## **INDIAN AGRICULTURE**

#### Unit Structure:

- 1.0 Objectives
- 1.1 Agriculture in India : An Introduction
- 1.2 Definition of Agriculture
- 1.3 Nature of Agriculture
- 1.4 Features of Agriculture
- 1.5 Exercise

#### **1.0 OBJECTIVES**

- 1) To understand the definition of agriculture.
- 2) To study nature of Indian agriculture.
- 3) To study the salient features of Indian agriculture.

#### **1.1 AGRICULTURE IN INDIA: AN INTRODUCTION**

At the time of Independence in 1947, Indian agriculture was traditional and stagnant in every respect. It was characterized by feudal land relations, primitive technology, and the resultant low productivity per hectare. The first task of Indian Government in the immediate post-Independence period was, therefore, to initiate growth process in agriculture on modern lines. Modernization of agriculture was salient required both in terms of technological and institutional changes. Abolition of intermediaries in agriculture, like zamindars and jagirdars, was accomplished soon after Independence.

The largest portion of the natural resources of India consists of land and by far the largest number of its inhabitants is engaged in agriculture. Therefore, in any scheme of economic development of the country, agriculture holds a position of basic importance. Although Indian agriculture is way back compared to the levels in developed countries, some notable development have occurred over the years since Independence in 1947. Large areas which suffered from repeated failures of rainfall have received irrigation, new crops have come to occupy a significant position in the country's production and trade, agricultural and theindustrial economies in the country now exert a powerful influences on one another, problems of rural indebtedness and the exploitative practices of the village moneylender are much less, and finally there is already in the countryside an awakening and a desire for raising standards ofliving.

#### **1.2 DEFINITION OFAGRICULTURE**

The word agriculture comes from the Latin words ager, means the soil and culture, meanscultivation.

"Agriculture can be defined as the cultivation and / or production of crop plants or livestock products."

Agriculture includes Crop Production, Animal Husbandry and Dairy Science, Agriculture Chemistry and Soil Science, Horticulture, Agriculture Economics, Agriculture Engineering, Botany, plant pathology, Extension Education and Entomology, which develops its separate and distinct branches of agriculture occupying now a days place in several Agriculture llniver sites in the country.



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#### **Conventional Agriculture:**

"Conventional Agriculture is the term for predominant farming practices and systems of crop production adapted by farmer in a particularregion."

Agriculture can be termed as a science, an art and business altogether.

Science: because it provides new and improved strain of crop and animal with the help of the knowledge of breeding and genetics, modern technology of dairy science.

Art: because it is the management whether it is crop or animal husbandry.

**Commerce (Business):** Because the entire Agriculture produce is linked with marketing, which brings in the question of profit or loss.

#### **1.3 NATURE OF INDIANAGRICULTURE**

At the time of Independence, India's agriculture was in a state of back wardness. Productivity per hectare and per worker was extremely low. The techniques employed were age-old and traditional; there were only 7 tractors per lakh hectares of gross cropped area in 1950-51. The number of oil engines and irrigation pump sets per lakh hectares was only 62 and 16 respectively in that year. The use of fertilizers was also neglible being only 0.66 lakh tones in 1952-53. Because of low productivity, agriculture merely provided 'subsistence' to the farmers and had not become

'commercialized'. Approximately 45 per cent of the total consumption of farmers came from their own production in1951-52. This highlights the importance of money in the village economy. All the factors described above when taken together describe the nature of India's agriculture. They reveal that Indian agriculture was back and qualitatively traditional in nature on the eve of the First Five YearPlan.

#### 1) Feudal Relations of Production:

At the time of Independence, three types of land tenure system were prevalent in the country - Zamindari, mahalwari and ryotwari. Approximately 57 per cent area of the country was under the zamindari system. In terms of coverage, ryotwari came second with 38 per cent area, while mahalwari was restricted to only 5 per cent area. The zamindari system was based on exploitation since zamindars pressurized peasants in a variety of ways with the objective of extracting as much rent from them as possible. As we shall discuss in Chapter 16, the zamindari system was a major hindrance to agricultural development. Ryots in the ryotwari system also leased out their land to tenants for cultivation as prevalent under the zamindarisystem.

After Independence, the State governments enacted laws to abolish the intermediaries. However, these wereentirely inadequate to have any drastic impact on the agrarian structure. The zamindars only changed their grab and became absentee landlords. These absentee landlords wield considerable economic power derived from land-ownership: (a) cultivation with the help of hired labourers; (b) leasing out of land to tenants; (c) usury; and (d) trading in grains and other commodities. This is the true ruling class in our country. As its predecessor, the zamindari class, this new class of absentee big landlords is also based onexploitation.

Obviously, the classes that are exploited by these landlords are the classes of tenants and agricultural workers. Though no exact estimates on tenancy are available, it has been estimated that around 50 per cent of the cultivated land is under written or oral tenancy. A large number of tenants come under the category of tenants-at-will and sub-tenants. These classes of tenants possess no security of tenure and enjoy cultivation rights only so long as the landlords allow them to do so. This exposes them to the exploitative practices of the landlords since their very existence hinges on the pleasure of thelandlords.

The second exploited class is constituted of agricultural workers. This class is at the lowest rung of social ladder in rural areas. It can be divided into two categories - (i) attached labourers, and (ii) casual labourers. The former are attached to some cultivator household on the basis of a written or oral contract. Normally they are not free to work at any other place. As against this, casual labourers are free to work on the farm of any farmer. A large number of tenants have also been evicted under the guise of personal cultivation and have swelled the ranks of agricultural labourers. The growing number of labourers indicates the process of ' immiserisation' of the ruralpoor.

#### 2) Usurious Capital and Rural Indebtedness:

The control of usurious capital is very strong on the Indian agriculture and indebtedness is a common legacy of poor framers. During the pre-Independence period, moneylenders and mahajans ruled the roost as there was no other credit agency worth the name. Taking advantage of their position, these people exploited the farmers in a number of ways. After Independence, the government has initiated a number of steps to curb their activities - the most important policy measure being the development of co-operative credit institutions and the increasing participation of banks in providing rural credit. However, because of a number factor, the small and marginal farmers continue to depend on moneylenders for fulfilling their credit requirements to a large extent and thus become victims of exploitation by the latter. The phrase 'once in debt, always in debt' expresses the condition of these farmers graphically. The moneylenders charge exorbitant rates of interest manipulate accounts to their advantage and often seize the land of the small and marginal farmers on one pretext or the other. This usurious capital and rural indebtedness in India is a result of the social system or the relations of production prevailing in agriculture, since long the Indian peasant has been living the life of a bonded landslave. It is this wretched existence that is responsible for his economic bankruptcy and consequently for his continued indebtedness.

#### 3) Labour Market Dualism:

Because of the excessive pressure of population on land, wages in the agricultural sector tend to be considerably lower as compared to the modern (industrial) sector. This leads to a labour market dualism. This dualism is explained by the fact that large number of workers remain sticking to traditional agriculture despite low wage due either to ignorance of better opportunities outside agriculture or to their inability to obtain a modern sector job despite wishing to do so or to the cost of moving being unacceptably high (including the cost of giving up the relative security of remaining at home) in relation to the expected wage premium. Low wages in the agriculture sector lead to low per capita income and this, in turn, results in low labour productivity.

The cheapness of labour in the traditional agricultural sector causes it to be used extensively there. That is, extra labour is employed to perform tasks which would be unprofitable at the modern wage rate. Moreover, cheap labour leads to the adoption of labour - intensive methods of production such as cultivation by hand rather thanmechanically.

#### 4) Outmoded Farming Techniques:

Most of the Indian farmers continue to use outmoded farming techniques. The traditional griculture depends on the biological sources of energy (human and animal labour), rains and dung manure. Returns to farmers under this technique of production arevery meagreand the nature of farming is appropriately described as 'subsistence farming'. However, with the advent of the new agricultural strategy in 1966, modern techniques of production were initiated in certain selected regions of the country like Punjab, Haryana and

Western Uttar Pradesh. As a consequence of the adoption of modern techniques of production and new high yielding varieties of seeds, agricultural productivity registered substantial increases in these areas. However, since large areas of the country continue to use outmoded agricultural techniques, a sort of technological dualism has emerged in thecountry.

#### 5) Fluctuations and Instability in Crop Output:

The Indian agriculture has rightly been called a 'gamble in monsoons.' Gross cropped area in 1950-51 was 131.9 million hectares whereas gross irrigated area was only 22.6 million hectares. Thus, only 17 per cent of gross cropped area had irrigation facilities. In 1993-94, the gross cropped area was 186.4 million hectares of which 68 million hectares was irrigated. Thus 36 per cent of gross cropped area had irrigation facilities in1993-94. This shows that even now as much as 64 per cent of gross cropped area continues to depend on rainfall. This shows that nature continues to play a major role in determining the level of agricultural production. If anything, the use of bio-chemical technology in the post 1965 period (often known as High Yielding Varieties Programme) has increased the sensitivity of output (except wheat) to variations in rainfall. The analysis carried out by C.H. HanumanthaRao, Susanta K. Ray and K. Subbaraoforthe period 1959 to 1985 shows a steady upward trend in the sensitivity of total food grains output to variations in rainfall.<sup>5</sup>Irregular or uncertain monsoon in some years leads to large fluctuations and instability in agricultural production.

## 6) Diversities in the Agricultural Sector and the Problem of Generalization:

India is a large country having substantial agricultural diversities. Different regions exhibit entirely different characteristics so that no one Plan can be conceived for all agricultural regionsofthe country. The nature of soil, the magnitude of rainfall, availability ofwater, etc. differ considerably between different regions. For instance, take the case of rainfall. While Western Raj as thenand a part of the Thar Desert have a very uncertain rainfall of 4 to 5 inches in a year, Cherrapunjiin Assam has an annual rainfall of more than 450 inches. While considerable areas face drought conditions in a particular year, some areas encounter the fury of floods. Some areas face the problems of waterlogging and salinity. Practically the entire cultivated area of the country suffers from deficiency of nitrogen. Elements of phosphates and potash also differ significantly indifferent areas. It is not infrequent to find plots of land of highly different productivity existing side by side in a particular village. Not only this, relations of production are different in different States; There are substantial regional inequalities also in regard to sub- division and fragmentation ofholdings.

The presence of large diversities in the agricultural sector makes it imperative to devise separate agricultural policies fordifferent regions. It is not possible to generalize and formulate asingle agricultural policy for the nation as a whole as such generalization is bound to gloss over interregional differences and fail to deliver thegoods.

#### **1.4 SALIENT FEATURES OF INDIANAGRICULTURE**

Some of the outstanding features of Indian agriculture are mentioned as follows.

#### 1) Subsistence agriculture:

Most parts of India have subsistence agriculture. The farmer owns a small piece of land, grows crop with the help of his family and consumes almost the entire farm, produce with little surplus to sell in the market.

This types of agriculture has been practiced in India for the last several of hundred years & still prevails in the spite of the large scale changes in agricultural practices after in dependence.

#### 2) Pressure of Population on Agriculture:

The Population in India is increasing at rapid pace and exerts heavy pressure on agriculture. Agriculture has to provide employment to large section of work force and has to feed the teeming millions. While looking into the present need of food-grains we require an additional 12-15 million hectares of land to cope with the increasing demand. Moreover there is rising trendin urbanization. Over one-fourth of the Indian population lived in urban areas in 2001. It is estimate that over one-third of the total population of India would be living in urban areas by 2010. This requires more land for urban settlements which will ultimately encroach upon agricultural land.

#### 3) Dependant upon Monsoon:

Indian agriculture is mainly dependentupon monsoon which is uncertain, unreliable and irregular. In spiteof the large scale expansion of irrigation facilities since, independence, only one third of the cropped area is provided by perennial irrigation and the remaining two-third of the cropped area has to bear the brunt of the vagaries of monsoons.

#### 4) Variety of Crops:

India is a vast country with varied types of relief, climate and soil conditions. Therefore, there is a large variety of crops grown in India. Both the tropical and temperate crops are successfully grown in India. Very few countries in the world have variety of crops comparable to that produced inIndia's.

#### 5) Importance of Animals:

Animals' force has always played a significant role in agricultural operations. Such as ploughing, irrigation, threshing and transporting the agricultural products. Complete mechanization of Indian agriculture is still a distant goal and animals will continue to dominate the agricultural scene in India for several years to come.

#### 6) Predominance of FoodCrops:

Since Indian agriculture has to feed large population, production of food crops is the first priority of the farmers almost everywhere in the country. More than two-thirds of the total cropped area is devoted to the cultivation of food crops. However, with the change in cropping pattern, the relative shares of food crops came down from 76.7% in 1950-51 to 58.8% in 2002-03

#### 7) Insignificant place to given foddercrops:

Although India has the largest population of livestock in the world, fodder crops are given very insignificant place in our cropping pattern. Only 4% of the reporting area is devoted to the permanent pastures and other grazing lands. This is due to pressing demand of land for food crops.

#### 8) Seasonal patterns:

India has three major cropseasons.

- i) Kharif season starts with the onset of monsoons & continues till the beginning of winter. Major crops of this season are rice, maize, Jowar, Bajara, Cotton, groundnut and pulses such as moong, Urad, etc.
- Rabi season starts at the beginning of the winter and continues till the end of winter or beginning of summer. Major crops of this season are Wheat, barley, jowar, gram & soil seed such as linseed, rape &mustard.
- iii) Zaid is summer cropping season in which crops like rice, maize, groundnut, vegetables and fruits aregrown.

#### **1.5 EXERCISE**

- 1) Explain the concept of agriculture and state nature of Indian agriculture.
- 2) What is agriculture? Discuss the salient features of Indian agriculture.



