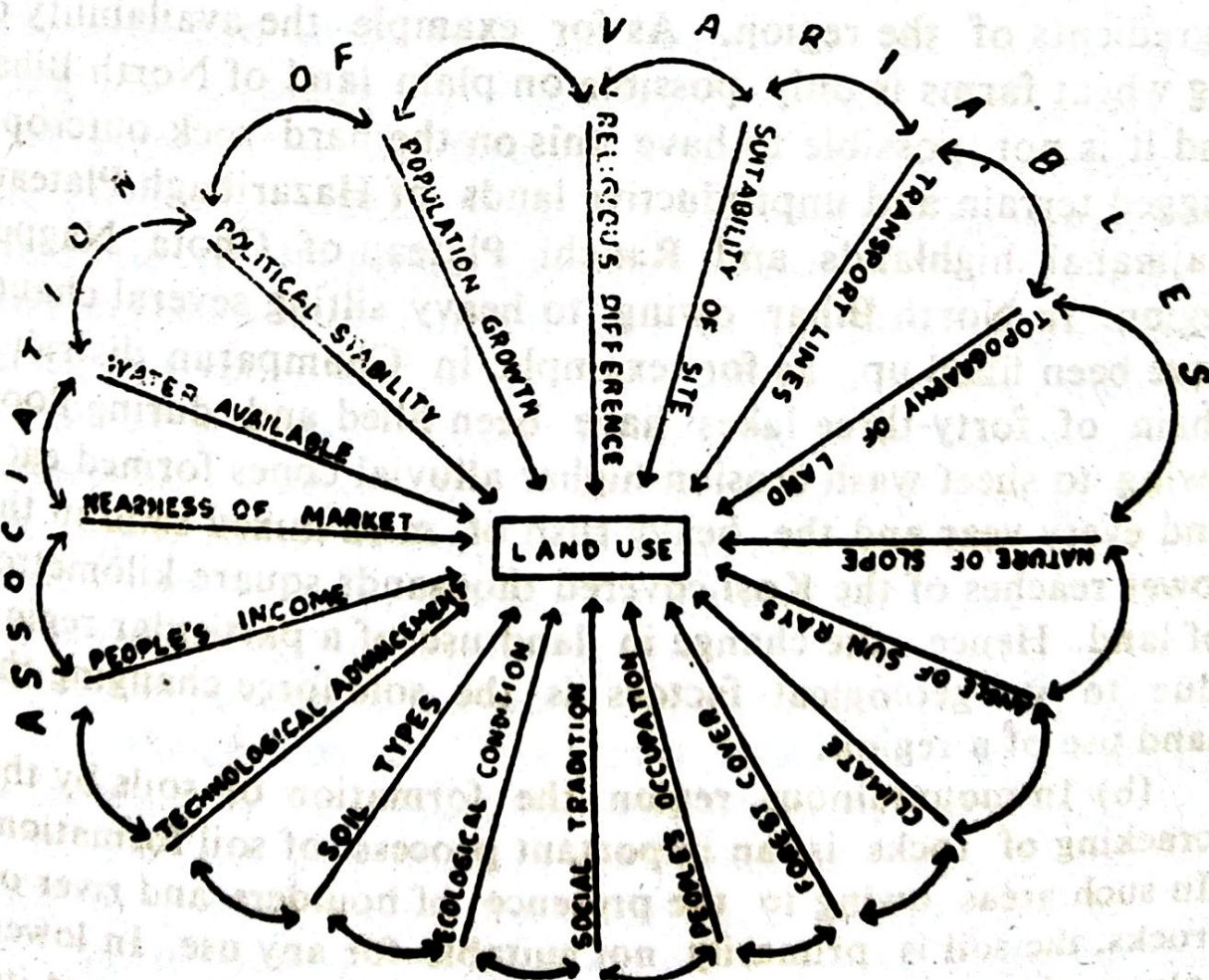


FIG. 2.1 : Ecological Balance of Land Use

Thus, in general, there are three factors of land use, e.g. (1) Physical factors which include geology, relief surface, drainage underground water, climate, soil and vegetation, (2) Economic or Locational Factors, (3) Institutional Factors.

