
UNIT 9 LAND UTILISATION AND CROPPING PATTERN

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9.0 OBJECTIVES

After going through this unit you will be in a position to:

- explain the concept of land utilization;
- identify the categories in which land is used;
- explain the shift in land utilization pattern;
- explain the pattern of agricultural production;
- appreciate the changes in cropping pattern over time; and
- identify the impact of the changes in cropping pattern.

9.1 INTRODUCTION

The scope of bringing in more land into cultivation is limited in any country. The physical conditions, geographical location, population size and growth, level of

development, institutional framework, etc. determine the nature of land use in an economy. Moreover, the area available for cultivation is put to use for different crops keeping in view the quality of land, food habits of people and relative profitability of different crops. Thus, as food habits, relative prices and productivity undergo change, the cropping pattern may change over time. However, such changes should be commensurate with the land use planning in a country.

In the present unit we will learn about the land use and cropping patterns in India, particularly during the post-independence period. We will also bring out the probable reasons for the changes in these patterns.

9.2 LAND UTILIZATION PATTERN

In a broad sense the term land use pattern means the use of land resources under different ecological settings. The pattern of land use of a country at any particular time is determined by the physical, economic and institutional framework taken together. In other words, the existing land use pattern in different regions in India has been evolved as a result of the action and interaction of various factors, such as physical characteristic of land, the institutional framework, the structure of other resources (capital, labour, etc.) available. In addition, the geographical location of the region in relation to other aspects of economic development, viz., those relating to transport, industry, trade, etc. influence the land use pattern. A close scrutiny of the present land use pattern and the trends during the recent years will help us in understanding the Indian economic scenario.

9.2.1 Typology of Land Use

The total land in India can be divided into five categories from the land utilization perspective. These are: (i) Forests, (ii) Area not available for cultivation, (iii) Uncultivated land excluding current fallow, (iv) Fallow lands, (v) Cultivated Area.

The area not available for cultivation generally includes land put to industrial and other non-agricultural uses as well as barren and uncultivable land. Under the heading uncultivated land we include pasture, grazing land, tree cover and wasteland. On the other hand, fallow relates to land that is cultivable but is left unplanted. The cultivated land indicates the *net sown area*.

Let us look into the land utilization pattern for the year 1995. The total area of India is 328.73 million hectares (mha). The data available for land use classification for the year 1995 is for 304.83 mha. Of which forest area represent 22.43% (i.e., 68.39 mha.) (See Table 9.1). You can see from the table that the largest share of the total geographical area is occupied by the net sown area (46.8%) with 142.82 mha. On the other hand, the un-cultivated area comprising area under non-agricultural uses and barren and uncultivable land, represent 13.6 per cent of the total area. Other uncultivated land excluding fallow land which consists of i) permanent pasture and other grazing land, ii) land under miscellaneous tree crops and groves not included in net sown area, and iii) waste land is stretched over 29.08 mha. (9.6 per cent of the total geographical area). Of these, 11.24 mha. are under permanent pasture and other grazing land, 3.63 mha. under miscellaneous tree crops and groves and 14.21 mha. under wasteland. Fallow land occupies an area of 23.3 mha, i.e., 7.6 per cent.

9.2.2 Changes in Land Utilization Pattern

The picture that we observe for 1995 is quite different from that in 1950.

You can compare the land utilization patterns for the year 1995 over that in 1950 from Table 9.1. Some prominent features of the table are:

- 1) The area under forest cover has increased from 14.24 % in 1950 to 22.43% in 1995.
- 2) The net sown area, which represents area available for cultivation, has increased from 41.77% in 1950 to 46.85% in 1995. This has been made possible by bringing additional area into cultivation.
- 3) The area not available for cultivation has declined from 16.71% in 1950 to 13.54% in 1995. Here, the area under non-agricultural uses has increased while the area under barren land has declined. This implies that a large proportion of the barren land has been brought to economic use.
- 4) The area under uncultivated land excluding fallow land has declined. An important feature in this context is that land under miscellaneous tree crops, plantation, etc. has declined significantly from 6.97% to 1.19%.

There is also a marked increase in the gross cropped area by 56.26 mha. (131.89 mha. in 1950 to 188.15 mha. in 1995). The increase in the cropping intensity from 110.7 to 131.7 is an indication of *rabi* and *kharif* area put to cultivation. Development and construction of major, medium and minor irrigation projects has resulted in higher cropping intensity and more area under crops.