## SCOPE AND ROLE OF AGRICULTURE IN INDIAN ECONOMY

#### **Unit Structure:**

- 2.0 Objectives
- 2.1 Introduction
- 2.2 Scope of IndianAgriculture
- 2.3 Role of agriculture in IndianEconomy
- 2.4 Necessity for the Development of Agriculturalsector
- 2.5 Exercise

#### **2.0 OBJECTIVES**

- 1) To study the scope of agriculture in IndianEconomy.
- 2) To understand the significance of agriculture in IndianEconomy.
- 3) To study the necessity for the development of agricultural sector.

#### 2.1 INTRODUCTION

Indian agriculture had reached the stage of development and maturity much before the now advanced countries of the world embarked on the path of progress. At that time, there was a proper balance between agriculture and industry and both flourished hand in hand. This situation continued till the middle of the eighteenth century. The interference from the alien British government and its deliberate policy of throttling the village handicrafts and cottage industries destroyed the fibre of balance and the economy of the country was badly shattered. Britishers pursued a typical colonial policy in India and did nothing to develop (or restore) agriculture. Instead, they created a class of intermediaries known as zamindars who sucked the very blood out of the rural poor. A substantial part of the produce was taken away by this parasitic class the actual cultivator was left only with subsistence income. The cultivators had neither the resources nor the incentive to invest in agriculture. Therefore, Indian agriculture in the pre-independence period can be correctly described as a 'subsistence' occupation which yielded 'too little to live on and too much to die on'. The zamindars and money- landers usurped a large part of land on the pretext of settlement for debts taken by cultivators and anumber of cultivatorswerethus left land less. This gave birth to the class of landless labourers or agricultural workers who worked on the land of others for wages which were often too meagre to keep the body and sow together. A majority of farmers were just able to eke out a level of subsistence from agricultural activities.

#### 2.2 SCOPE OF INDIANAGRICULTURE

Proverbially, India is known as "Land of Villages".Near about 67% of India's population live in villages. The occupation of villagers is agriculture. Agriculture is the dominant sector of our economy and contribute in various ways such as:

#### 1) National Economy:

In 1990-91, agriculture contributed 31.6% of the National Income of India, while manufacturing sector contributed 17.6%. It is substantial than other countries. For example in 1982 it was 34.9% in India against 2% in UK, 3% in USA, 4% in the Canada. It indicated that the more advanced stage of development the smaller is the share of agriculture in NationalIncome.



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#### 2) Total Employment:

Around 65% population is working and depends on agriculture and allied activities. Nearly 70% of the rural population earns its livelihood from agriculture and other occupation allied to agriculture. In cities also, a considerable part of labor force is engaged in jobs depending on processing and marketing of agriculturalproducts.

#### 3) Industrial Inputs:

Most of the industries depend on the raw material produced by agriculture. So, agriculture is the principal source of raw material to the industries. The industries like cotton textile, jute, paper, sugar depends totally on agriculture for the supply of raw material. The small scale and cottage industries like handloom and power loom, ginning and pressing, oil crushing, rice husking, sericulture fruit processing, etc. are also mainly agro-basedindustries.

#### 4) Food Supply:

During this year targeted food production was 198 million tons and which is to be increased 225 million tons by the end of this century to feed the

growing population of India i.e. 35 croresin 1951 and 100 crores at the end of this century. India, thus, is able to meet almost all the need of its population with regards to food by develop intensive program for increasing foodproduction.

#### 5) State Revenue:

The agriculture is contributing the revenue by agriculture taxation includes direct tax and indirect tax. Direct tax includes landrevenue, cesses and surcharge on land revenue, cesses on crops and agril income tax. Indirect tax induces sales tax, custom duty and local octroi, etc. which former pay on purchase of agriculture inputs.

#### 6) Trade:

Agriculture plays an important role in foreign trade attracting valuable foreign exchange, necessary for our economic development. The product from agriculture-based industries such as jute, cloth, tinned food, etc. contributed to 20% of our export. Around 50% of total exports are contributed by agril sector. Indian agriculture plays an important role in roads, rails and waterways outside the countries. Indian in roads, rails and waterways used to transport considerable amount of agril produce and agro-based industrial products. Agril products like tea, coffee, sugar, oil seeds, tobacco, spices, etc. also constitute the main items of export from India.

#### **2.3 ROLE OF AGRICULTURE IN INDIANECONOMY**

Agriculture is the main sector of Indian economy which is amply powered by the following points:

#### 1) Share in National Income:

The contribution from agriculture has been continuously falling from 55.1% in 1950-51 to 37.6% in 1981-82 & further to 18.5% in 2006-07. But agriculture still continues to be the main sector because it provides livelihood to a majority of thepeople.

#### 2) Largest Employment providing sector:

In 1951, 69.5% of the working population was engaged in agriculture. This percentage fell to 66.9% in 1991 & to 56.7% in 2001. However, with rapid increase in population the absolute number of people engaged in agriculture has become exceedingly large.

#### **3)** Provision of Food surplus to the Expanding population:

Because of the heavy pressure of population in labor-surplus economies like India & its rapid increase the demand for food increase at a fast rate. Therefore, unless agriculture is able to continuously increase its surplus of food-grains a crisis is likely to emerge. Experts foresee that by the end of 11<sup>th</sup> Five year plan (i.e. 2007-2012) the demand for food grains is expected to increase to280.6 million tons. Meeting this demand would require 2% growth per annum.

#### 4) Contribution to capital formation:

There is a general agreement on the importance of capital formation in economic development. Unless the rate of capital formation increases to a sufficient high degree economic development cannot be achieved. Agriculture can play a big role in pushing the capital formation in India. Rural sector can transfer labor & capital to the industrial sector which can be effectively used to increase the productivity in the latter.

#### 5) Providing Raw Material of industries:

Agriculture provides raw materials to various industries of national importance. Sugar industry, jute industry, cotton textile industry, vanaspati industry are examples of some such industries which depend on agriculture for their development.

#### 6) Market for industrial products:

Since more than two-thirds of the population of India lives in rural areas, increased rural purchasing power is a valuable stimulus to industrial development.

#### 7) Importance in International Trade:

Agriculture constitutes about 75% of the total exports of the country such is the importance of agriculture as far as earnings of foreign exchange are concerned.

#### 8) Importance of agriculture products in the consumption basket:

The per capita income in India is very low. Consequently, a large part of this income is spent on fulfilling the basic consumption requirements of the people. It has been estimated that in India approximately 60% of household consumption and 85% of household commodity consumption is agricultural products.

The above discussion brings out clearly the role and importance of agriculture in the Indian economy. In fact, development of agriculture is a virtual pre-condition of sectorial diversification and hence of development itself. A growing surplus of agricultural produce is needed in the country to- (i) increase supplies of a food and agricultural raw materials at non-inflationary prices. (ii) Widen the domestic market for industrial good through increased purchasing power within the rural sector. (iii) Facilitate inter-sectorial transfers of capital needed for industrial development (including infrastructure) and (iv) increase foreign exchange earnings through agriculturalexports.

# 2.4 NECESSITY FOR THE DEVELOPMENT OF AGRICULTURALSECTOR

After analyzing the Role of agriculture in the economic development, now, let us discuss the factors which determine the necessity for the further development of agriculture the brief analysis of the factor is as stated below:

#### 1) To Remove Poverty and Hunger:

Agriculture is considered to be the dominant sector in the economy of India. Therefore, a strong foundation of agriculture is necessary condition of sustained and rapid economic progress so far as the problem of poverty and hunger is concerned. It is acute in those countries having more density of population. It is further aggravated by the inequalities of income. These features are also present in India economy which is termed as the obstacles in the path of agriculture development. Therefore, under such circumstances the development of agricultural sector is not possible so long as poverty and hunger are notremoved.

#### 2) Proper utilization of Resources:

Proper utilization of resources is indispensable to increase the level of production. The increase in production depends on the use of improved farm technology. Moreover, irrigation facilities also go a long way to enable the farmers to put more area under multiple crops. Therefore, efforts should be made to get the maximum productivity from the area were expensive infra- structures of irrigation have beencreated.

#### 3) Increasing the Growth Rate:

The positive nature of the interdependence between agriculture and industry facilitates to stimulate the further development of these two sectors when agricultural sector starts to development on modern scientific lines, it will require more inputs than before. These inputs are supplied by the industrial sector in this way the development of agricultural sector is relied upon the development of industrial sector. Contrary to this, when agriculture sectors starts to produce more food grains and raw material for industrial sector the expansion of industrial sector will in turn increase the demand for agricultural products and thereby increase the employment and incomes of the agro-based population. The increase in the income further creates the demand for consumption goods supplied by the industrial sector and thus, stimulate the growth of industrialsector.

#### 4) Creation of surplus of investment:

As it is known the modernization of agriculture requires a huge amount of capital for investment command area development programme initiated for the development of agricultural sector also required capital for investment. Moreover, processing, marketing and storage and all other activities connected with agriculture need capital investment. In such circumstances, surplusare required to increase savings and enable investment. The creation of surplus is possible only through modernization and technological improvement inagriculture.

#### 5) Surplus for wage goods:

In future greater and planned efforts will have to be made to expand wage employment through both industrial and urban job creation to provide employment to the unemployed people. Besides, employment programme in rural areas for building up infrastructure and off form facilities to absorb the growing labour force would be undertaken. Thus, it will be necessary to generate a large surplus of wage good for sustained supply to the working population at reasonable and stable prices so that there is sufficient economic stability for planneddevelopment.

#### 6) Reduction in imports:

Import of food grains has become a peculiar feature of Indian economy. Therefore, the country has to get rid of imports of food- grains. Selfsufficiency in food grains as well as in cash crops would help to elimate the burden of Foreign exchange resources. Moreover, it would reduce the uncertainties generally associated with the procurement of supplies from international sources and their adverse impact on internal availability, prices and economy as awhole.

#### 7) Diversification of employment opportunities:

The low level of rural incomes and the low standard of the rural population are the results of serious under employment as well as open unemployment in rural areas. Crop production alone cannot give adequate employment. Therefore, it pre-requisite to diversify rural employment opportunities by developing suitable subsidiary occupations such as dairy, rearing of poultryetc.

#### 8) Provision of Food and Nutrition:

Agriculture sector has a great responsibility of providing food and nutrition not only for rural population but also for urban population. Even to maintain the present levels of intake food production has to be stepped up significantly apart from adequate production of food grains as well as supplementary protective foods are necessary for improving the productivity of labour. The productivity of labour can only improve when the human capital is endowed with health and vigour. Therefore, through the adequacy of food the capacity to work and earn substantially be increased which in turn increases production welfare happiness and thus economic development of thecountry.

#### 9) Provision of Raw material for industrial sector:

Agriculture sector has to meet the increasing demand of raw material required by the industrial sector. The industries sector, the industries like cotton and jute textiles, dairy products, vegetable, oils, tea, coffee, leather and leather products all depend on the production performance of agricultural sector. The expansion and utilization of the existing capacity in these and other similar industries would depend on the internal availability of raw materials. Therefore, internal production of the

agricultural raw materials would augment the functioning of these industries.

#### 10) Useful for Allied sector:

Agricultural sector has to pay more attention on the development of allied sector. As the improvement of nutrition is a basic aim of development thus increased production in these fields assumes particular importance. Besides the development of allied activities is in advantage of nation since agro climate conditions in many areas do not make crop production advantageous.

#### 11) Contribution to Foreign exchange:

Agricultural sector can make a positive contribution to Foreign exchange earnings by reducing the agricultural imports. Food alone constitutes a large proportion of current agricultural imports. Therefore, self-sufficiency in food, animal husbandry products and important raw materials will substantially result in the saving of foreign exchange. Therefore, agricultural sector has to develop its self-sufficiency in food articles and other agricultural products to avoid imports and thus to save the foreign exchange earnings.

#### 2.5 EXERCISE

- 1) Explain the scope of Indian agriculture in ruraldevelopment.
- 2) Discuss the role of Indian agriculture in Indianeconomy.
- 3) State the necessity for development of agricultural sector in India.



## PRODUCTIVITY OF INDIAN AGRICULTURE

#### **Unit Structure:**

- 3.0 Objectives
- 3.1 Introduction
- 3.2 Concept of agricultural productivity
- 3.3 Causes of low agricultural productivity
- 3.4 Measures to increase agricultural productivity
- 3.5 Exercise

#### **3.0 OBJECTIVES**

- 1) To understand the concept of agricultural productivity.
- 2) To study what are the various causes of low agricultural productivity inIndia.
- **3)** To suggest some remedial measures to increase agricultural productivity and production.

#### **3.1 INTRODUCTION**

'Agricultural Productivity' has been defined by several scholars with reference to their own views and disciplines. Agriculturalists, agronomists, economists and geographers have interpreted it in different ways. Agricultural productivity is defined in agricultural geography as well as in economics as 'output per unit of input' or 'output per unit of land area', and the improvement in agricultural productivity is generally considered to be the results of a more efficient use of the factors of production, viz. physical, socio-economic, institutional and technological.

Singh and Dhillion (2000) suggested that the 'yield per unit' should be considered to indicate agricultural productivity. Many scholars have criticized this suggestion pointing out that it considered only land as a factor of production, with no other factors of production. Therefore, other scholars have suggested that agricultural productivity should contain all the factors of production such as labor, farming experiences, fertilizers, availability and management of water and other biological factors. As they widely accept that the average return per unit does not represent the real picture, the use of marginal return per agricultural unit was suggested.

#### 3.2 CONCEPT OF AGRICULTURAL PRODUCTIVITY

Agricultural productivity may be defined as the **"ratio of index of local agricultural output to the index of total input used in farm production**". It is, therefore, a measure of efficiency with which inputs are utilized in production, if other things being equal. Agricultural productivity here refers to the returns from arable land or cultivableland unit. "Agricultural efficiency as productivity expressing the varying relationship between agricultural produce and one of the major inputs, like land, labor or capital, while other complementary factors remaining the same". This expression reveals that the productivity is a physical component rather than a broad concept. Saxon observed that productivity is a physical relationship between output and the input which gives rise to that output.

# Defination: "Agriculture productivity is an Index of efficiency of major production factores like Land Laour, Capital and Organiser."