PHYSICAL FACTORS

Geology : Geological structures have both indirect and direct influences on land use. The indirect influences may be categorised into:

- (a) ground having presence of absence of any geological occurrences,
- (b) formation of soil from the parent source region,
- (c) influence on permanent water table, and
- (d) surface water supply and underground drainage.

(a) Land utilization of any region is the direct product of its geological structure and man is the main source behind moulding land use, according to their need and the geological ingredients of the region. As for example the availability of big wheat farms is only possible on plain land of North Bihar and it is not possible to have this on the hard rock outcrops, rugged terrain and unproductive lands of Hazaribagh Plateau, Rajmahal highlands and Ranchi Plateau of Chota Nagpur region. In North Bihar owing to heavy silting several chauras have been filled up, as for example, in Champaran district a chain of forty-three lakes have been filled and during flood owing to sheet wash erosion higher alluvial cones formed each and every year and the heavy rush of mica mixed sand in the lower reaches of the Kosi covered thousands square kilometres of land. Hence, the change in land use of a particular region due to its geological factors is the sole force changing the land use of a region.

(b) In mountainous region the formation of soils by the cracking of rocks is an important process of soil formation. In such areas owing to the presence of boulders and river of rocks, the soil is primarily not suitable for any use. In lower plains, the flowing away of fine silt, by the streams and its deposition in the form of alluvial soil is of great importance for a judicious land use scheme. In case the parent rock is

calcareous then in the lower plains or valleys calcareous soil will form and in case of laterite rocks on the higher land, in lower areas red soil will form. Originally, the areas of sand dunes are not suitable for crop raising but with the help of irrigation good crops may be raised e.g. in the Punjab, Rajasthan and Haryana areas of India.

(c) The texture of drainage and availability of underground water are the products of their geological conditions. Underground water is generally available in three types of rock structures, e.g. in aquifer, sandy layer and in calcareous rocks, because these are sufficiently porous to hold water. These rocks also allow the passage of water through them, if there is lack of impervious layer of rocks in between the two continued beds. There are three sources of obtaining underground water (a) surface well, (b) deep tube-wells and (c) springs.

Surface well : In the surface well or shallow wells the supply is from the sandy layer or aquifers near the surface in the bed of gravel.

Deep tubewells : In deep wells the water supply is mainly from aquifer or sandy layer at great depths. In case the rocks are arranged in the form of a basin the supply water may be huge in amount. After shipage through impervious rocks fountain results giving rise to artesian wells. In Australian artesian basin and London basin of England such wells are numerously found but in London basin, the artesian wells are now not giving water, naturally, but the pumping process is necessary. So far as the water giving capacity is concerned the difference is clearly visible in the Chalk country of England. In case of fissured Chalk, water comes out freely but in case of hard rock the ejection of water is low.

Springs : When underground water comes on the surface by means of shipage through impervious rock structure it is known as springs. To mould the land use of any region this source of water has great value in the respective areas. There were 1,000 deep wells in the Santa Clara Valley of California in 1910 but by the end of 1930 all the wells dried up and the ground gradually and slowly started sinking at the rate of 5 feet in 20 years time. Hence, this example is to be kept in mind, especially in India where the sinking of tube-wells is

use. Such as a PH value of 4 in any soil means the presence of acid in the soil, PH value of 7 means neutral soil. In most of the agricultural areas, the PH value in soils varies from 5 to 5.8. What type of fertilizer should be used in a soil is largely dependent upon the PH value of the soil. Besides this, for the healthy growth of plant life 17 chemical elements are necessary which is generally known by chemical analysis and the character of soil may be changed by the use of fertilizer and tillage practices. In view of this U.S. Department of Agriculture has grouped the soil of the U.S.A. into eight categories according to its capability and suitability of land use. In this classification, categories first to fourth are suited for crops, pastures, woodland and wild life and categories 5th to 8th suited for pasture, woodland and wild life, but are not suitable for cultivation.

Land tillage varies according to the nature of the soil and the purpose as follows:

- (a) to change the structure of soil,
- (b) to kill weeds, and
- (c) to manage crop residues.

Geological structure of a land determines the method of tillage. In case of shallow soils on the upper layer with hard basement deep furrowing is not suitable and, therefore, one has simply to use hoe, spades, etc. Deep layer of alluvial soil alone permits deep furrowing by heavy implements.