National forest policy lays down that the area under forest be steadily increased to 33% of the total geographical area of the country. There is now little scope for extension of cultivable area without creating imbalance in ecological settings. Intensive cultivation with extension of irrigation facilities and scientific methods of dry farming could meet the food requirements of the growing population.

Table 9.1 : Land Utilization Pattern (in mha)

Type of Land	1950		1995	
	Area	Percentage	Area	Percentage
A. Total Geographical Area	328.73		328.73	
B. Reporting Area for Land utilization	284.32		304.85	
1. Forest	40.48	14.24	68.39	22.43
2. Area not available for cultivation	47.52	16.71	41.28	13.54
a. area under non-agricultural uses	9.36	3.29	22.51	7.38
b. Barren and uncultivable land	38.16	13.42	18.77	6.16
3. Other uncultivated land excluding fallow land	49.45	17.39	29.08	9.54
a. Permanent pasture and other grazing land	6.68	2.35	11.24	3.70
b. Land under miscellaneous tree crops and groups not included in net sown area	19.83	6.97	3.63	1.19
c. Cultivable waste	22.96	8.08	14.21	4.66
4. Fallow land	28.12	9.89	23.3	7.64
a. Fallow land other than current fallow	17.44	6.13	9.77	3.20
b. Current fallow	10.68	3.76	13.53	4.44
5. Net sown area	118.75	41.77	142.82	46.85
C. Gross cropped area	131.89		188.15	
D. Cropping intensity (%)	111.07		131.70	

Source: Agricultural Statistics at a Glance:1999, Government of India

9.3 AGRICULTURAL LAND USE IN INDIA

In 1993-94, an area of 42.68 mha was under rice, 25.2 mha was under wheat, 33.5 mha was under coarse cereals and 101.49 mha under total cereals. An area of 23.4 mha was under total pulses; 124.8 mha was under total foodgrains, 2.94 mha under fruits, 4.2 mha under vegetables, 28.5 mha under total oilseeds, 8.36 mha under total fibers, 0.42 mha under tobacco, 3.74 mha under sugarcane, 2.36 mha under spices, 10.64 mha under other crops.

9.3.1 Scientific Cropping Pattern and Agricultural Land Use

In order to increase agricultural production from given land resources, it is necessary to use scientific cropping pattern. Cropping system approach holds many promises in this regard. The adoption of cropping system technology and its successful implementation depend on physical and socio-economic resources, which are available or are made available at the time when they are needed. Location specific and farm based cropping patterns have to be evolved with consideration of such determinants as land, topography, water availability, intensity and duration of sunlight, labour availability, cash or credit, power source and market demand.

Adequate resource utilization of a farm in integrated farming system with crops as major enterprise is the crux of the problem. Carandang (1980) has projected that the cropping system approach has two main components, viz., farm resources and production technology. Farm resources are of two types: physical and socio-economic. Physical resources include land, sunshine, and water. On the other hand, socio-economic factors include markets, labour, power, cash, etc. Production technology depends on nature of crops and varieties, tillers, fertility, weed management, insects management, disease control, inter-plant durations, water management, etc. Both farm resources and production technology need to be integrated on scientific basis.

9.3.2 Governmental Intervention for Scientific Land Use

A nation lives for thousands of years whereas individuals live for some decades. Therefore, individual activities should not be allowed to restrict the potentials for future generations. Any national government has to safeguard the interests of future generations without compromising the welfare of the present generation. Hence the need for better land use planning arise where both the public and private interests are taken care of.

In order to facilitate scientific and sustainable land use governments have promulgated various legislations. These legislations have been enacted mostly after Independence. Land Utilization Acts were passed in 1947 and 1949 respectively by Uttar Pradesh and Punjab governments. The Uttar Pradesh Soil Conservation Act, 1954 embodies soil conservation programmes. The states of Bihar and Punjab have passed Land Reclamation Acts. The Madhya Bharat Land Utilization Act of 1950 restricts keeping land fallow for longer periods. The Bombay Khar Land Act, 1948 and Punjab Land Preservation, Amendment Act 1953 were enacted to restrict misuse of land resources.

However these acts have not been able to check the mismanagement of land resources. Due to improper implementation and loose interpretation of laws there have been many instances of misuse of land.