Productivity of land is a very important factor of agriculture because it is the most permanent and fixed factor among the three categories of inputland, labor and capital. Basically, land as a unit basis articulates yield of crop in terms of output to provide the foodstuff for the nation and secure employment opportunities for the rural community. Productivity of land may be raised by applying input packages consisting of improved seeds, fertilizers, agro- chemicals and labour intensive methods.

Productivity of labour is important as a determinant of the income of the population engaged in agriculture. In general, it may be expressed by the man-hours or days of work needed to produce a unit of production. Shafi has mentioned that the labourproductivity is measured by the total agricultural output per unit of labour. It relates to the single most important factor of production, is intuitively appealing and relatively easy to measure. On the other hand, labourproductivity is a key determinant of living standards, measured as per capita income, and this perspective is of significant policy relevance. However, it only partially reflects the productivity of labour in terms of the personal capacities of workers or the intensity of their efforts. In agricultural geography, the labourproductivity has two major important aspects. First, it profoundly affects national prosperity and secondly :principally determines the standard of living of the agricultural population.

Capital, in terms of purchase of land, development of land, reclamation of land, drainage, irrigation purpose, livestock, feeds, seeds, agricultural implements, and machineries, crop production chemicals is being given priority as a factor for enhancing agricultural productivity.

#### 3.3 CAUSES OF LOW AGRICULTURAL PRODUCTIVITY

Agricultural Productivity is still very low when compared with other countries and vis-a-visthe potential productivity. In this topic we propose to

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discuss the institutional and technological factorsthataccount for low productivity inagriculture.

#### A) The Institutional Factors:

The most important institutional factors that have traditionally kept agricultural production and productivity low in India are: (i) the exploitative land tenure system, (ii) uneconomic size of holdings, (iii) underdevelopment of credit institutions, and (iv) defects in marketing structure.



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#### 1) The exploitation land tenure system:

Perhaps the most important reason for lowagricultural productivity in India has been the zamindari system. Thissystem createda unique agrarian structure in the countryside, which conferred the right of sharing the produce of land without participating personally in the production process. The system itself was based on exploitation as it conferred unlimited rights on the zamindarsto extract as much rent as they wished. According to Bhawani Sen,<sup>1</sup> approximately 25 per cent of the produce was taken away by the intermediaries in the form of rent. This would mean that out of the income of Rs. 4,800 crorefrom agriculture in 1949-50, the share of intermediaries was as high as Rs. 1,200 crores. The grabbing of such a high proportion of income by a parasitic class was not only socially unjust but also highly detrimental to capital formation and economic development. The actual cultivator was left with no surplus to invest in better implements, improved seeds or fertilizers and neither was there any incentive for him to increase agricultural production and productivity. Thus, according to Thorner, a built-in 'depressor' continued to operate in the countryside characterized by lowcapital intensity and antiquated methods.<sup>2</sup> The tillers showed no interest in modernization of agriculture partly because they were deprived of resources to invest in agriculture by the zamindars (who, in turn, used the acquired wealth only on conspicuous consumption and on items to sustain their profligate lifestyle) and partly because they knew that any gains in agricultural production and productivity would be siphoned off by the zamindars while they would continue to live in conditions of abjectpoverty.

In large areas of the country, actual cultivation was done by tenants whose tenancy, in most areas, was insecure and depended on the mercy of the landlords. This made them prone to various exploitative practices adopted by the latter. They were forced to payexorbitantrates of interest which

ranged from 34 to75 percentin different areas of the country.<sup>3</sup>Naturally this left little for reinvest- meant on land. In fact, the toiling tenants could hardly make both ends meet. Moreover, since their tenancy rights were insecure, the tenants were not even interested in investment on land as they could be evicted out by the landlords almost at will. Even where law provided for security of tenure, tenants were not in a position to take advantage of it because most of the leases are oral and informal. It has been estimated that about 82 per cent of tenancies in the country in 1961 were insecure.

Obviously, under such exploitative land tenure systems, agricultural production and productivity was bound to be low. After Independence, the State governments passed legislations to abolish zamindari and improve the position of tenants. However, all critics agree that the above measures have been unsuccessful in achieving their objectives. Zamindars continue to existin the garb of large landowners. They have acquired large areas of land for personal cultivation on which cultivation is done with the help of hiredagricultural labour. In the States where a ceiling hasbeen fixed as to the amount of land a former zamindar can hold, the ceiling has been kept so high that very few zamindars have been affected. Flaws in the legislations have also enabled them to transfer land to other members of their families and thus escape the ceiling law. For example, Daniel Thorner found that in post-reform Bihar, there existed estates of 500, 700 or even 1000 acres and the older structure of landowner, raivat, underraivat, and bataidar (cropsharer) continued even after the so-called zamindari abolition. Bihar remained a stronghold of large landholders and hierarchical property rights, where "leasing, sub-leasing and evictions are all common."<sup>5</sup> As far as tenants are concerned, they have no strength to match the force of landlords and often evict the land under the pressure of the latter voluntarily. In any case, since most of the tenancies are insecure and oral, the actual tenants are not in a position to obtain the protection oflaw.

#### 2) Uneconomic size of holdings:

The average size of holdings is very small in India. It was merely 1.57 hectares in 1990-91. 59 per cent of the holdings were less than 1 hectare in 1990-91 and can, consequently, be regarded as uneconomic. Not only this, even these small holdings are scattered and fragmented into a number of units. According to the 8th round of the National Sample Survey (conducted in 1953-54) an operational holding in India was divided into five units. It was also found that with an increase in the size of holdings, the average number of fragments also increased.

Small and fragmented holdings impede agricultural progress and adversely affect agricultural production and productivity. This is due to the following reasons: (1) Because of sub-division and fragmentation of holdings, the size of plots becomes so small that sometimes it is not possible to cultivate on them. Substantial land is also wasted in drawing boundaries and hedges between small, tiny plots. (2) Because of the small size of farms, it is not possible to make use of new technological innovations in the field of agriculture. The application of new methods of production requires ample doses of fertilizers, which in turn, require sufficient irrigation facilities. However, because of fragmentation, it is frequently not possible for the farmer to make proper arrangement of irrigation in all plots belonging to him. As a consequence, adoption of new agricultural technology ishindered.

(3) In addition to the problems in adopting new agricultural technology, sub-division and fragmentation of holdings makes it difficult for the farmers to manage all their plots efficiently. Inefficient management leads to low agricultural productivity.

#### 3) Under development of credit institutions:

In the pre-Independence period, the only source of credit worth the name was the village moneylender. Even in 1951, non- institutional sources (moneylenders, traders, landlords, relatives, friends etc. provided as much as 93 per cent of rural credit while the institutional sources (government, co-operative credit societies and commercial banks) provided only 7 per cent of rural credit. In the category of non-institutional sources, the most important were moneylenders who provided as much as 72 per cent of rural credit in 1951. This heavy dependence of the farmers on the money lenders enabled the latter to dictate terms and exploit the former in a number of ways. For instance, moneylenders charged exorbitant rates of interest ranging from 19 per cent to 50 per cent or even more. They often manipulated accounts to their advantage by not entering the money returned and interest paid into the account. They also forced the farmers to sell the agricultural produce to them at low prices. On account of all these practices of moneylenders, the farmers were left with no resources to invest in programmes to increase agricultural production and productivity. Most of the farmers were under heavy burden of debt and all their lives they could not get out of it. The position of the average farmer wasexpressed in the following phrase graphically "the Indian farmer is burden of debt and all their lives they could not get out of it. The position of the average farmer was expressed in the following phrase graphically "the Indian farmer is born in debt, lives in debt and dies in debt."Naturally theIndian agriculture was only a subsistence agriculture in these conditions with very low levels of production and productivity.

The most important move to free the agriculturists from the clutches of the moneylenders in the post-Independence period was the expansion of institutional credit to agriculture. For this purpose, the government has helped the co-operatives in anumber of ways to expand their operations. In an important move, 14 major commercial banks were nationalized in 1969and this was followed by the nationalization of6 more banksin1980. One of the important objectives of this measure was the expansion of rural credit. In 1975, the government established an institution to meet specifically the requirements of rural credit— Regional Rural Banks. This was followed by the setting up of the National Bank for Agriculture and Rural Development (NABARD) in 1982. On account of all these efforts undertaken by the government, the institutional sources have increased their participation in

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rural credit considerably. Millions of first generation depositors and borrowers have been introduced to the banking system and they have shifted their loyalties from the non-institutional moneylendersand pawnbrokers to the banking institutions and co-operatives. However, this is only one part of the story. As noted by the Agricultural Credit Review Committee (1989), "the dual 'economy' has melted substantially, but themoneylender has not gone away". Non-institutional sources of agriculturalcredit still remain and they offer credit at high rates of interest which are, however, lower than before. Despite the phenomenal growth in the deposits and advances of institutional agencies, the latter have not made much dent in the rural economy. Only about 30 per cent of the rural families have demanded or have obtained access to the institutional credit system. Another serious matter of concern is the fact that the small and marginal farmers - the target group of the credit system- continue to be inadequately attended to. In 1951-52, they depended mainly on non-institutional sources. But, even in 1988, households with an asset holding of less than Rs. 10,000 depended on non- institutional sources for 67-90 per cent of their creditneeds.

#### 4) Defects in marketing structure:

For a considerable period of time, the Indian agricultural marketing structure has suffered from a number of defects. As a consequence, the Indian farmer has been deprived of a fair price for his produce. A considerable part of the total produce is sold by the farmers to the village traders and moneylenders. Most of the farmers are under heavy burden of debt and the moneylenders compel them to sell their produce to them (lien moneylenders) often at prices considerably lower than the market prices. The transportation facilities are not properly developed and many farmers therefore sell the produce in the village market itself after harvesting. The villages do not possess adequate warehousing facilities and substantial quantities of the produce are unloaded in the village markets immediately after harvesting. Supply in the village markets increases substantially and the farmers are notable to get a fair price for their produce. Farmers who go to mandiesto sell their produce face a chain of middlemen like kutchaarhativas, puccaarhativas, brokers, wholesalers, retailers etc. Thus, the farmers receive only a small part of the actual price of their crop. Moreover, the farmers are required to pay anumber of charges like arhatto the arhatiyas, tulai for weighing the produce, palledari to unload the bullockarts and for doing other miscellaneous types of allied works and gardafor impurities in the produce. In addition, the farmers are also required to pay a number of other undefined and unspecified charges. In many mandiesuse of wrong weights and measures was rampant till quite recently. Many mandiesdo not possess grading facilities and the practice usually prevalent in these mandies in the one known as Jara sales wherein heaps of all qualities of produce (good as well as bad) are sold in one common lot. Thus, the farmer producing better qualities is not assured of better prices. As a consequence, there is no incentive to use better seeds and produce better varieties. Naturally, under the marketing conditionsdescribed here, agricultural production and productivity are bound to below.

#### **B)** The Technological Factors:

The most important technological factors resulting in low agricultural production and productivity are: (i) inadequate irrigation facilities, (ii) use of outmoded techniques of production, (iii) limited use of fertilizers, (iv) inadequate plant protection measures, and (v) restricted use of high yielding varieties of seeds.

1. Inadequate irrigation facilities: Increase in agricultural production and productivity depends, to a large extent, on the availability of water. Hence, the importance of irrigation. However, the availability of rrigation is highly inadequate in India. For example, gross irrigated area as percentage of cropped area was only 18.3 per cent in 1960-61. Despite massive investments on expansion of irrigation facilities during the lanning period, gross irrigated area as percentage of cropped area had risen to only 36.0 per cent in 1993-94. Thus, we can say that, almost 65 per cent (i.e. a little less than two-thirds) of cropped area continues to depend upon rainfall. Productivity on this land is considerably lower than the productivity on irrigated land. According to an estimate of the Planning Commission, the productivity on un-irrigated land is just about one-half the productivity on irrigated land.7 B. D. Dhawan has observed that land productivity on irrigated lands averaged about 22 quintals per crop hectare in 1983-84 whereas it was less than 9 quintals per crop hectare on un-irrigated lands.8 Since almost two thirds of agricultural land is unirrigated, this shows that the general level of agricultural production and productivity is very low in India. Another point worth mentioning in this context is that multiple cropping is not possible on un-irrigated lands as 80 per cent of the annual rainfall in India is received in less than four months. Provision of irrigation facilities over large areas can make possible the growing of two or three crops in a year in these areas. This will considerably enhance agricultural production and productivity.

#### 2. Use of outmoded techniques of production:

In India, traditional techniques of production continue to be adopted on a large scale in agriculture. The farmers use primitive and simple agricultural implements for carrying out farm operations and these implements require biological sources of energy (viz., human labour and animal labour) for their operation. As against this, advanced countries of the West use mainly mechanical sources of energy (viz., tractors, threshers, harvester combines, pump sets etc.) for carrying out agricultural operation. The mechanical sources of energy increase the speed of carrying out operations and also increase the efficiency of resource use. Labour productivity increase as less labour is required than before to produce the same level of output. It is often observed that under traditional agriculture based on wooden (or iron) ploughs, bullocks and other primitive implements, agriculture is a mere subsistence occupation (even though the farmers might sell a portion of their produce in the markets). Introduction of tractors, harvesters, threshers, pump sets for irrigation etc. changes the very nature of traditional agriculture and transforms it into a commercial occupation. This leads to an increase in the economic surplus (the difference between total production and

consumption of agricultural output) and, consequently, the incomes of farmers increase. This, in turn, enables the farmers to invest more in the land and carry our permanent improvements on it. The use of better seeds, more fertilizers, pesticides etc. also increases and all these factors lead to an increase in agricultural production and productivity.