The rotation of crop is also necessary for the continuous maintenance of soil fertility. Thus, it is advisable to use specific type of crops on specific type of land, because in this way, land can produce good crops and add nitrogen and humous, etc. to the soil according to the nature of crops.

Soil management needs the categorisation of land in accordance with capability. The practice of soil conservation should be adopted after assessing the geological structure of the land, physical and chemical properties of soil and the need to conserve soil which are immune to erosion. In this way the steep slopes may be left for afforestation work, slopes on the hillides for raising grass to breed cattle and in the plains the agricultural operations should be permitted.

RELIEF FEATURES

The intensity of land use and the distribution of population show that 75 per cent population of the world live in plain land up to 1000 feet from mean sea level. This is due to the availability of sufficient amount of water for the performance of agricultural operation in comparison with the desert environment. But all plains are not equally habitable such as the Arctic, frost-frozen ground, tropical dense forests, deltas and coastal plains have contained excessive moisture in the air. In such areas the problems of surface and underground drainage area always there to determine the extent of land use. In such an environment the arable farming is difficult and the ripening of crops becomes uncertain. In these areas, swampy ground, marshes, grass and thick forests are found. In order to make the land habitable, people have cleared forests, circumvented hills, constructed river-embankments, reclaimed swamps and marshy areas for the adjustment of resourceful land use. Further, some examples have been given here to determine the possibility of limitations in land use.

Coastal plain : The poor drainage and unfertile soil are the two hinderances of proper land use in the coastal lowlands. Here the drainage is related to slope and unfertile soil to the sandy waste. In this way on Malabar, Coromandel and Konkan coasts wilderness still prevails along with hunting and commercial development of ports. In all around the port site, intensive land use is found.

Deltas : In deltaic plains, the characteristic feature is the poorly drained land in between levees where the soil is fine and unconsolidated. The rivers are generally divided into numerous sluggish channels with abnormally wider course and the unfertile sand deposits abounding in sand bars and levees. Here, the agricultural plots are generally found in a linear fashion along narrow embankment away from the swampy ground. Deltaic plains are mostly sparsely settled but high population density is also found as in the Ganga delta and the Nile delta. Northern side of Sunderban delta is an example of reclaimed deltaic marshy ground for better land use.

Flood plains : Flood plains are the products of rivers coming from the higher ground and such rivers deposit vast amount of sand and silt especially during flood. The meandering

streams and oxbow lakes are found, as these are the signs of senile stage for rivers to meet with the deltaic plains. Owing to lesser variation in slope, the problem of surface drainage is low and owing to periodic renewal of alluvial soil, excellent agricultural regions are formed. On such plains bumper crops are raised, roads built, embankment laid down on the side of rivers and the locations of towns and rural settlements are found above normal flood level. North Bihar is a good example of flood plains in India, where the general land use is determined by the availability of water, meandering streams, river embankments and permanent water-bodies e.g. Kabartal and Baraialal in Vaishali and Begusarai districts of North Bihar respectively. Oxbow lakes are also found in Vaishali district along the Burhi-Gandak river. Similarly, marshy grounds are numerous found in the Kosi flood plain of Saharsa district.

Piedmont plains : The materials deposited on such plains range from coarse granular to fine sands and gently sloping plains are found away from the piedmont area. In moist region, this is best suited for agricultural use but for rain-shadow zones, irrigation is much needed.

Glaciated plains : The source of the soil is found in mountainous belt from where the coarse material drifted downwards and deposited in the form of glaciated moraines, moors, terminal moraines along with the deposit of smooth silt and sand. Generally, forest cover instead of good agricultural land use is found then Glaciated plains of North America and Kashmir valley in India, good agricultural land use is found there but morainic area is preferred for livestock raising and dairying.

PLATEAU AND LAND USE

Plateaus are higher horizontal land mass, evolved due to tilt or uplift and are composed of hard rocks. In youth stage this may be a featureless flat topped country but in maturity plateaus may become badly dissected. Two plateaus are often separated by narrow steep sided valleys. It is not suitable for farming and in most cases plateaus are erosional surfaces. Only on rolling plateau deep layers of soils are found and it is for this fact that it becomes suitable for agricultural purposes. Plateaus are of three types :

Factors of Land Use

- (a) mid-Humid Latitude Plateaus,
- (b) mid Latitude Dry Plateaus, and
- (c) low Latitude Plateaus.