9.4 SOIL CONDITIONS IN INDIA

Soil is an essential input for agricultural production. It supports plant growth. You may be aware that soil is transferable natural material, which is found on earth crust and provides natural medium to plant growth. The soil is a natural body, differentiated into

layers of loose (unconsolidated) mineral and organic matter. The depth of soil varies across regions.

Soils of India have been classified into large number of groups and sub- groups. The main groups are:

- i) **Red Soil-** The colour of the soil is red due to presence of various oxides of iron. These soils are poor in fertility and deficient in organic matter. This type of soil comprises vast area of Tamil Nadu, Karnataka, Goa, Daman and Diu, South Eastern Maharashtra, Andhra Pradesh, Chhattishgarh, Orissa and Jharkhand. It is also extended to Santhal Praganas of Bihar and Birbhum district of West Bengal to Jhansi and Hamirpur of Uttar Pradesh. The red soil in Tamil Nadu occupies the largest area and constitute nearly 2/3 of the cultivated area.
- ii) **Laterite Soil-** This type of soil is yellowish red or red in colour. These soils are high in organic matter. These soils are peculiar to India with an intermittently moist climate. This type of soil is generally found in the summit of the hills of Karanataka, Kerala, Madhya Pradesh, the Eastern Ghats of Orissa, Maharashtra, West Bengal and Tamil Nadu. On the laterite (soil), at lower elevations paddy is grown whereas in higher elevations, tea, cinchona, rubber and coffee is grown.
- iii) **Black Soil-** This soil type has characteristic dark colour, varying from dark brown to deep black. These soils contain high amount of organic matter. These soils are varying in depth from shallow to deep. Typically soil derived from the Deccan trap is the black cotton soil. It is prevalent in Maharashtra, western part of Madhya Pradesh, parts of Andhra Pradesh, parts of Gujarat, and some parts of Tamil Nadu. Many black soil areas have a high degree of fertility but some especially in the uplands are moderately productive. In Maharashtra these soils are derived from the Deccan trap and occupy quite large area.
- iv) **Alluvial Soil-** These soils are dark in colour and contain lime. Considerable salinity and alkalinity are also found. The fresh alluviums are coarser in texture and show little or no horizonation. This is by far the largest and most important soil group in India contributing the largest share to agriculture. This type of soil is formed by the deposition laid by the Ganges and the Bramhputra system. Alluvial soil stretches over West Bengal, Uttar Pradesh and Assam on the Bramhaputra and Ganga river basins. The alluvial soil of Tamil Nadu, Kerala, and Gujarat found in the deltaic areas along the coast are the deposition of sediment of southern rivers.
- v) **Desert Soil-** This type of soil is low in organic matter content. The colour varies from yellowish brown to pale brown. It contains many water-soluble minerals. These soils are predominating in western Rajasthan, Haryana, Punjab, lying between Indus river and Aravali range. The Rajasthan desert is a vast sandy plain including isolated hills at places. In many parts, these soils are alkaline to saline with unfavorable physical conditions.
- vi) **Terai Soil-** This type of soil is found in the hills of Himalayan region, Jammu and Kashmir, Uttar Pradesh, Bihar and West Bengal. They are formed by the down-ward movement of materials from the lower Himalayan ranges.
- vii) **Brown Soil-** In this case the surface soil is brown and moderately rich in organic matter. The organic content varies between 0.5 to 1 per cent. The soil is neutral to slight acidic in nature.
- viii) **Saline and alkaline Soil-** They contain high contents of soluble salts. It is estimated that about 7 million hectares of land in the country are driven out of cultivation due to salinity. Three cases of salinity soil are recognized.

a) **Saline Soil**

This soil contains toxic core of soluble salts in the net zone. This is also called white alkali.

b) **Non saline Alkali or Sodic Soil**

These soils do not contain any large amount of neutral salt.

c) **Saline Alkali Soil**

This group of soil is both saline and alkali. This causes low yield of crops.

- ix) **Peat Soils**- This type of soil usually develops from brackish water sediments. There is high accumulation of organic matter due to poor drainage condition. This soil contains high percentage of free alumina.

9.5 SOIL EROSION

A major factor responsible for the degradation of natural resources is soil erosion. It has been estimated that accelerated soil erosion has irreversibly destroyed some 430 mha of land area covering 30% of the present cultivated area in different countries of the world. Soil erosion is more severe in mountainous than in undulating area. The loss of topsoil resulting in reduced productivity is a most serious degradation problem in the Indian sub- continent.