#### Limited use of fertilizers:

The consumption of fertilizers in India was a meager 66.000 tonnes in 1952-53. This limited use of fertilizers kept the productivity of land at very low levels. With the adoption of the New Agricultural Strategy in 1966, the consumption of fertilizers increased by leaps and bounds as this strategy depended on fertilizers considerably for its success. As a consequence of this strategy, the consumption of fertilizers rose considerably touching the level of 22 lakh tonnes in 1970-71, 55 lakh tonnesin 1980-81 and 162 lakh tonnes in 1997-98. However, even now the perhectare use of fertilizers in India is considerably lower as compared with many other countries. For example, amount of fertilizers used per hectare was only 81.8 kgs in India against 370.7 kgs. in China, 135.4 kgs in Bangladesh and 345.5 kgs in Egypt in 1995-96. What is more, there are substantial inter-state disparities in per hectare fertilizer consumption which ranged from 9.5 kg in Assam to 174.7 kg in Punjab in 1994-95 (average for the country being 75.7 kg in that year. In fact, the five States of Punjab, Harvana, Uttar Pradesh, Andhra Pradesh and Tamil Nadu together account for more than half of the total fertilizer consumption in the country. Moreover, rain fed areas which constitute 65 per cent of the cultivated area account for only about 20 per cent of the total fertilize; consumption. All this shows that large parts of the country have a very low level of consumption of fertilizers and this is one of the main reasons for their low productivity. Many regions of the country are deficient in nitrogen, phosphorous and potash and this deficiency can be made good by an increased use of fertilizers.

#### Inadequate plant protection measures:

It has been estimated that in India monetary loss in agriculture due to weeds, diseases, insects, nematodes, storage pests, rodents and birds runs into about Rs. 6,000 crores per annum.<sup>9</sup> Most of the farmers in the countryside were unaware of the pesticides and insecticides to manage this problem till quite recently. As a result, the consumption of pesticides was very low. After the adoption of the New Agricultural Strategy in the mid- sixties, the consumption of pesticides has increased at a fairly rapid rate. In 1995-96, the consumption of pesticides was 73,650 tonnes. However, the use of pesticides brings with it anumber of problems. For example, pesticides are by their very nature poisonous and can kill nontarget organisms (including man). Moreover, after the continued use of some pesticides for some years, the pests and insects develop resistance to them and this leads to the use of stronger and stronger pesticides over a period of time. Thirdly, use of fertilizers and pesticides brings about physiological changes in plants leading to multiplication and proliferation of pests. Lastly, pesticides application needs a scientific approach and

this approach is lacking in most: of our farmer. They are not aware of the actual quantity of toxicant needed to destroy a pest and tend to use more quantity than is necessary. The surplus used appears as a residue that may persist and accumulate within theecoweb.

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The above discussion shows that what is required not justpest extermination but economical utilization of pesticidal chemicals with least ecological damages. The thrust, accordingly, has not to be on increased use of pesticides but on Integrated Pest Management (IPM). This approach implies the adoption of cultural mechanical, biological and chemical methods of pest control. The government has been adopting this approach over the past number of years. It is on account of IPM approach adopted by the government that the consumption of pesticides has actually come downfrom 82,000 tonnes in 1990-91 to 73,650 tonnes in 1995-96.

#### Restricted use of high yielding varieties of seeds:

Use of quality seeds is essential for achieving higher crop production. The traditional seeds that have been used in this country from times immemorial have low productivity. During the period of mid-1960s, high yielding varieties of seeds for wheat were imported by the government from abroad and the use of these seeds pushed up the levels of productivity of wheat to new heights in India. This was the starting point of the New Agricultural Strategywhich led to, what is now known as, Green Revolution. The High Yielding Varieties Programme (HYVP) was launched in the country in thekharif season of 1966. Initially it was implemented in a total area of 1.89 million hectares. Over the years, area under this programme has been increased in phases and in 1997-98, it covered 76 million hectares. However, this is only about 40 per cent of the gross cropped area. Thus, almost 60 per cent gross cropped area continues to use traditional, low productivity, seeds. In this context, it is also pertinent to point out that the benefits of HYVP have, by and large, remained limited to wheat growing areas. The productivity of rice has also somewhat risen in recent years. In the case of most of the other cereals, pulses and other crops (excepting oilseeds), the productivity levels continue to be very low. The Economic Survey has expressed its concern on this issue in the following words, "The seed technology breakthrough that ushered in the green revolution in the seventies and even eightieshas unfortunatelylost its momentum in nineties. There has been no perceptible progress in evolving new seed varieties in the recent years particularly in respect of cereals and pulses, as also fruits and vegetables. Lack of any significant breakthrough in seed technology is perhaps one of the main reasons for slow growth in foodgrainsoutput during thenineties.

#### 3.4 MEASURES TO INCREASE AGRICULTURAL PRODUCTIVITY

The causes given above also suggest the measures to increase productivity. As would be clear, such measures would have to attack the problem from technical, institutional, social and economic angles. In particular, attempts will have to be made in the following directions.

#### 1) Implementation of land reforms:

Though land reforms have been introduced in India in the post- Independence period with a view to eliminating the intermediary interests inland (especially zamindari), providing security of tenure and ownership rights to tenants and reorganising agriculture through land ceiling legislation, co-operative movement and consolidation of holdings, theprogress registered is too unsatisfactory. Therefore, special attempts will have to be made by the State governments to implement the land reforms legislation forcefully so that the slogan 'land to the tiller' is translated into practice. Unless this is done, the tiller will have no incentive to invest in land and adopt new agricultural techniques. Therefore, land reforms are the first and foremostnecessity.

#### 2) Integrated management of land and water resources:

The total geographical area of the country for which information was availablein 1989-90 was 304.9 million hectares of whichonly 264.0 million hectares possess potential for biotic production, of this, 'wastelands' account for 79.5 million hectares, leaving only 184.5 million hectares. However, even this area cannot be regarded as beingin good health According to the land use statistics, the total extent of lands that suffer from degradation, to a greater or less degree, is 175 million hectares. Since this figure obviously includes wastelands, it follows that the area of lands that are still productive but are suffering from degradation is 95.5 million hectares (175 million hectares minus 79.5 million hectares). Since this area of 95.5 million hectares must necessarily be a part of the 142.2 million hectares of land that is under agriculture, it means that nearly twothirds of our agricultural lands are sick to some extent or another. This is quite alarming. In fact, as pointed out by B.B. Vohra, of the nearly twothirds of our total land resources suffering from degradation, about 50 per cent have undergone such degradation that they have, for all purposes, ceased to be productive. This proves the urgency of an integrated management of our land and water resources. It is particularly important to control soil erosion which affects around 150 million hectares out of the country's total land area of 304.9 million hectares as it constitutes the biggest single threat to the sustainability of ouragriculture.<sup>11</sup>

#### 3) Extension of new agricultural strategy:

Adoption and extension of HYVP to new areas and regions is essential to enhance agricultural productivity. This requires- (i) more use of highyielding varieties of seeds, (ii) more availability of fertilizers and (iii) judicious use of pesticides and adoption of plant protection measures. Improved seeds can play an important role in increasing productivity. This has been amply proved by the experience of many countries and by the demonstration of high- yielding varieties of wheat in Punjab, Haryana and Western Uttar Pradesh in our own country. Therefore, more and more farmers in more and more areas should be encouraged to use improved seeds. Improved varieties of seeds require heavy doses of fertilizers. In fact, the use of fertilizers in ample quantity (especially nitrogen, phosphorous and potash) can push up the productivity manifold. The new varieties of seeds are more prone to the attacks of pests and insects. Therefore, use of pesticides in judicious amounts is essential. As noted earlier, the focus should be on Integrated PestManagement. Productivity of Indian Agriculture

#### 4) Irrigation:

Use of improved seeds and fertilizers requires proper irrigation facilities. Irrigation can also make multiple cropping possible in a number of areas and hence enhance productivity. Attempts in this field will have to be undertaken in the following direction-modernizing irrigation systems in a phased manner, better operation of existing systems, efficient water management, adequate maintenance of canals and distribution systems, detailed surveys and investigation for preparation ofnew projects, developing a National Grid System to ensure water supply from water surplus areas to water deficit areasetc.

#### 5) Farm mechanization:

It is generally believed that through farm mechanization agricultural productivity can be increased. Supporters of mechanization argue that it results in increase in productivity of land and labour, reduction of costs, saving of time and increase in economic surplus. However, it should be borne in mind that all estimates of productivity include the contribution of machines as well as other agricultural inputs like improved seeds, fertilizers, etc. and it is not possible to say how much of increase in productivity is due to mechanization alone. Nonetheless, it cannot be denied that mechanization saves labour time, which can be utilized elsewhere.

#### 6) Provision of credit and marketingfacilities

Use of improved varieties of seeds, fertilizers, pesticides, insecticides, agricultural machinery and irrigation facilities all require substantial money resources which small farmers do not usually possess. Therefore, it is necessary to strengthen the credit cooperative sector and free it from the clinches of large landowners so that it can meet the credit requirements of small farmers. The commercial banks should be encouraged to lend more to small farmers. Regional rural banks can play a special role in this regard. The marketing structure also needs a reorientation to serve the small and marginal farmers in a better way. Co-operative marketing societies should be promoted to ensure better prices to small farmers.

#### 7) Incentives to the producer:

Incentives to the agriculturists can go a long way in encouraging them to increase productivity. Incentives can be in the following forms: (a) implementing land reforms rigorously and vigorously, (b) ensuring timely availability of agricultural inputs, (c) guaranteeing remunerative prices of produce to the farmer, (d) implementing crop-insurance scheme to cover the risk of damage to crops and other risks in agriculture, and (e) socialrecognition and conferment of Awards, merit certificates, etc.

#### 8) Better management:

Just as industry needs skilled management for Increasedproductivity, agriculture also requires better management for raising the level of productivity. For this purpose farmers have to be educated in more efficient use of their resources particularly land, irrigation facilities and agricultural implements. A related problem is the extension of science and technology in agriculture. This can be accomplished only if there is a vast network of managerial staff engaged in disseminating information about new agricultural techniques and methods of production. Other tasks of this extension staff could be to test die suitability of social and climatic conditions for different crops and advising the farmers on day-to-day problems confronted by them in carrying out agriculturalactivities.

#### 9) Agricultural Research:

Agricultural research is presently being conducted by the Indian Council of Agricultural Research, various Agricultural Universities and other institutions for evolving high-yielding varieties of seeds for different crops. Considerable success has been achieved in the case of wheat. However, intensive efforts are required for achieving similar success in other crops. Research should also be conducted on a substantial scale at different regional centersfor testing the quality of soil, suggesting measures for soil conservation and reclamation, examining the diseases affecting different crops, improving the quality of agricultural implements, avoiding wastage in agriculture especially damage to cropsresulting from pests, insects,rodents, etc.

#### 10) Emphasis on dry-land farming needed:

In India approximately 65 per cent of the cropped area is rain fed. It accounts for 44 per cent of the food and supports 40 per cent of India's population. It contributes 91 per cent, of the coarse cereals, 90 per cent of the pulses, 81 per cent of the oilseeds and 55 per cent of rice production. However, as we shall show in the Chapter on 'New Agricultural Strategy', the benefits of growth during the last three decades have gone mostly to areas having assured irrigation facilities (particularly Punjab, Haryana and Western Uttar Pradesh). Consequently, the rainfedareas have lagged considerably behind. Risks in such areas are high because rain is undependable. Soils are also degraded in quality and deprived of fertility. Economically, dry-land farmers are weak with low ability to withstand risk; their holdings are small and marginal which are unconsolidated and scattered.<sup>12</sup>

Given the above conditions, specific attempts are required to pushup the productivity levels in dry-land farming areas. This requires an 'integrated' approach to avoid run off of the rainfall from the area of its incidence, prevention of soil erosion, extensive research on rainwater management, minimizing evaporation losses through greater rain water conservation, watershed management, integrated nutrient management etc. Effective and efficient dryland farming practices can push up the productivity of coarse cereals, pulses, rice, cotton, oilseeds and many other crops. Not only will this help in pushing up overall productivity levels in Indian agriculture, it will also help in 'broadbasing' agricultural development and increasing the levels of income of small and marginal farmers.

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#### **3.5 EXERCISE**

- 1) Explain the concept of agricultural productivity and state the various causes of low agricultural productivity inIndia.
- 2) What is agricultural productivity? Explain the measures to increase agricultural productivity in India.



## LAND AND CONSTITUENTS OF LAND

#### **Unit Structure:**

- 4.0 Objectives
- 4.1 Introduction
- 4.2 Uses of Land
- 4.3 Characteristics of Land
- 4.4 Types of soils
- 4.5 Exercise

#### **4.0 OBJECTIVES**

- 1) To understand the various uses of land.
- 2) To understand the characteristics of land.
- 3) To study the various types of soils in India.

#### **4.1 INTRODUCTION**

Man along with all the plants and animals has been living on the surface of this earth for years together. He has been using the soil, water-bodies, forest, grasslands, animals, minerals etc. all related with land in various ways for his living.

Man gets the primary needs of living like food, clothing and shelter from the land itself. All human settlements, roads, agriculture, grazing of domestic animals, establishment of industries etc. are done on land. It is our most important primary naturalwealth.



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Land or the surface of the earth is not a like everywhere. Natural resources are also not equally available everywhere on the land surface. Man, too,

does not utilize land equally at all times. Land has been being equally at Land and Constituents of Land all times. Land has been being used differently at different times with the growth of civilization. The primitive man when he was living in caves of hills, did not know anything about agriculture.

Almost the entire land surface was covered with forests. Man in those by gone days, used to earn his living by collecting fruits and roots from the forests and by hunting birdsand animals. Hebegan to live at one place permanently when he gradually became intelligent and knew agriculture so, human settlements, roads and various institutions were set up.

Therefore, land was mainly used for forests, pastures, farming, human settlements and such other useful purposes.

#### 4.2 USES OFLANDS

India is one of the largest countries of the world. It ranks seventh in respect of population. The total land area of India is 32 lakh 87 thousand square kilometers. Three major types of lands are found in India in respect of its relief, such as, mountains, plateaus and plains. About 29% of our total land areas are mountains, 28% plateaus and 43% plains.