Owing to heavy rains humid plateaus show dissected topographic features such as Appalachian, Ozark, Ouchita, Chota Nagpur, Shillong, etc. Such plateaus are mostly covered with forests or plantation crops where the production of food crops is not possible.

In mid latitude dry plateaus, higher percentage of grass land favours widespread animal rearing. Granchaco of Argentina and Australian Plateaus are the homes of sheep ranchers. Agricultural land use in such areas is possible only after irrigation is supported by glacial streams. Hay, wheat and sugarbeet are the important crops grown. The steep escarpments on the marginal belts of the plateaus restrict the construction of roads and railways.

Low latitude plateaus are mostly found in the tropical areas. In these areas subsistence agricultural practice is found. In the areas of European colonization e.g. in south-east Asia Plantation agriculture has also developed. Scattered patches of cultivable land are also found and that is controlled by the gradient of slope and depth of soil layers.

MOUNTAIN AND LAND USE

In mountainous country, hills and valleys are predominant factors in determining the intensity of land use according to slope. Thus agricultural practice on rugged terrain is totally impossible while terraced cultivation on small patches of land is the rule. Tracking of bulky animal is not possible on mountain slope, while donkeys, goats and sheep have adopted themselves to the slopes easily, on account of their light body. The stony-waste soil, rough terrain, dense forest cover and land restrict agricultural operation in the hilly region while in the tropics, sufficient amount of rainfall favours the cultivation of land on mountain slope, but the gradient of slope is the most determining factors of land use in the hilly region. The location of hill stations, points of scenic beauty, construction of road on the ridge, tunnels for railway siding and road are the important features of land use in mountainous region.

CLIMATE AND LAND USE

The climate determines the utilization of land. Under the impulse of climatic conditions the early distributions of dense population and the maximum use of land "seems to be confined approximately to a zone bounded by the Tropic of Cancer and the fortieth parallel of latitude. The climate is warm enough so that many plants can quickly complete their cycle of growth and take advantage of the interval between periods of seasonal rainfall".² Thus, under favourable climatic conditions, especially in India as many as four cycles of the growth of plants, viz., bhadai, aghani, rabi and garma corresponding to the rainy, winter, spring and hot weather may easily be discerned. In this way, it can be said that climate is the dominant factor of determining agricultural land use.

LOCATIONAL FACTORS

Land use is the product of varying factors in which locational factor has its own importance. Lands of economic importance are generally distributed around the centres of economic activity. Generally, costs are involved in moving the land products to the market through transportation lines and bringing capital and labour to the land. All these involve locational problem in land use study.

Man is the producer of goods on a particular piece of land and it depends upon him to select whether his earnings will be large, assured, and better working conditions available. Man is also consumers of such products and it depends upon him to select settlement site, where living is secure, cheap and easily agreeable. It is also found that a man living in any climate from generations to generations never wants to shift his settlements, this is due to his habitual living and utilization of land. All these enterprises and locational decisions are generally determined by the concepts of economic specialization and comparative advantage.

ECONOMIC SPECIALIZATION AND COMPARATIVE ADVANTAGE

Economic and functional specialization are common phenomena in the modern world. Individuals starting a business for themselves often perform a wide variety of tasks. Once their business expands and prospers, new employees are usually

hired. This way, a division of labour takes place and each employee tends to do that type of work which he can do best in comparison with his fellow employers. Many of the principles that apply to individual specialization also apply to area specialization in production.

PRINCIPLE OF COMPARATIVE ADVANTAGE

The crops generally produced in local area have predominance of higher income in comparison with those in other areas. This is known as the principle of comparative advantage and owing to this fact, some areas specialize in the production of some crops, and look toward other area for so many products they use.

This principle can be best understood by taking the examples of two areas and two products respectively. Here we may assume that area C & D each produce maize and paddy crops according to their need and each area receives the net output per unit of input indicated below:

Crops	Area	
	C	D
Maize	50	50
Paddy	55	55

In these cases not even a single area possesses production advantages, because they have no specialization in these crops. In case of change in production situation in area D as indicated below, it is profitable for each area to specialize. Area C finds it profitable in producing paddy, while area D should concentrate on producing maize crops.

Crops	Area	
	C	D
Maize	50	55
Paddy	60	50

In reality, there is occasionally some advantage for more than one use in any area while most areas fail to enjoy any absolute advantage for any use.