9.5.1 Soil Erosion by Water

Erosion by water is the most serious degradation problem in Indian Context. At present soil erosion is taking place at a rate of 16.35 tons per hectare per year totaling 5334 million tons per year. Nearly 29% of the total eroded soil is permanently lost to the sea and nearly 10% is deposited in reservoirs.

9.5.2 Wind Erosion

Wind erosion is a serious problem in the Arid and Semi-arid regions, including the states of Rajasthan, Haryana, Gujarat and Punjab. Removal of natural vegetative cover resulting from excessive grazing and extension of agriculture to marginal areas is the major human induced factor leading to accelerated wind erosion. Wind erosion is also prevalent in the coastal area where sandy soil predominates.

9.5.3 Salinization

A large fraction of irrigation has been achieved through expansion of canal irrigated area. In almost all cases the ground water table which was several meter deep prior to the introduction of irrigation has been rising following the introduction of irrigation. When ground water table reaches within 2 meter of the surface, it contributes significantly to evaporation from the soil surface and causes soil salinisation. Nearly 50 per cent of the canal irrigation areas are suffering from salinization or alkalization or both. The main reason for these problems as you will see in Unit 10 are inadequate drainage and inefficient use of available water resources. The socio-political factors have also contributed to the salinisation problem.

9.5.4 Waterlogging

Another cause of soil degradation in irrigated area is water logging due to excessive water application and canal seepage. It not only hampers crop growth but also degrades soil and productivity reduces considerably. The adverse effect of waterlogging

has affected the agricultural potential especially in eastern region. It is estimated that as high as 8 million hectares of land is exposed to waterlogging in the country.

Check Your Progress 1

- 1) What is cropping intensity? What are the measures of raising cropping intensity?

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- 2) Distinguish between red soil and black soil in terms of availability, fertility and crops grown.

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- 3) What are the important changes taking place in land utilisation pattern?

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9.6 CROPPING PATTERNS IN INDIA

Cropping pattern indicates the proportion of area under different crops at a point of time. Cropping activities go on all the year round in India provided water is available for the crops.

In India, the cropping pattern follows two distinct seasons; *Kharif* season from July to October and *Rabi* season from October to March. The crops grown between March to June called *zaid*. The crops are grown solo or mixed (mixed-cropping) or in a definite sequence (rotational cropping). The land may be occupied by one crop during one session (mono cropping) or by two crops during one season (double-cropping) which may be grown in a year in a sequence. We explain these cropping systems below.

9.6.1 Types of Cropping Systems

- a) **Mono-cropping:** Mono-cropping or monoculture refers to growing of only one crop on a piece of land year after year. It may be due to climatological and socio-economic conditions or due to specialization of a farmer in growing a particular

crop, e.g., under rainfed conditions, groundnut or cotton or sorghum are grown year after year due to limitation of rainfall. In canal irrigated areas, under waterlogged condition, rice crop is grown as it is not possible to grow any other crop.

- b) **Multiple-cropping:** Growing two or more crops on the same piece of land in one calendar year is known as multiple-cropping. It is intensification of cropping in time and space dimensions, i.e., more number of crops within a year and more number of crops on the same piece of land at any given period. It includes inter-cropping, mixed-cropping and sequence cropping. Double-cropping is a case where the land is occupied by two crops, which are grown in a year in sequence.
- c) **Inter-cropping:** Inter-cropping is growing of two or more crops simultaneously on the same piece of land with a definite row pattern. For example, growing *setaria* and *redgram* in 5:1 ratio. Thus, cropping intensity in space dimension is achieved. Inter-cropping was originally practiced as an insurance against crop failure under rainfed conditions. At present, the main objective of inter-cropping is higher productivity per unit area in addition to stability in production. Inter-cropping system utilizes resources efficiently and their productivity is increased.

For successful inter-cropping, there are certain important requirements:

- 1) The time of peak nutrient demands of component crops should not overlap.
- 2) Competition for light should be minimum among the component crops.
- 3) Complementarity should exist between the component crops.
- 4) The differences in maturity of component crops should be at least 30 days.
- d) **Mixed-cropping:** Mixed-cropping is growing of two or more crops simultaneously intermingled without any row pattern. It is a common practice in most of dryland tracts of India. Seeds of different crops are mixed in certain proportion and are sown. The objective is to meet the family requirement of cereals, pulses and vegetables.
- e) **Sequence-Cropping:** Sequence cropping can be defined as growing of two or more crops in a sequence on the same piece of land in a farming year. Depending on the number of crops grown in a year it is called double, triple or quadruple cropping involving two, three and four crops respectively.