The mountains include the high Himalayan mountains in the north, the Aravalli ranges and the western Ghats in the west, the vindhyas and the satpura range at the centre, the Eastern Ghats in the east, the Agro, Khaki and Jacinta range in the north east. The plateaus include the Chhota Nagpur plateau, the Amarkantaka, Malawi, Karnataka and the Deccan plateaus. The plains include the Gangetic plains in the north, the Brahmaputra valley, the east and the west coastal plains and the flood plains of different river valleys ofIndia.

About 80% of the total land area of India is utilized by man. This land utilization of man is influenced by the relief, climate, soil as well as man's social and economicconditions.

According to use, lands in India are utilized as forest lands, pasture and grazing lands, agricultural or farm lands, settlement and other such purpose.

#### 1) FORESTLANDS:

India was covered with dense forests in primitive ages. More and more lands were needed for agriculture, settlement, industry, roads etc. with the growth of population. So man utilized land by cutting down and cleaning the forests in order to fulfill his growing needs. Now only about 22% of the total land area of our country is covered with forests.

The National Forest policy formulated in the year 1952 proclaims that about 33% of the country's total land area should be covered with forests in order to maintain ecological balance in our environment. It will control the country's climate and the country will be saved to a great extent from the ravages of flood, drought and cyclones. Therefore, there should be

forests in about 60% of lands in hilly areas and 20% of lands in theplains.

According to law, these forests are of three categories. Such as, reserved forest, protected forests and unclassified forest. Valuable forests are taken as the reserved forests, for which about half of the total lands under forests have been conserved. Man gets many useful forest products from the forests.

Forests play vital role in checking soil erosion, controlling flood, increasing the amount of rainfall and creating favourable conditions in the local climate. That is why forests are on important natural wealth of the country. Forests of India are being destroyed owing to various natural as well as man-made courses sothe extent of forests is graduallydiminishing.

In some hilly areas of the country, the Advises adopt shifting cultivation by clearing forests. Such type of farming is known as "pod on tail' cultivation in Orissa. At some places forests are cut down to raise farm lands, settlements, industries, roads etc. Cattle also treat forests as their grazing ground, thereby the seedlings and finally the forests are destroyed.

Only 2% of the total forest land of the world is in India. But 15% of the total world population and 13% of the total cattle population depend on forests. It is known as biotic pressure. Such enormous pressure is and important reason of deforestation. Besides, floods, cyclones and land erosion etc. also diminish the forest areas of our country.

Various projects like afforestation, social forestry, farm forestry etc. are being worked out in order to increase the forest area and efforts are being made to bring more land under forests. Artificial forests are being raised on waste lands in village and town areas under the social forestryscheme.

Plantations are likewise in progress bunds and plots dividing boundaries under the Farm Forest Scheme. By means of afforestation, the destroyed forests of hills, mountains and plateaus are being developed and thereby the extent and density of forests are increasing.

#### 2) PASTURES AND GRAZINGLANDS:

There are pastures and grazing lands of about 4% of the total land area of India. These are mainly seen in hilly areas. We don't have any definite grassland areas. So pastures are almost mingled with the forests of hilly areas and dwindled forests of the foot-hills of the Himalayan Mountains, the Eastern and the Western Ghats and the north-eastern mountain areas.

It has been very much necessary to grow more food by adopting farming on more and more lands owing to the growth of population and for want of rains for about eight months a year as a result of which it is not possible to spare definite land areas for grazing purposes. Himachal Pradesh has the maximum land under pastures and grazing lands in India.

#### Land and Constituents of Land

#### 3) LAND FOR AGRICULTURE OR FARMLANDS:

India is primarily an agricultural country. About 55% of the total land areas are used for growing food crops, vegetables, cash crops and fruit food crops are grown an about 45% of land out of the total 55% under cultivation. Vegetables and fruit are grown on the rest of the lands and some lands are left without any cultivation occasionally.

India has more form lands according to its land area as compared with the other countries of the world, but it is strange that the agricultural products are less. Plains, river - valleys, flood-plains and delta areas are mostly used for agriculture. Very limited farming is done on the plateaus and mountain - slopes. Shifting cultivation or pod cultivation is carried on by clearing the forest areas.

Only paddy is cultivated on about three-fourths of the total land under food crop cultivation, as rice is the staple food of the people in most parts of India. Wheat is grown on less amount of land than this the area of farm lands is increasing year after year as more people depend on agriculture. The area of land under food crop production in 1951 has by now increased by one and a half times. But the per capita holding of arable land has been decreasing gradually because of rapid growth ofpopulation.

#### 4) LAND UNDER HUMAN SETTLEMENT ETC:

About 19% of the total lands in India are being used for settlement of villages, towns, roads and rail - roads, airports factories and for educational, health and administrative organizations. As per 1981 census, there were 3,949 towns'. 557,137 villages having human settlements and 48,087 villages having no humansettlement.

A major portion of lands is also being used in construction of roads and rail - roads for communication among those towns utilized for establishing industrial organizations and setting up schools, colleges, universities, dispensaries and variousoffices.

#### **4.3 CHARACTERISTICS OF LAND**

The term 'land' in economics is often used in a wider sense. It does not mean only the surface of the soil, but it also includes all those natural resources which are the free gifts ofnature.

It, therefore, means all the free gifts of nature. These natural gifts include:

- i] Rivers, forests, mountains andoceans:
- ii] Heat of sun, light, climate, weather, rainfall etc. which are above the surface ofland:
- iii] Minerals under the surface of the earth such as iron, coal, copper, water etc. According to Marshall, "By land ismeant...materials and forces which nature gives freely for man's aid in land, water, air, light and heat, "Therefore, land is a stock of free gifts of nature.

#### **Characteristics of Land:**

Land possesses the following characteristics:

#### 1) Free Gift of Nature:

Man has to make efforts in order to acquire other factors of production. But to acquire land no human efforts are needed. Land is not the outcome of human labour. Rather, it existed even long before the evolution ofman.

#### 2) FixedQuantity:

The total quantity of land does not undergo any change. It is limited and cannot be increased or decreased with human efforts. No alternation can be made in the surface area ofland.

#### 3) Land ispermanent:

All man-made things are perishable and these may even go out of existence. But land is indestructible. Thus, it cannot goout.

#### 4) Land is a Primary Factor of Production:

In any kind of production process, we have to start with land. For example, in industries it helps to provide raw materials and in agriculture, crops are produced on land.

#### 5) Land is a Passive factor of Production:

This is because it cannot produce anything by it self. For example wheat cannot grow on a piece of land automatically. To grow wheat, man has to cultivate land. Labour is an active factor, but land is a passive factor of production.

#### 6) Land isImmovable:

It cannot be transported from one place to another. For instance, no portion of India's surface can be transported to some other country.

#### 7) Land has some original IndestructiblePowers:

There are some original and indestructible power of land, which a man cannot destroy Its fertility may be varied, but it cannot be destroyed completely.

#### 8) Land Differs inFertility:

Fertility of land differs on different pieces of land. One piece of land may produce more than theother.

#### 9) Supply of land is Inelastic:

The demand for a particular commodity makes way for the supply of that commodity, but the supply of land cannot be increased or decreased according to itsdemand.

#### 10) Land has ManyUses:

We can make use of land in many ways. On Land, cultivation can be done, factories can be set up, roads can be constructed, buildings can be raised and shipping is possible in the sea /rivers.

#### **4.4 TYPES OF SOILS ININDIA**

Soil is a valuable resource of India. Much of the Indian agriculture depends upon the extent and qualities of soil. Weathering prepares loose materials on the surface of the Earth and mixed with decayed organic matters it forms soil.

India is a large country and witness's diverse range of climaticand other natural conditions. The nature of soil in a place is largely influenced by such factors as climate, natural vegetation and rocks.

The various types of soil found in India includealluvial soil, Laterite soil, Red soil, Black soil, Desert soil and Mountain soil. They are each discussed below.

#### Major types and characteristics of soils India:

Indian soils may be divided into six major types based on their character and origin:

1) Alluvial soil: Materials deposited by rivers, winds, glaciers nd sea waves are called alluvium and soils made up of alluvium are alluvial soils. In India alluvial soils are mainly found on the Indo- Ganga Brahmaputra Plains, Coastal Plains and the broad river valleys of South India. They are also found along the river basins of some plateau and mountainregions.

In the Indo-Ganga plain two other types of alluvium are found. The old alluviums are clayey and sticky, have a darker color, contain nodules of lime concretions and are found to lie on slightly elevated lands. The new alluviums are lighter in color and occur in the deltas and the floodplains.

In comparison to old alluvial soil, the new alluvial soils are very fertile. The alluvial soil is regarded as the best soil of India for its high fertility and the rich harvest, it gives rice, wheat, sugarcane, jute oil- seeds and pulses are the main crops grown on this soil.

The alluvial soil is spread all over the plains of north India. They are also found in the four delta regions of the south. Strips of alluvium occur along rivers in the plateau as well as in themountains.

Alluviums are mainly loams, i.e. mixtures of sand and clay. New alluvial loams are very fertile. In the younger stage of the riverine plains, sandy soils are more common. While in the beds of the rivers, it consists generally of pure sands. These soils cannot retain water. 'Zaid' types of crops grow here, such as watermelons. Near the river mouths, the soil is usually clay. It retains water but does not allow rootgrowth.

**2)** Laterite and Lateritic soils: Laterite is a kind of clayey rock or soil formed under high temperature and high rainfall. By further modification laterite is converted into red colored lateritic soils charged with iron nodules. Laterite and lateritic soils are found in South Maharashtra, the Western Ghats in Kerala and Karnataka, at places on the Eastern Ghat, in some parts of Assam, Tamil Nadu, Karnataka and in western West Bengal (particularly in Birbhumdistrict). These soils are generally infertile. Some plants like tea, coffee, coconut, areca nut, etc. are grown in thissoil.

Laterite soils in India are found in the Eastern Ghat of Orissa, the Southern parts of Western Ghat, Malabar Coastal plains and Ratnagiri of Maharashtra and some part of Andhra Pradesh, Tamil Nadu, Karnataka, Meghalaya, western part of West Bengal.

Laterite soils are said to farraginous aluminous rock. They are formed by decomposition; because of they are found in black soil regions having heavy rainfall. The rocks are completely leached out having a high proportion of iron and aluminiumas residue. High temperature and heavy rainfall transformed the black soil into laterite.

**3) Red Soils:** Red soils develop on granite and gneisses rocks under low rainfall condition. The dissemination of red oxides of iron gives the characteristic red color of the soil. These soils are friable and medium fertile and found mainly in almost whole of Tamil Nadu, South-eastern Karnataka, North-eastern and South-eastern Madhya Pradesh, Jharkhand, the major parts of Orissa, and the Hills and Plateaus of North-east India. But these have capacity to grow good crops after taking help of irrigation and fertilizers. Wheat, rice, millets, gram, pulses, oil-seeds and cotton are cultivatedhere.

Red soils are formed by weathering of the ancient crystalline and metamorphic rocks. Their color is red due to their very high iron content. They are found in areas of low rainfall and is obviously less leached than laterite soils. They are sandier and less clayey soils.

Red Soil in India are poor in phosphorus, nitrogen and lime contents. The red soils covers a large portion of land in India. It is found in Indian States such as Tamil Nadu, southern Karnataka, north-eastern Andhra Pradesh and some parts of Madhya Pradesh, Chhattisgarh and Odisha.

4) Black Soils or Regur soils: The Reguror black soils have developed extensively upon the Lava Plateaus of Maharashtra, Gujarat, MadhyaPradesh mainly Malwa. Black soils have also developed on gneisses of north Karnataka and north and west of Andhra Pradesh. The Reguris clayey, becomes very sticky when wet. Its special merit lies in its water holding capacity. These soils are very fertile and contain a high percentage of lime and a moderate amount potash. The type of soil is especially suited to the cultivation of cotton and hence sometimes called 'black cotton soil'. Sugarcane, wheat, and groundnut are also cultivated.

5) Desert soil: The soils of Rajasthan, Haryana and the South Punjab are sandy. In the absence of sufficient wash by rain water soils have become saline and rather unfit for cultivation. In spite of that cultivation can be

carried on with the help of modern irrigation. Wheat, bajra, groundnut, etc. Land and Constituents of Land can be grown in thissoil.

#### The Great Indian Desert (also Thar Desert, Rajasthan plains):

The extends through the Jaisalmer, Bikanir, Jodhpur, Barmer districts of India and Khairpur, Bahawalpur districts of Pakistan. The area of the Great Indian Desert is more than two lakh square kilometers.

Located to the south-west of north Indian plain and to the west of AravalliMountain the region is also known as Rajasthan plain.

6) Mountain soil: Soils are varied in mountains. Alluvium is found at the valley floor, brown soil, rich in organic matter, in an altitudinalzone lying between about 700-1800 m. Further up podzolsoils, greyin color and acidic in reaction, are found associated with coniferous vegetation. In the Alpine forest belts the soils are thin and darker in color. This type of soil is suitable for the cultivation of potatoes, fruits, tea, coffee and spices andwheat.

The mountain soils are mainly found in Jarnmu and Kashmir, U.P., West Bengal, in the Himalayas submontane tracts. The Himalayas, the Northeastern Hills, and other mountains and hills in India show a variety of soils. In the drier areas of deciduous forest belt, brown soils are found. They are rich in humus and deep. They are very good for orchard crops. In coniferous forest belts in Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, etc., brownforest soils called Podzol are found. These soils grow maize, barley, wheat and fruits. In the Alpine Zone of the Himalayas lie Alpine Meadow soils.

Good crops of paddy, wheat, soybean and even sugarcane are grown in mountain soils.