SCOPE OF COMPARATIVE ADVANTAGE

The comparative advantage is frequently sought in terms of natural advantages, e.g., favourable climate, soil and topography. The approach of comparative advantage is much more affected by the human judgment and policies. This may also be measured in terms of the economic ability of an area to compete with other areas in the production of given products within the control of environmental location, transportation cost and favourable institutional arrangements.

Natural advantages: The availability of minerals in sufficient quantity favours the use of land for mining. Salubrious climatic conditions in a region favours recreational developments. A port with productive hinterland favours urban development, e.g. Cochin, Kandla, Machhliptam and others.

Favourable production combination : Natural advantage is known as comparative advantage in relation to the factors which enter into production. Shortage of skilled labour, capital, credit and marketing facilities may easily outweigh natural advantage of an area.

Transportation advantage : Owing to locational advantage in relation to transport lines, some areas have good linkage and in transporting goods from their area of produce to the market, generally, local producers get more benefit in moving the goods in lesser time and fresher condition than the outside competitors with their savings in the transportation cost. In supplying milk and vegetables to the market, this situation generally arises.

Institutional advantages : Institutional factors affect land use indirectly, such as tariff barriers, trade restrictions of field produce etc. as these hamper outside competition. This enhanced the production advantages enjoyed by the local producers such as protective tariff often gives definite market advantages to agricultural and industrial enterprises.

Principle of first choice: The supply of any products from an area shows the demand of land for a particular use and this is said to be the first choice of the area. This principle is applied for comparative advantages and the best use of land. Mining may be the first choice in areas of proved iron-ore deposits. Mountain passes may have first choice of railway line or roads and others. This situation arises due to higher demand and

lesser supply of specialized use of land. Thus, from an individual point of view, a waterfall may be suitable for power site but the society may like to use it as the place of scenic attraction.

Spatial relationship of economic factors affecting land use: Land utilization of any region reflects locational differences with respect to market or point of consumption. This is particularly true when one deals with the land areas of the like productive capacity located at different distances from the market. Transportation cost is the key factor in these cases. The cost generally increase with the distance from the settlement site, hence the field located near the market has comparative advantage over the land located away from the market. This means that areas close to the market receive a higher advantage of price for the produce and thus yield more economic rent for their produce and have higher resource value than the areas located away from the market. This aspect of location factor is close to the idea of Von Thunen's concept.

In locational decision for a particular type of land use, these factors are constantly at work and producers often find that they must gear their operating decisions to national and international conditions. Instead of worrying about the local market demand for their products, businessmen often find their market in distant cities and towns. They never calculate their prospect of profit in terms of local competition but their market prices are influenced by the industrial employment, public price policies and changes in international supply and demand core.

INSTITUTIONAL FACTORS

The collective or social action of various groups that influences and controls the individual behaviour may be described as institutional factor. According to Griffith Taylor it is a purposeful cooperative behaviour.

It is often desirable to classify different types of institutional norms available in our society into primary and secondary groups. Primary group is made of fundamental institutions e.g., governmental, industrial, educational and family. Each of these primary institutions is associated with a subordinate secondary institution. The governmental institu-

tion involves a region of subordinate institutions such as constitution, legislation, political parties, civil service systems, tax regulations, tariff control and social security. In the same way religion involves several secondary institutions, such as beliefs, caste structure, rituals, symbols and taboos. In general an institution represents established ways of doing anything. This includes the working rules of the society under the control of economic, educational, family, legal political systems.

IMPORTANCE OF SPECIFIC INSTITUTIONS

The institutional factors which affect the ownership and use of land resources are sometimes described as landed institutions. In this way, the landed property right is the fundamental factor affecting land use, while some economic and non-economic factors also have greater impact in the ownership and land use. The government, law, customs, religion and education have also left their impact on judicious use of land resources.

Government and political institution : There is a considerable impact of these institutions on land use. This can be viewed from two aspects: (a) the overall impact of government policies and restrictions on public and private decisions regarding land resources, (b) the impact of organization and framework of government on the development and administration of public land resource policies.

Effects of Government policies and restrictions : Every decision of the government, especially that which is related to rural areas has affected the ownership and use of land resources e.g., levy can be used to force land into more intensive uses. Inheritance taxes can force the breaking up of landed estates and a vast ownership of private land.