In addition to the above systems, relay cropping and ratoon cropping are also in existence. Relay cropping refers to planting of the succeeding crop before harvesting the preceding crops. Ratoon cropping or ratooning refers to raising a crop with re-growth coming out of roots or stalks after harvest of the crop.

- f) **Integrated Farming System:** Integrated farming system is a holistic method of combining several enterprises like cropping system, diarying, piggy, poultry, fishery, bee-keeping, etc. in a harmonious way so as to complement each other. The objective is efficient resource utilisation and maximization of profit in such a way so as to cause least damage to soil and environment.

9.6.2 Why Cropping Systems Differ?

Both climatic factors and resources of the farmers determine the cropping pattern on a farm. Though climate plays most vital part in crop selection, the area under crop is also influenced by economic considerations of the farmer, namely irrigation water, cost of inputs and prices of the products. In any locality, the prevalent cropping

system is the cumulative results of past and present decisions by individuals, communities or government or their agencies. A basic requisite for higher cropping intensity is the availability of water either through precipitation or through irrigation. It is being increasingly realized that the land and water resources are not unlimited and the wise use of the same is imperative. This is especially so for the countries like India where the population pressure is continuously increasing.

Tropical countries like India are fortunate in that the temperature condition remain favorable practically throughout the year for growing crops. However, it is crucially dependent upon water supply through natural precipitation or irrigation facility. Multiple-cropping has been in practice in many parts of India since long. Similarly, mixed-cropping has been an ancient art in India. Mixed-cropping systems were adopted as an insurance against failure of crops due to seasonal conditions or due to attack of pests and diseases. In recent years it has been shown beyond doubt that there are many other advantages too.

Integrated farming system seems to be the answer to the problem of scarcity of land resources. This will increase the income level and improve the nutrition standard of small-scale farmers with limited resources. Researchers on multiple-cropping system, however, suggest that the resources of the farmers be given major emphasis so that technologically a mixed-cropping can be adopted. Gradually new concepts on multiple-cropping have started coming in and now there has been some accumulation of useful scientific information. The information is based on analytical work on different crop combinations and sequential growth of the crops. In this respect cultivated areas in the country can be broadly classified into three categories based on rainfall pattern:

- i) Area where annual rainfall is above 1150 mm
- ii) Area where rainfall ranges from 750-1150 mm
- iii) Area where rainfall is below 750 mm

Most of the areas in Assam, Kerala, Orissa and West Bengal can be included in the first category. Basic problems in these areas pertain to limited irrigation and poor drainage. Most of the farmers are engaged in rice cultivation. Large parts of Tamil Nadu, Uttar Pradesh and Andhra Pradesh fall in the second category and occupy about one third of the total cultivated area in the country. In these areas there is large potential for creating minor irrigation facilities. The third category also occupies nearly one third of the cultivated area, comprising parts of Andhra Pradesh, Karnataka, Maharashtra and Rajasthan. In these areas, unless major and medium irrigation facilities are provided, there is little hope for raising cropping intensity to a substantial extent.

The cropping pattern is influenced by:

- Traditional social practices and dietary habits
- The crops with practicable pest and disease control method and suitability with ecological environment.
- The crops which are most profitable (or are high-yielding)
- The combination of crops that result in profit maximization and cost minimization.

9.7 CURRENT CROPPING PATTERNS

Three important features mark the cropping pattern of India: i) Predominance of foodgrains crops, ii) Slight shift towards commercial crops, and iii) Noticeable increase in some individual crops.

Table 9.2

Crops	Area in '000 hectares	% share in Gross Cropped Area
Rice	42965	22.84
Wheat	25853	13.74
Jowar	11722	6.23
Bajra	10320	5.49
Maize	6141	3.26
Ragi	1902	1.01
Barley	894	0.48
Other cereals and millets	1820	0.97
Coarse cereals	32799	17.43
Total cereals	101617	54.01
Total pulses	24281	12.91
Sugarcane	4144	2.20
Spices and condiments	2645	1.41
Total fruits	3040	1.62
Potatoes	1070	0.57
Onions	392	0.21
Total vegetables	4506	2.39
Groundnut	7969	4.24
Rapeseed and mustard	5769	3.07
Sesamum	2212	1.08
Linseed	894	0.48
Other oilseed	10326	5.49
Total oil seed	27070	14.44
Cotton	7967	4.23
Jute	760	0.40
Mesta	190	0.10
Total fibers	9014	4.79
Tobacco	408	0.22
Other crops	11322	6.02
Gross cropped area	188147	100

Source: Agricultural Statistics at a Glance.