#### **4.5 EXERCISE**

- 1) Explain the various uses ofland.
- 2) Discuss the characteristics ofland.
- 3) Describe the various types of soilIndia



## **SOIL EROSION**

#### **Unit Structure:**

- 5.0 Objectives
- 5.1 Introduction
- 5.2 Physical Process
- 5.3 Factors affecting Soil Erosion
- 5.4 Human activities that increase Soil Erosion
- 5.5 Global Environmental Effects
- 5.6 Remedial on Soil Erosion
- 5.7 Exercise

#### 5.0 **OBJECTIVES**

- 1) To study the concept of soil Erosion.
- 2) To understand the various factors affecting on soil Erosion.
- 3) To study the impact of soil erosion on Environment.
- 4) To underst and the various remedial measures on soilerosion.

#### 5.1 INTRODUCTION

**Soil erosion** is one form of soil degradation. Soil erosion is a naturally occurring process on all land. The agents of soil erosion are water and wind, each contributing a significant amount of soil loss each year. Soil erosion may be a slow process that continues relatively unnoticed or it may occur at an alarming rate causing serious loss of topsoil. The loss of soil from farmland may be reflected in reduced crop production potential, lower surface water quality and damaged drainagenetworks.

While erosion is a natural process, human activities have increased by 10-40 times the rate at which erosion is occurring globally. Excessive (or accelerated) erosion causes both 'on-site' and 'off- site' problems. On-site impacts include decreases in agricultural productivity and (on natural landscapes) ecological collapse, both because of loss of the nutrient-rich upper soil layers. In some cases, the eventual end result is desertification. Off-site effects include sedimentation of waterways and eutrophication of water bodies, as well as sediment-related damage to roads and houses. Water and winderosion are the two primary causes of land degradation; combined, they are responsible for about 84% of the global extent of degraded land, making excessive erosion one of the most significant
Soil Erosion

environmental problems world-wide. Intensive agriculture, deforestation, roads, anthropogenic climate change and urban sprawl are amongst the most significant human activities in regard to their effect on stimulating erosion.<sup>[3]</sup> However, there are many prevention and remediation practices that can curtail or limit erosion of vulnerable soils.

# 5.2 PHYSICALPROCESSES

### 1) Rainfall and surface run-off:

Rainfall and the surface runoff which may result from rainfall, produces four main types of soil erosion: splash erosion, sheet erosion, rill erosion, and gully erosion. Splash erosion is generally seen as the first and least severe stage in the soil erosion process, which is followed by sheet erosion, then rill erosion and finally gully erosion.

In splash erosion, the impact of a falling raindrop creates a small crater in the soil, ejecting soil particles. The distance these soil particles travel can be as much as 0.6 m (two feet) vertically and 1.5 in (five feet) horizontal on levelaround.



https://www.usgs.gov

### Soil and water being splashed by the impact of a single raindrop

If the soil is saturated or if the rainfall rate is greater than the rate at which water can infiltrate into the soil, surface run-off occurs. If the run-off has sufficient flow energy, it will transport loosened soil particles (sediment) down the slope. Sheet erosion is the transport soil particles by overlandflow.

Rill erosion refers to the development of small, ephemeral concentrated flow paths which function as both sediment source and sediment delivery systems for erosion on hillslopes.

Generally, where water erosion rates on disturbed upland areas are greatest, rills are active. Flow depths in rills are typically of the order of a few centimeters (about an inch) or less and along- channel slopes may be quite steep. This means that rills exhibit hydraulic physics very different from water flowing through the deeper, wider channels of streams and rivers.



### A spoil up covered in rills and gullies due to erosion processes caused by rainfall :Rammu. Estonia

Gully erosion occurs when run-off water accumulates and rapidly flows in narrow channels during or immediately after heavy rains or melting snow, removing soil to a considerable depth.

### 2) Rivers and streams:

Valley or stream erosion occurs with continued water flow along a linear feature. The erosion is both downward, deepening thevalley and headward, extending the valley into the hillside, creating head cuts and steep banks. In the earliest stage of stream erosion, the erosive activity is dominantly vertical, the valley have a typical V cross-section and the stream gradient is relatively steep. When some base level is reached, the erosive activity switches to lateral erosion, which widens the valley floor and creates a narrow floodplain. The stream gradient becomes nearly flat, and lateral deposition of sediments becomes important as the stream meanders across the valley floor. In all stages of stream erosion, by far the most erosion occurs during times of flood, when more and faster-moving water is available to carry a larger sediment load. In such processes. It is not the water alone that erodes: suspended abrasive particles, pebbles and boulders can also act erosively as they traverse a surface, in a process known astraction.

Bunk erosion is the wearing away of the banks of a stream or river. This is distinguished from changes on the bed of the watercourse, which is referred to as scour. Erosion and changes in the form of river banks may be measured by inserting metal rods into the bank and marking the position of the bank surface along the rods at different times.

Thermal erosion is the result of melting and weakening permafrost due to moving water. It can occur both along rivers and at the coast. Rapid river channel migration observed in the Lena River of Siberia is due to thermal erosion, as these portions of the banks are composed of permafrost-cemented non-cohesive materials.<sup>[15]</sup> Much of this erosion occurs as the weakened banks fail in large slumps. Thermal erosion also affects the Arctic coast, where wave action and near-shore temperatures combine to undercutpermafrost bluffs along the shoreline and cause them to fail. Annual erosion rates along a 100-kilometre (62-mile) segment of the Beaufort Sea shoreline averaged 5.6 meters (18 feet) per year from 1955 to 2002.

### 3) Floods:

At extremely high flows, kolks or vortices are formed by large volumes of rapidly rushing water. Kolks cause extreme local erosion, plucking bedrock and creating pothole-type geographical features called Rock-cut basins. Examples can be seen in the flood regions result from glacial Lake Missoula, which created the channeledscablands in the ColumbiaBasin region of eastern Washington.

### 4) Wind erosion:

Wind erosion is a major geomorphological force, especially in arid and semi-arid regions. It is also a major source of land degradation, evaporation, desertification, harmful airborne dust and crop damage especially after being increased far above natural rates by human activities such as deforestation, urbanization and agriculture.



### www.omafra.gov.on.ca

### Arbol de Piedra, a rock formation in the Altiplano. Bolivia sculpted by wind erosion.

Wind erosion is of two primary varieties: deflation, where the wind picks up and carries away loose particles; and abrasion, where surfaces are worn down as they are struck by airborne particles carried by wind. Deflation is divided into three categories: (1) surface creep, where larger, heavier particles slide or roll along the ground; (2) saltation, where particles are lifted a short height into the air, and bounce and salt ate across the surface of the soil; and (3) suspension, where very small and light particles arc lifted into the air by the wind and are often carried for longdistances.

Saltation is responsible for the majority (50-70%) of wind erosion, followed by suspension (30-40%), and then surface creep (5-25%).

Wind erosion is much more severe in arid areas and during times of drought. For example, in the Great Plains, it is estimated that soil loss due to wind erosion can be as much as 6100 times greater in drought years than in wetyears.

# 5.3 FACTORS AFFECTING SOILEROSION

### **Climate:**

The amount and intensity of precipitation is the main climatic factor governing soil erosion by water. The relationship is particularly strong if heavy rainfall occurs at times when, or in locations where, the soil's

surface is not well protected by vegetation. This might be during periods whenagricultural activities leave the soil bare, or in semi-arid regions where vegetation is naturally sparse. Wind erosion requires strong winds, particularly during times of drought when vegetation is sparse and soil is dry (and so is more erodible). Other climatic factors such as average temperature and temperature range may also affect erosion, via their effects on vegetation and soil properties. In general, given similar vegetation and ecosystems, areas more precipitation (especially highintensity rainfall), more wind, or morestorms are expected to have moreerosion.

In some areas of the world (e.g. the mid-western USA), rainfall intensity is the primary determinant of erosivity, with higher intensity rainfall generally resulting in more soil erosion by water. The size and velocity of rain drops is also an important factor. Larger and higher-velocity rain drops have greater kinetic energy, and thus their impact will displace soil particles by larger distances than smaller, slower-movingraindrops.

In other regions of the world (e.g. Western Europe), run-off and erosion result from relatively low intensities of strati formrainfall falling onto previously saturated soil. In such situations, rainfall amount rather than intensity is the main factor determining the severity of soil erosion bywater.

### 2) Soil structure and composition

The composition, moisture and compaction of soil are a 11 major factors in determining the erosivity of rainfall. Sediments containing more clay tend to be more resistant to erosion than those with sand or silt, because the clay helps bind soil particles together. Soil containing high levels of organic materials are often more resistant to erosion, because the organic materials coagulate soil colloids and create a stronger, more stable soil structure. The amount of water present in the soil before the precipitation also plays an important role, because it sets limits on the amount of water that can be absorbed by the soil (and hence prevented from flowing on the surface as erosive run-off). Wet, saturated soils will not be able to absorb as much rainwater, leading to higher levels of surface run-off and thus highererosivity for a given volume of rainfall. Soil compaction also affects the permeability of the soil to water, and hence the amount of water that flows away as run-off. More compacted soilwillhave alargeramountofsurfacerun-offthanlesscompactedsoils.

### 3) Vegetativecover

Vegetation acts as an interface between the atmosphere and the soil. It increases the permeability of the soil to rainwater, thus decreasing run-off. It shelters the soil from winds, which results in decreased wind erosion, as well as advantageous changes in microclimate. The roots of the plants bind the soil together and interweave with other roots, forming a more solid mass that is less susceptible to both water and wind erosion. The removal of vegetation increases the rate of surface erosion.

### 4) Topography

The topography of the land determines the velocity at which surface runoff will flow, which in turn determines the erosivity of the run-off. Longer, steeper slopes (especially those without adequate vegetative cover) are more susceptible to very high rates of erosion during heavy rains than shorter, less steep slopes. Steeper terrain is also more prone to mudslides, landslides and other forms of gravitational erosion processes.

# 5.4 HUMAN ACTIVITIES THAT INCREASE SOIL EROSION

### 1) Agricultural practices:

Unsustainable agricultural practices are the single greatest contributor to the global increase in erosion rates. The tillage of agricultural lands, which breaks up soil into finer particles, is one of the primary factors. The problem has been exacerbated in modern times, due to mechanized agricultural equipment that allows for deep plowing, which severely increases the amount of soil that is available for transport by water erosion. Others include mono- cropping, farming on steep slopes, pesticide and chemical fertilizer usage (which kill organisms that bind soil together), row-croppingand the use of surface irrigation. A complex overall situation with respect to defining nutrient losses from soils, could arise as a result of the size selective nature of soil erosion events. Loss of total phosphorus, for instance, in the finer eroded fraction is greater relative to the whole soil. Extrapolating this evidence to predict subsequent behaviour within receiving aquatic systems, the reason is that this more easily transported material may support a lower solution concentration compared to coarser sized fractions.<sup>[39]</sup>Tillage also increases wind erosion rates, by dehydrating the soil and breaking it up into smaller particles that can be picked up by the wind. Exacerbating this is the fact that most of the trees are generally removed from agricultural fields, allowing winds to have long, open runs to travel over at higher speeds. Heavy grazing reduces vegetative cover and causes severe soil compaction, both of which increase erosionrates.

### 2) Deforestation:

In an undisturbed forest, the mineral soil is protected by a layer *of leaf litter* and humusthat cover the forest floor. These two layers form a protective mat over the soil that absorbs the impact of rain drops. They are porous and highly permeable to rainfall, and allow rainwater to slow percolate into the soil below, instead of (lowing over the surface as run-off. The roots of the trees and plants hold together soil particles, preventing them from being washed away. The vegetative cover acts to reduce the velocity of the raindrops that strike the foliage and stems before hitting the ground, reducing their kinetic energy. However, it is the forest floor, more than the canopy, that prevents surface erosion. The terminal velocity of rain drops is reached in about 8 metres (26 feet). Because forest canopies are usually higher than this, rain drops can often regain terminal velocity even after striking the canopy. However, the intact forest floor, with its layers

of leaf litter and organic matter, is still able to absorb the impact of therainfall.

Deforestation causes increased erosion rates due to exposure of mineral soil by removing the humus and litter layers from the soil surface, removing the vegetative cover that binds soil togetherand causing heavy soil compaction from logging equipment. Once trees have been removed by fire or logging, infiltration rates become high and erosion low to the degree the forest floor remains intact. Severe fires can lead to significant further erosion if followed by heavyrainfall.

Globally one of the largest contributors to erosive soil loss in the year 2006 is the slash and burn treatment of tropical forests. In a number of regions of the earth, entire sectors of a country have been rendered unproductive. For example, on the Madagascar high central plateau, comprising approximate ten percent of that country's land area, virtually the entire landscape is sterile of vegetation, with gully erosive furrows typically in excess of 50 metres (160 ft) deep and 1 kilometre (0.6 miles) wide. Shifting cultivation is a farming system which sometimes incorporates the slash and burn method in some regions of the world. This degrades the soil and causes the soil to become less and lessfertile.

### **3)** Roads and urbanization:

Urbanization has major effects on erosion processes. First by denuding the land of vegetative cover, altering drainage patterns, and compacting the soil during construction; and next by covering the land in an impermeable layer of asphalt or concrete that increases the amount of surface run-off and increases surface wind speeds. Much of the sediment carried in runoff from urban areas (especially roads) is highly contaminated with fuel, oil and other chemicals. This increased run-off, in addition to eroding and degrading the land that it flows over, also causes major disruption to surrounding watersheds by altering the volume and rate of water that flows through them and filling them with chemically polluted sedimentation. The increased flow of water through local water ways also causes a large increase in the rate of bank erosion.

### 4) Climate change:

The warmer atmospheric temperatures observed over the past decades arc expected to lead to a more vigorous hydrological cycle, including more extreme rainfall events. The rise in sea levels that has occurred as a result of climate change has also greatly increased coastal erosionrates.