According to the requirement of the society government may reserve large areas of public lands for parks, afforestation work, mineral exploitation, grazing and pasture land and for national parks and sanctuaries. For the use of military and defence purposes even private land may be acquired. Government has made several resource development programmes e.g. the construction of Bhakra-Nangal dam in the Punjab and Himachal Pradesh, D.V.C. in Bihar and West Bengal Hoover

dam, etc. This also includes the building of highways, the digging of canals, navigation and other facilities.

In the U.S.A. the State Governments have used their power to develop land use zoning ordinance, subdivision regulation, building codes, restriction in forest cutting, etc. as the guidelines for the private land use in the public interest. Other important regulation is for the provision and maintenance of parks and recreational areas, the location of building and streets and the management of public parking areas in urban centres.

Framework of Government : The organisation capacity and assignment of power at various levels, affect land resources according to their policies for land. The federal government can operate and administer its own land, set up and dispose policies and acquire private land for public use, etc. Government may provide fund for land use research, housing and reclamation projects, conservation of agricultural land, control of price, highway and canal construction scheme, programmes of agricultural development and the provision of land mortgage bank, cooperative bank, etc. These have both direct and indirect influences on land ownership and resource development. The problem of land use arises here in the border areas of two countries because no country can take independent view in the utilization of land in such areas. In Indian and other areas of the World State or local government, by their invested powers influence the land use to some extent.

Law and legal systems : These systems have their impact on land resources. The government is the framers of the constitution and in turn is governed by the set rules of the constitution. With this measure the government safeguards the claims made by a person or the society and favours property right on land against arbitrary action. Besides this, the government make laws, promulgate ordinance relating to the acquisition of lands, land registration Act and leasing and mortgage of land.

Custom and habits : These facts also have impact upon land use practice of an area. As for example in India a rich person often favours the planting of flowers in front of his house while a poor man often grows vegetables. Owing to food habits in India the food crops are highly raised while in the

U.S.A., besides this, large area is left for pasture land, as the population density is low and for rearing cattle wealth and poultry the land is sufficient there.

In the surrounding areas of an urban centre it is customary to invest land in market gardening, while in the rural areas generally food crops are grown.

A few decades ago cotton clothes were rarely available, while today besides this synthetic fibres are also used and hence this requires excess land to establish factories, etc. In the same way the increasing use of coal, oil, rubber, dietary items, writing papers, newspapers, wools, flex and nylon have vari-ously changed the use of our land slowly, as our population is rapidly increasing. Property inheritance, land ownership are also affected by the custom.

Religious institutions : Affects land use in three ways—(a) ownership of land by religious institutions, (b) claims made by maths, temples, mosques, church and other religious organizations in the income of land and (c) religious beliefs affecting land use practices.

In historical times also particular sites were often regarded as holy spots. Today such sites are centres of religious repute e.g. Rameswaram, Deoghar, Rome, Mecca, Jerusalem and the Ganga river have become the local centres of pilgrimage. Graveyard and burial grounds have also been maintained for religious reasons and some quarters of productive land are retained for this purpose in many countries.

Educational institutions : The establishment of educational institutions, exert a considerable pressure on land, hence this affects the prevailing land use practices. Besides this, the specialized training of agricultural science, land tillage, crop rotation give an insight that induces the people not to depend upon traditional and customary way of agricultural practices and land utilization but to act according to their imagination. Thus technical abilities, resource development and urban planning have their direct influences on land use. The extensive use of mass communication media, e.g. public meetings, publication of newspapers and magazines, radio and television programmes, games and sports and film shows have increased the practice of new and improved land utilization techniques.

Other institutional factors : There are several other institutional factors which have considerable impact on land use. Family is an institution which provides incentive for settling down and carrying on its economic activities as commercial, industrial or agricultural. Among secondary factors transportation lines, banks and marketing facilities are important, which play a major role in determining the land use of particular area. These physical, economic and institutional factors control the success and failure of land use in any geographical region.

REFERENCES

1. V. Nath, Land utilization in India, *Journal of Social and Water Conservation in India*, Vol. I, No. 2, 1953, p. 4.
2. Paul Vidal de la Blache, *Principles of Human Geography*, London, 1959, p. 75.