Taking the major crops into consideration we can present a broad picture in the cropping pattern in India. The major pattern follows two distinct groups: *Kharif* (monsoon crops) and *Rabi* (post-monsoon crops). The *kharif* crop includes rice, sorghum, bajra, maize, ragi, groundnut, cotton, etc. The crop occupying the highest percentage of the sown area of the region is taken as the base crop. All other possible alternative crops which are sown in the region either as substitute for the base crop in the same season or as the crops which fit in with the rotation in the subsequent season, are considered as the pattern.

9.7.1 The *Kharif* Season Cropping Patterns

The *kharif* season cropping pattern comprises mainly rice and non-rice-based crops.

- i) **Rice-based cropping pattern** - Rice is the best crop in this category and 9% of the area in India comes under rice-based cropping pattern. Nearly 45% of the total rice area in India receives 30 cm per month of rainfall during at least two months (July-August) of the south western monsoon and much less during other months. In contrast to these parts, the eastern and southern regions, comprising Assam, West Bengal, Coastal Orissa, Coastal Andhra Pradesh, Karnataka, Tamil Nadu and Kerala which receive 10-20 cm per month, also come under this cropping pattern. On the all India basis, about 30 rice-based cropping pattern have been identified in different states.
- ii) **Kharif cereals other than the rice-based cropping pattern-** Maize, *jowar*, *bajra* form the main *kharif* cereals, *Ragi* and small millets come next, these are grown in limited area. Maize is grown in high rainfall areas, *jowar* in medium rainfall areas and *Bajra* in low rainfall areas. The extent of the area under these crops during south western monsoon season is: maize(5.6 mha), *jowar* (11 mha) and bajra 12.4 mha.

Ragi is a *kharif* cereal (2.4mha) and is mainly concentrated in Karnataka, Tamil Nadu and Andha Pradesh. These states account for more than 60% of the total area under this crop.
- iii) **Maize-based cropping pattern-** The largest areas under *kharif* maize are : Uttar Pradesh (14mha), Madhya Pradesh (0.58 mha) and Punjab (0.52 mha). In the four states namely Gujarat, Jammu & Kashmir, Himachal Pradesh and A.P; the area under maize ranges from 0.24 to 0.28 mha in each, whereas other states have much less area under it. On the all India basis, about 12 Maize based cropping pattern have been identified.
- iv) **Kharif jowar-based cropping pattern-** The area under the *kharif jowar* in India is highest in Maharashtra (2.5 mha), closely followed by Madhya Pradesh (2.3 mha). In each of the states of Rajasthan, Andhra Pradesh, Karnataka and Gujarat, the area under this crop is between 1 and 1.4 mha. *Jowar* is mainly grown in areas having rainfall range from 10 to 20 cm per month, least for 3 to 4 months of the southeastern monsoon. On the all India basis, 17 major cropping patterns have been identified under this category.
- v) **Bajra-based cropping pattern:** The area under bajra crop is about 12.4 mha. Rajasthan has about two-third of the total area. Maharashtra, Gujarat and Uttar Pradesh together have over 4.6 mha, constituting the remaining one-third area under the bajra crop. On all India basis 20 major cropping patterns have been identified with bajra as base crop.
- vi) **Groundnut-based cropping pattern:** Groundnut is sown over an area of about 7.2 mha , mostly in five major groundnut producing states : Gujarat (24.4%) area,

Andhra Pradesh, (20.2%), Tamil Nadu (35.5%), Maharashtra (12.2%) and Karnataka (12%). Five other states, viz, Madhya Pradesh, Uttar Pradesh, Punjab, Rajasthan and Orissa together have about 17.3% of the total area under groundnut as base crop. On the all-India level, about nine major groundnut based cropping patterns have been identified.