Studies on soil erosion suggest that increased rainfall amounts and intensities will lead to greater rates of soil erosion. Thus, if rainfall amounts and intensities increase in many parts of the world as expected, erosion will also increase, unless amelioration measures are taken. Soil erosion rates are expected to change in response to changes in climate for a variety of reasons. The most direct is the change in the erosive power of rainfall. Other reasons include: a) changes in plant canopy caused by shifts in plant biomass production associated with moisture regime; b) changes in litter cover on the ground caused by changes in both plant residue decomposition rates driven by temperature and moisture dependent soil microbial activity as well as plant biomass production rates; c) changes in soil moisture due to shifting precipitation regimes and evapo-transpiration rates, whichchanges infiltration and run-off ratios; d) soil erodibility changes due to decrease in soil organic matter concentrations in soils that lead to a soil structure that is more susceptible to erosion and increased run-off due to increased soil surface scaling and crusting: e) a shift of winter precipitation from non-erosive snow to erosive rainfall due to increasing winter temperatures: f) melting of permafrost, which induces an erodible soil state from a previously non-erodible one; and g) shifts in land use made necessary to accommodate new climaticregimes.

Studies by Pruski and Nearing indicated that, other factors such as land use unconsidered, it is reasonable to expect approximately a 1.7% change in soil erosion for each 1% change in total precipitation under climatechange.

# 5.5 GLOBAL ENVIRONMENTALEFFECTS

Due to the severity of its ecological effects and the scale on which it is occurring, erosion constitutes one of the most significant global environmental problems we facetoday.

### 1) Land degradation:

Water and wind erosion are now the two primary causes of land degradation; combined, they are responsible for 84% of degraded acreage.

Each year, about 75 billion tons of soil is eroded from the land -a rate that is about 13-40 times as fast as the natural rate of erosion. Approximately 40% of the world's agricultural land is seriouslydegraded.

According to the United Nations, an area of fertile soil the size of Ukraine is lost everyyear becauseof drought, depreciation and climate change. In Africa, if current trends of soil degradation continue the continent might be able to feed just 25% of i tspopulation by 2025, according to UNU's Ghana-based Institute for Natural Resources inAfrica.

The loss of soil fertility due to erosion is further problematic because the response is often to apply chemical fertilizers, which lead to further water and soil pollution, rather than to allow the land to regenerate.

### 2) Sedimentation of aquatic ecosystems:

Soil erosion (especially from agricultural activity) is considered to be the leading global cause ofdiffuse water pollution, the excess sediments flowing into the world's waterways. The sediments themselves act as pollutants, as well as being carriers for other pollutants, such as attached pesticide molecules or heavymetals. Soil Erosion

The effect of increased sediments loads on aquatic ecosystems canshe catastrophic. Silt can smother the spawning beds of fish, by filling in the space between gravel on the stream bed. It also reduces their food supply and causes major respiratory issues for them as sediment enters their gills. The biodiversity of aquatic plant and algal life is reduced and invertebrates arc also unable to survive and reproduce. While the sedimentation event itself might be relatively short-lived, the ecological disruption caused by the mass die off often persists long into thefuture.

One of the most serious and long-running water erosion problems worldwide is in the People's Republic of China, on the middle reaches of the Yellow River and the upper reaches of the Yangtze River, from the Yellow River, over 1.6 billion tons of sediment flows into the ocean each year. The sediment originates primarily from water erosion in the Loess Plateau region of the northwest.

### **3)** Airborne dust pollution:

Soil particles picked up during wind erosion of soil are a major source of air pollution, in the form of airborne participates- 'dust'. These airborne soil particles are often contaminated with toxic chemical such as pesticides or petroleum fuels, posing ecological and public health hazards when they later land or are inhaled /ingested.

Dust from erosion acts to suppress rainfall and changes the sky color from blue to white. Which leads to an increase in red sunsets? Dust events have been linked to a decline in the health of coral reefs across the Caribbean and Florida, primarily since the 1970s.<sup>[67]</sup> Similar dust plumes originate in the Gobi desert, which combined with pollutants, spread large distances downwind or eastward, i nto North America.

# 5.6 REMEDIAL ON SOILEROSION

Surface cover is a major factor to control erosion because it reduces the impact of raindrops falling on bare soils and wind removing soil particles. It also reduces the speed of water flowing over the land. Erosion risk is significantly reduced when there is more than 30% soil cover. Total cover is achievable for many grazing and cropping systems. Run-off concentrates as it flowsdownslope. By the time rivers draining large catchments reach the coast, they are usually justa few hundred meters wide. Eventhough surface cover encourages run-off to spread, run-off concentration is inevitable. Co-ordination across the catchment is important when implementing run-off control measures. Run-off may pass through several properties and cross several roads (sometimes railway lines) as it passes from the most remote part of a catchment to a major drainage line or creek.

1. Keep soil covered year-round: Bare soil is far more vulnerable to erosion than soil with ground cover. Aim for atleast30% ground cover on all grazing land, ideally 40% or more.[8] After harvesting crops, leave the residue on the soil as a mulch or plant hardy winter crops.

- 2. Plant trees to prevent landslides: Tree roots are powerful tools when soil is too eroded or steep to plant. Plant native trees on steep slopes and riverbanks to reduce soil loss. Bare ground around the tress still needs to be covered in mulch or grass for bestresults.
- **3.** Reduce tillage : Deep, frequent tillage creates a layer of compact soil vulnerable to water erosion, topped by loose soil easily removed by wind.[10][11]Consider a zero-tillage approach using a coulter or other deep planting device.[12]If this is not feasible, trya
- **4.** ridge-till or mulch-till system that leaves the lower soil levels untouched. These conservation tillage techniques also reduce the amount of vehicle traffic and therefore soil compaction.
- 5. Protect weak crops with strip cropping: Crops with weak roots or that need to be sparsely planted are more vulnerable to erosion. Plant these in strips, alternating with strips of an erosion- resistant crop such as dense grass or legumes. Plant the crops so they contour the slope. Plant these crops perpendicular to the prevailing wind if possible.
- 6. Practice wet season spelling: Grazing land cannot remain healthy and erosion-resistant if cattle are allowed to graze year- round. For best results, close off a paddock for the entire wet season to allow grasses to reestablish themselves. This may not be effective if the other paddocks cannot support the spelled cattle. If possible, keep cattle away from riverbanks and heavily eroded soil at alltimes.
- 7. Control downhill run-off with flume : Run-off concentrated into a narrower area as it travels across lands. The points where the concentrated run-off reaches a slope are particularly vulnerable to erosion. Build a paved flume or lined channel, to lead the water to a safe drainage system. Build these at gully heads aswell.
- 8. Plant grass and shrubs : Plant roots hold the soil together, while their leaves lessen damage caused by rain. Turf, ornamental grass, and low, spreading shrubs work best, since they leave no areas of bare soil. These have a good chance of controlling erosion by themselves, as long as the ground grade is less than 3:1 (3 units horizontal for each 1 unit rise). For steeper slopes, see below for additional work.
- **9.** Add mulch or rocks : Use these to cover any remaining patches of bare soil. Plant-matter mulch such as grass clippings or bark chips are especially effective.[3]These will also protect grass seeds and young plants from animals and water run-off, giving them time to grow. Mulch deteriorates over time, but ideally the soil should no longer need protection by the time it does. You may want to reapply mulch anyway, if your plant varieties and climate requireit.
- **10. Use mulch matting to hold vegetation on slopes:** Fiber mulch mats or erosion control mats are a layer of mulch held together in a fiber

mesh. This structure holds them together in areas where normal mulch would be washed or blown away. After planting vegetation, lay these over sloped ground, with a grade between 3:1 and 2:1. In areas with heavy wind or water, use liquid mulch binder to keep the mulch on theground.

- **11. Build retaining walls or terraces for steep slopes:** Eroding slopes with a 2:1 grade or steeper rarely support vegetation. Build a retaining wall to slow erosion while the vegetation takes hold. Give the wall a roughly 2% slope direct water flow. Tall hills can be transformed into terraces with several walls and soil grading. You may build the wall from concrete blocks, rock or wood. Only use wood treated with a preservative to prevent rot. Use retaining walls around flowerbeds and other raised soil areas as well. You may need local government approval to build these structures.
- **12. Improve drainage:** All buildings should have gutters or pipes that can drain water effectively out of your garden and into water collection systems. Without adequate drainage, heavy rain could potentially wash away a whole layer of topsoil. Areas with heavy water run-off may require installing an underground perforated drainage pipe.
- **13. Reduce watering if possible:** Over-watering your garden can speed up erosion. Consider a less frequent watering schedule or install a drip irrigation system to reduce the amount of waterrunoff.
- 14. Avoid soil compaction: Foot and vehicle traffic compresses soil, making it less porous and more vulnerable to water run-off. Take steps to minimize this effect. Establish permanent walkways with paving stones, stepping stones, or clearedpaths.

Water erosion and surface water run-off are problematic. One of the main causes of soil erosion is water erosion, which is the loss of topsoil due to water. Removal of vegetation is another cause or soil erosion and so is the removal of keystone species such as elephants from an area, when they are unable to fulfill their niche in the local ecology.

# 5.7 EXERCISE

- 1) Explain the concept of soil erosion and state the various factors affecting on soilerosion.
- 2) State the various causes and consequences of soilerosion.
- 3) Suggest some remedial measures an soil erosion in ruralarea.



# **ACQUISITION OF LAND**

### **Unit Structure:**

- 6.0 Objectives
- 6.1 Introduction
- 6.2 Purpose of landacquisition
- 6.3 Issues of landacquisition
- 6.4 Consequences of landacquisition
- 6.5 Proposed amendments
- 6.6 Alternatives for landacquisition
- 6.7 Exercise

### 6.0 **OBJECTIVES**

- 1) To understand the concept and purpose of Landacquisition.
- 2) To study the variousissues and consequences of landacquisition.
- 3) To understand proposed amendments and alternative for land acquisition.

# 6.1 INTRODUCTION

Land acquisition in India refers to the process by which the Union or a State Government in India acquires private land for the purpose of industrialization, development of infrastructural facilities or urbanization of the private land and provides compensation to the affected land owners and their rehabilitation and resettlement.

Land acquisition in India is governed by the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (LARR) and which came into force from 1 January 2014. Till 2013, land acquisition in India was governed by Land Acquisition Act of 1894. On 31 December 2014, the President of India promulgated an ordinance with an official mandate to "meet the twin objectives of farmer welfare; along with expeditiously meeting the strategic and developmental needs of the country". Anamendment bill was then introduced in Parliament to endorse the Ordinance. LokSabhapassed the bill but the same is still lying for passage by the RajyaSabha. On 30 May 2015. President of India promulgated the amendment ordinance for third time. Union Government of India has also made and notified the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2014 under the Act to regulate the procedure. The land acquisition in Jammu and Kashmir is governed by the Jammu and Kashmir Land Acquisition Act, 1934.

# 6.2 PURPOSE OF LANDACQUISITION

As per the Act, the Union or State Governments can acquire lands for its own use, hold and control including for public sector undertakings and for 'public purpose', and shall include the following purposes :

- 1. For strategic purposes relating to naval, military, air force and armed forces of the Union, including central paramilitary forces or any work vital to national security or defense of India or State police, safety of thepeople;
- 2. For infrastructure projects as defined under theAct;
- 3. Project for project affected families;
- 4. Project for housing for such income groups, as may be specified from time to time by the appropriateGovernment;
- 5. Project for planned development or the improvement of village sites or any site in the urban areas or provision of land for residential purposes for the weaker sections in rural and urban areas;
- 6. Project for residential purposes to the poor or landless or to persons residing in areas affected by natural calamities or to persons displaced or affected by reason of the implementation of any scheme undertaken by the Government, any local authority or a corporation owned or controlled by the State. The land can be acquired for private bodies for certainpurposes:



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- 7. For public private partnership projects, where the ownership of the land continues to vest with the Government, for public purpose as defined in theAct;
- 8. For private companies for publicpurpose.

# 6.3 ISSUES OF LANDACQUISITION

Some of the important issues surrounding the Land Acquisition are discussed below. The major land acquisition and conflicts happen in the densely populated areasof the countryside.

### 6.3.1 Eminent Domain:

The power to take property from the individual is rooted in the idea of eminent domain. The doctrine of eminent domain states, the sovereign can do anything, if the act of sovereign involves public interest. The doctrine empowers the sovereigntoacquire private land for a public use, provided the public nature of the usage can be demonstrated beyond doubt. The doctrine is based on the following two Latin maxims- 1) Saluspopulisupremalex (Welfare of the People Is the Paramount Law) and 2) Necessitaspublica major est quam (Public Necessity Is Greater Than Private Necessity). In the history of modern India, this doctrine was challenged twice once when land reform was initiated and another time when Banks were nationalized.

The Constitution of India originally provided the right to property (which includes land) under Articles 19 and 31. Article 19 guaranteed that all citizens have the right to acquire, hold and dispose of property. Article 31 stated that "no person shall be deprived of his property save by authority of law." It also indicated that compensation would be paid to a person whose property has been taken for public purposes.

In India, with this introduction of 'social' elements to the property rights, a new phase had begun. K. K. Mathew, justice of KesavanandaBharativs State of Kerala stated this precisely: "Property in consumable goods or means of production worked by their owners were justified as necessary condition of a free and purposeful life; but when property gave power not only over things but through things over persons also, it was not justified as it was an instrument of servitude rather thanfreedom."

### 6.3.2 Legislative changes:

The 2013 Act focuses on providing not only compensation to the land owners, but also extend rehabilitation and resettlement benefits to livelihood looser from the land, which shall be in addition to the minimum compensation. The minimum compensation tobe paid to the land owners is based on a multiple of market value and other factors laid down in the Act. The Act forbids or regulates land acquisition when such acquisition would include multi-crop irrigated area. The Act changed the norms for acquisition of land for use by private companies or in case of public-private partnerships, including compulsory approval of 80% of the landowners. The Act also introduced changes in the land acquisition process, including a compulsory social-impact study, which needs to be conducted before an acquisition ismade.

The new law also has some serious shortcomings as regards its provisions for socio-economic impact assessment and it has also bypassed the constitutional local self-governmentsby not recognizing them as 'appropriate governments' in matters of land acquisition.