- vii) **Cotton-based cropping pattern:** Cotton is grown over 7.6 mha in India. Maharashtra shares 36%(2.8mha), followed by Gujarat with 21% (1.6 mha), Karnataka with 13% (1mha) and Madhya Pradesh with 9%(.6mha) of the area. Together these four states account for about 80% of area under cotton. The other cotton growing states are Punjab, Andhra Pradesh, Tamil Nadu, Haryana and Rajasthan. On the all India basis about 16 broad cotton-based cropping patterns have been identified.

9.7.2 Rabi-season Cropping Patterns

The major cropping patterns prevalent in India during the *rabi* season are: i) wheat and gram based cropping pattern, and ii) *jowar*-based cropping pattern.

a) Wheat and gram based cropping patterns

These two crops are grown under identical climate and can often be substituted for each other. On the all-India level, about 19 cropping patterns have been identified with wheat and 7 cropping patterns with gram. The core of the wheat region responsible for 70 per cent of the area and 76 per cent of production comprises Punjab, Haryana, Uttar Pradesh, Madhya Pradesh flanked by Rajasthan and Gujarat in the Western region and Bihar and West Bengal in the Eastern region.

b) Rabi-Jowar based cropping patterns

On the all-India level, about 13 cropping patterns have been identified with the *rabi jowar*. Maharashtra has the largest number of these cropping patterns, wherein starting with the exclusive *rabi jowar*, bajra, pulses, oilseeds and tobacco are grown as alternative crops.

Check Your Progress 2

- 1) Distinguish between the following terms:

- a) double cropping and mixed cropping
- b) double cropping and sequence cropping
- c) mono-cropping and multiple cropping

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- 2) Describe the major cropping patterns followed in Northern India.

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- 3) What are the important cropping patterns during kharif season?

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- 4) Differentiate between rice-based and non-rice-based cropping patterns with suitable examples.

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9.8 CHANGES IN THE CROPPING PATTERNS

The trend in the land use pattern and cropping pattern over the last 50 years in India has shown increasing use of land for the purpose of cultivation with slight variations. The change in the land use pattern and cropping pattern is vastly affected by rapid urbanization. The higher cultivable area has been achieved by bringing large acreage of uncultivable land into cultivation.

9.8.1 Factors Affecting Cropping Pattern

The cropping pattern is highly influenced by personal, social, cultural and economic factors of the farmers. Apart from that, it is also affected by the climatic factors of a region.

The major factors are :

- i) *Size of the Land Holding*

In India, marginal and small farmers represent the majority of farming community. So the mono crop paddy has become predominate as it fulfills the household needs and perpetuates the subsistence agriculture with little scope for commercial crop husbandry.

- ii) *Literacy*

Majority of the farmers are ignorant of the scientific methods involved in mixed-cropping, mono cropping and other technological knowhow for practicing better cropping pattern.

iii) *Disease and Pest*

The cropping pattern also depends on the possibility of disease and pest infection

iv) *Ecological Suitability*

The cropping pattern of a particular region is highly dependent on the ecological condition (temperature, rainfall, humidity, etc.).

v) *Moisture Availability*

The source of irrigation greatly determines the type of the cropping pattern to be practiced. For example, in low rainfall area, dry land farming is the best possible way to profit maximization.

vi) *Financial Stability.*

The economic condition of the farmers also affects the cropping pattern. As the cash crops (for example, cotton) involve high capital investments, these are practised only in estate farming. The marginal section of the farming community adopts low cost crops.

9.8.2 Emerging Problems in Cropping Patterns

Over the years the emerging scenario in the cropping pattern points to the following observations.

- 1) The dominance of cereal crops in the foodgrains point to the poverty of the people. It meets the demand of the low-income people, in whose case a large proportion of income is spent on cereals. Even pulses which are the source of protein for this class of people is not grown on a significant scale. Most of the farmers being marginal and small are the net purchaser of foodgrains and hardly can afford the high input cost for raising a successful non-food cash crop.
- 2) The predominance of foodgrains group together with the fact that a significant proportion of agricultural production is concentrated in small farms, leads one to conclude that much of the cultivation is for self consumption.
- 3) The fact that large areas remains under foodgrains shows that land productivity has not increased at par with technological possibilities.
- 4) Despite significant changes in cropping pattern, the shift towards high valued commercial crops has been very small. The result is an insignificant impact on the growth of the crop output.

9.9 LONG-RUN EFFECTS OF CURRENT TREND

Cropping pattern presently in vogue in India is cereal biased and fails in assuring balanced food security. The cropping pattern does not depict a picture of diversified agriculture despite some commercialization and technological progress. Other associated aspects of the present cropping pattern are increased use of chemical fertilizers and pesticides, increase in water demand, and duplication of forest areas which are discussed below.

9.9.1 Increase in Use of Fertilizers and Pesticides

Higher production of foodgrains has resulted from more inorganic fertilizer and pesticide application. The NPK used has increased from 65.6 thousand tonnes in 1951-52 to

17318 thousand tonnes in 1997-98. The higher chemical fertilizer and pesticide application has led to toxicity in feeds.

Area where pesticides use has been increasing vigorously has seen insurgency among the insects and pests, led to disturbance in bio-system. In addition, there has been increasing use of hybrid and high yielding variety replacing the local varieties heading to almost extinction of the local variety.

9.9.2 Increase in Water Demand

In the last fifty years, the net sown area has been increased from 118 to 142 million ha. The increase in net sown area and increase in cropping intensity in turn increased the demand for water sources for irrigation. This increased demand is causing depletion of water resources. Competing sectors are being deprived of required water as agriculture consumes as high as 70% of total water use. The intensive cropping pattern is always in need of higher irrigation supply. This in turn pushes for development of sources of irrigation. The higher requirement of water deplete the ground water level. Increased demand for irrigation in turn requires major, medium and minor irrigation projects, which are highly expensive. The construction of irrigation projects many times faces bureaucratic hurdles and opposition from local residents because irrigation projects cause various social and environmental problems.

9.9.3 Depletion of Forest Areas

The present cropping pattern emphasized on bringing more and more land under agriculture thereby depleting the forestland. There has been an increase in the agricultural area through deforestation during the thirty years period 1950-81. The area under field crops rose from 118.7mha to 142.9 mha by bringing an additional 24 mha under crop through deforestation of private and rural forests or older fruit orchards. The land use pattern has moved towards higher food production leaving the forestry neglected.

Check Your Progress 3

- 1) Identify and explain the factors affecting cropping pattern.

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- 2) What are the problems due to changes in cropping pattern?

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9.10 LET US SUM UP

The scope of bringing in more land into cultivation is limited in India. Thus the existing land has to be utilized properly so that its productivity increases and consequently agricultural production is higher. In India, nearly half of total area is devoted to cultivation. During the past fifty years the land utilization pattern has undergone some changes. While the proportion of net sown area has increased, the proportion of uncultivated and wasteland has declined. Major crops such as rice and wheat not only occupy substantial share in total area under cultivation their share is increasing. This has implications for food habits, water demand and loss of bio-diversity.

9.11 KEY WORDS

- Net Sown Area** : The total operational holding of a particular farmer on which he can grow crop counted only once in an agricultural year is termed as Net Area Sown. This term denotes the total area under crops and orchards, counting areas sown more than once in the year only once.
- Gross Cropped Area** : Gross Cropped Area is the area sown under different crops in different seasons in a year on the available land.
- Cropping Intensity (CI)** : Cropping Intensity assesses farmers' actual land-use in area and time relationships for each crop or group of crops compared to the total available land area and time including the land temporarily. It is given (in percentage terms) by the ratio of Gross Cropped Area to Net Cropped Area. In simple terms, CI indicates the number of times a field is grown with crops in a year.

9.12 SOME USEFUL BOOKS

Government of India, 1999, *Agricultural Statistics at a Glance*.

Planning Commission, 2003, *Tenth Five Year Plan*, Government of India.

Mal, P., 2001, *Infrastructure Development for Agriculture and Rural Development*, Mohit Publications, New Delhi.

Singhal, V., 1996, *Indian Agriculture*, Indian Economic Data Research Centre.

9.13 ANSWERS/HINTS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

- 1) Cropping intensity is given by the ratio of gross cropped area to net cropped area. It can be increased by raising the number of times a piece of land is cultivated. Thus multiple cropping and mixed cropping would increase cropping intensity.
- 2) Read Section 9.4 and compare red soil and black soil.
- 3) Read section 9.2.2 and answer.

Check Your Progress 2

- 1) Read Section 9.6.1 and differentiate between the concerned terms.
- 2) Read Section 9.7 and answer.
- 3) Read Sub-section 9.7.1 to answer this question.
- 4) Read Sub-section 9.7.1 to answer this question.

Check Your Progress 3

- 1) Summarise the points given in Sub-section 9.8.1.
- 2) Read Sub-section 9.8.2 and answer.