### 6.3.3 Monetary compensation:

Major Indian infrastructure projects such as the Yamuna Expressway have paid about INR 2800 crores (US\$500 million) forland or over US\$25,000 per acre between 2007 and 2009. For context purposes, this may be compared with land prices elsewhere in the world:

- According to The Financial Times, in 2008, the farmland prices in France were Euro 6,000 per hectare (\$2,430 per acre; IN Rs. 1,09,350per acre).
- According to the United States Department of Agriculture, as of January 2010, the average farmland value in the United States was \$2140 peracre (INRs.96,300 peracre). The farm land prices in the United States varied between different parts of the country, ranging between \$480 per acre to \$4,690 per acre.

A 2010 report by the Government of India, on labor whose livelihood depends on agricultural land, claims that, per 2009 data collected across all States in India, the all-India annual average daily wage rates in agricultural occupations ranged between IN Rs. 53 to 117 per day for men working in farms US\$354 to 780 per year), and between IN Rs. 41 to 72 per day for women working in farms (US\$274 to 480 per year). This wage rate in rural India study included the following agricultural operations common in India: ploughing, sowing, weeding, transplanting, harvesting, winnowing, threshing, picking, herdsmen, tractor driver, unskilled help, masonry, etc.

The compensation for the acquired land is based on the value of the agricultural land; however price increases have been ignored. The land value would increase many times, which the current buyer would not benefit from. Secondly, if the prices are left for the marketto determine, the small peasantscould never influence the big corporate tycoons. Also it is mostly judiciary who has awarded higher compensation thenbureaucracy.

### 6.3.4 Delayedprojects

Delayed projects due to mass unrest have caused a damaging effect to the growth and development of companies and the economy as a whole. Earlier States like Maharashtra, Tamil Nadu, Karnataka, and Andhra Pradesh had been an attractive place for investors, but the present day revolts have shown that land acquisition in some States poseproblems.

# 6.4 CONSEQUENCES OF LANDACQUISITION

The consequences of land acquisition in India are manifold. The empirical and theoretical studies on displacement through the acquisition of land by the government for development projects have so far focusedon the direct and immediate adverse consequences of land acquisition. Most of the analytical as well as the descriptive accounts of the immediate consequences of landacquisition for development projects draws heavily from Michael Cernea's' impoverishment risk model', which broadly enumerated eight 'risks' or 'dimensions' of development-induced

Acquisition of Land

displacement. These eight risks are VERY much direct and basic in naturewhich are- i) landlessness, ii) Joblessness. iii) marginalization iv) loss of access to common property resources, v) increased morbidity and mortality, vi) food insecurity, vii) homelessness and viii) social disarticulation. Recently L.K. Mahapatrahas added 'loss of education' as another impoverishment risk in situations of displacement.

But apart from these direct and immediate effects of land acquisition there are more subtle and indirect effects of this coercive and centralized legal procedure, which have a bearing on various decentralized and participatory democratic processes and institutions of the State power. Land reforms and the Panchayatiraj institutions are the two most important areas, which are being vitiated by land acquisition. Of all the States of India, the consequences and controversies around land acquisition in West Bengal has recently gained a lot of national and international attention. The peasant resistances against governmental land expropriation in Singur (a place in the Hoogly district) and Nandigram(a place in the East Medinipurdistrict) has finally led to the fall of the Communist Party (Marxist) led governmentin West Bengal, which ruled theState through democratic election for 34 years. The Communist led left front government of West Bengal under the economic liberalization policy adopted by the Central Union government of the country shifted from its pro-farmer policy and took to the capitalist path of industrial development, which at the microlevels endangered the food security of the small and marginal farmers as well as sharecroppers who formed the vote bank of the Left Front Government of West Bengal. The new anti-Communist Trinamul Congress led government of West Bengal which came to power in the State in 2011 through a massive electoral victory is yet to develop any comprehensive resettlementand rehabilitation policy for the thousands of families affected by various development projects. The new government has enacted a law on 14 June 2011, in the West Bengal Assembly named 'SingurLand Rehabilitation and Development Act, 2011 '. With this law, the West Bengal government has reacquired Narmada was planned on acquired land, though the project was later cancelledby the WorldBank.

The Land Acquisition Act of 1894 allowed the government to acquire private lands. It is the only legislation pertaining to land acquisition which, though amended several times, has failed to serve its purpose. Under the 1894 Act, displaced people were only liable for monetary compensation linked with market value of the land in question, which was still quite minimal considering circle rates are often misleading.

# 6.5 PROPOSEDAMENDMENTS

The current Narendra Modi lead National Democratic Alliance (India) government driven Land Acquisition Amendment Bill in the Lok Sabhaon 10 March 2015 has seen a tough resistance from key position parties in India who have called the proposed amendments "anti-farmer' and 'anti-poor'. The proposed amendments remove requirements for approval from farmers to proceed with land about 1000 acres of farmland from the Tatas which was given to the company for building a small-car manufacturing factory in

2006 by the then Left Front government. The Trinamul government's intention was to return 400 acres of farmland to the 'unwilling' farmers around whom the agitation against the Left Front government was organised by the Trinamul Congress Party. However, now the whole issue seems to have fallen into a long legal battle between the present State government and the Tatas, as the latter has challenged the 'Singur Land Rehabilitation and Development Act' in the court. As a result, the Trinamul government has not yet been able to return the land to those 'unwilling farmers' nor have they received any compensation (The Statesman, 12 January 2012). In another caseof governmental land acquisition for housing at North 24 Parganas district of West Bengal, the farmers began to cultivate their farmland which were acquired but remained unutilised. According to media report these farmers were assured by the Trinamul Congress party leaders before the election that their land, which is about 1687 acres would be returned to them if the party could come to power. However, now these farmers are turning their backs to the Trinamul Congress, since the party has not kept its preelection promise (The Statesman, 11 February 2012). Under the above disturbing episodes, it may be worthwhile to narrate the glaring incident of the opposition levelledby Mamata Banerjee, the present Chief Minister of West Bengal to the draft Land Acquisition (Amendment) Bill 2007 in the LokSabha. At that time Miss Mamata Baneriee was the Railway Minister of the Central Government. She opposed to a clause of the billwhich empowered private companies to acquire up to 70 per cent land directly from farmers and landowners. The remaining 30 per cent could be acquired by the State government. Miss Banerjee wanted private companies to buy 100 per cent of the land, according to a report (The Statesman, 26 July 2009). It seemed that Miss Banerjee would have allowed the amended Bill to be passed if the; LokSabha agreed to modify the 70/30 proportion to 100 per cent purchase by the companies under the principle of willing-buyer- willing-seller.

The process of land acquisition in India has proven unpopular with the citizenry. The amount reimbursed isfairly low with regard to the current index of prices prevailing in theeconomy. Furthermore, due to the low level of human capital of the displaced people, they often fail to find adequateemployment.

The draft of the government's National Policy for Rehabilitation states that a figure around 75% of the displaced people since 1951 arc still awaiting rehabilitation. However, it should be noted that displacement is only being considered with regard to 'Direct Displacement'. These rehabilitation policies do not cover fishermen, landless laborers and artisans. Roughly, one in ten Indian tribals is a displaced person. Dam projects have displaced close to a million Adivasis, with similar woe for displaced Dalits. Some estimate suggests 40 percent of displaced people are of tribalorigins.

There have been a rising number of political and social protests against the acquisition of land by various industrialists. They have ranged from Bengal, Karnataka, and Uttar Pradesh in the recent past. The acquisition of

997 acres of land byTata Motors in Bengal in order to set up a factory for the cheapest car in India was protested (Singur Tata Nano controversy). At least a decade before the Singur episode similar events occurred in West Bengal, although the opposition parties and other civil society organizations remained silent at that time. Similarly, the SardarSarovar Dam project on the river acquisition under five broad categories of projects.While the bill was passed in LokSaibha, it still needs approval from the RajyaSabha, where the current governmentdoes not have a majority, for the proposed amendments to become effective.

The following are the main disputation point -

- The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013defines 'consent' clause as "land can only be acquired with approval of the 70% of the land owners for PPP projects and 80% for the private entities. But the proposed amendments by the NarendraModi government does away with consent clause for Industrial corridors, Public Private Partnership projects, Rural Infrastructure, Affordable housing and defenseprojects.
- The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 says the land unutilized for 5 years should be returned to theowner, but the amendment proposed by NDA government intends to change to 5 years or any period specified at the time of setting up the project.
- While the The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act,2013 allows private companies to acquire land, but the proposed amendment allows any private entity to acquire land.
- According to the new amendment, if any government official conductsany wrong doing, he or she cannot be prosecuted without prior sanction from the government.
- The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 mandated the social assessment before land acquisition, but the NDA government's proposed bill does away with this requirement.

# 6.6 ALTERNATIVES FOR LANDACQUISITION

One of the alternative proposals to land acquisition is leasing the land from landowners for a certain lease period. Proponents cite how land acquisition policies by Governments unwittingly encourage rampant land speculation making the projects expensive since huge portion of investment would be need to be allocated for land acquisition costs. According to them, policies of land acquisition gaveway to political cronyism where land is acquired cheaply by securing favors from local governments and sold to industries at steep markup prices. Leasing land,may also support sustainable project development since the lands need to be returned to the landowners at the end of the lease period in a condition similar to its original form without

considerable environmental degradation. When the land is leased then anybody who has to otherwise give up land or livelihood will be compensated forits growing valuation over time. In this model, the landowner lends her land to the government for a steadilyincreasing rent or through an annuity-based system as currently practiced in Haryana and UttarPradesh.

Some industries already follow the model of leasing lands instead of acquiring it. Energy development projects such asoil&gas extraction usually lease lands. Renewable energy projects such as Wind Power farms projects often lease the land fro landowners instead of trying to acquire the land which could make the projects prohibitivelyexpensive.

# 6.7 EXERCISE

1) Explain the concept of Land acquisition and describe the various purposes of landacquisition.

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2) Describe the various consequences of land acquisition in rural area.

# 7

# **ROLE OF AGRICULTURAL INPUTS -SEEDS, FERTILIZERS AND PESTICIDES**

### Unit Structure:

- 7.0 Objectives
- 7.1 Introduction
- 7.2 High Yielding Varieties ofSeeds
- 7.3 Fertilizers
- 7.4 Pesticides
- 7.5 Exercise

# 7.0 OBJECTIVES

- 1) To study the importance and characteristics of High Yielding Variety (HYV)seeds.
- 2) To understand various types of fertilizers and pesticides.

# 7.1 INTRODUCTION

India has succeeded in raising farm production in some of the major and high value crops, there are still a number of crops where production and hence, return to farm household is very low. There can, therefore, be no complacency in organizing adequate input supports to the farming sector. Emphasis would have to continue on a package of especially for small and marginal farmers. The basic inputs which contributed for the development of agricultural sector mentioned as:

- 1) High yielding varieties ofseeds.
- 2) Fertilizers
- 3) Pesticides.

# 7.2 SEEDS

### 7.2.1 High Yielding Varieties ofseeds:

One of the basic pre-requisite of technical changes is the High Yielding Varieties of seeds (HYV). With this programme it becomes possible to lead intensive agriculture, yet the real impetus to these efforts was given by the adoption of new agricultural

strategy in 1966-67. It was, thus, during mid-sixties that the high yielding variety of wheat were evolved since then a number of HYV seeds of wheat, paddy, maize and bajara have been developed and widely distributed in the country. In 1966-67, only 1.89 million hectares of land had been brought under HYV seeds whichrose to 56.18 million hectares in 1980-87. During 1991-92, the area under high yielding verities of seeds from 1966-67 to 1993-94.

Crop	1970-71	1980-81	1990-91	1991-92	1993-94
Paddy	5.6	18.2	28.1	28.0	28.9
Wheat	6.5	16.1	20.4	20.5	22.0
Jowar	0.8	3.5	6.7	5.6	6.8
Bajara	2.0	3.7	5.1	6.8	5.1
Maize	0.8	1.6	2.6	3.8	3.9
Total	15.4	43.1	62.9	64.7	66.6

### Area under HYV (million Hectares)

The HYVP has been taken up for five crops. Among these the most striking success has been achieved in wheat. The average yield of wheat has been 634 kgs. per hectare. With high yielding strains (kalyansona, sonalika, safedlerwa) the yield have been high in Punjab, Haryana, Western U.P plains and Northern parts of Gujarat. Elsewhere the yields have been low. The major factor which triggered the wheat revolution in Sutlaj-Yamuna plains was the introduction of high yielding, nitrogen responsive dwarf- strains of wheat fromMexico.



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As regards the other crop production, yields have been rather low. As against the average yield of 1150 kgs of paddy per hectare, it increased to 1651 - 2050 kgs and 1251 - 1650 kgs. Per hectare in the core vice region. The yield increase due to the increasing area under improved strains i.e.,

Taiching Natiri-1, Taiching 65, Taiaon-3, ADT -28, IR -8, Padma Jaya, Hansa, Pankay, Jagannath, Sabaramati, Jamuna, IR -28 and Kaveri-7 etc.

Role of Agricultural Inputs -Seeds, Fertilizers and Pesticides

The productivity of Jowar did not show any appreciable increase. The national average was 685 kgs per hectare; it increased to as high as 1000 kgs. in Punjab, Haryana, Gujarat, Tamil Nadu and Andhra Pradesh to over 2000 kgs. on sandy soils of Marusthali. It has over 23000 kgs per hectare in Ferozpur districts of Punjab.

Average maize productivity has been 1467 kgs. Per hectare. It increased to over 1150 kgs. Per hectare due to increased use of improved seeds viz. Ganga 101, Ganga sated, Ganga - 3,etc.

### 7.2.2 Characteristics of HYV:

- 1) The fields, in which HYV seeds are to be sown, should have proper drainage facilities.
- 2) All varieties are short duration ranging from 100-140 days in different parts of thecountry.
- 3) Under better irrigated conditions the HYV seeds are highly responsible.
- 4) These are coarse and therefore the market price is invariably lower than the other medium and finevarities.
- 5) These are all dwarf varieties and they are responsive to higher does of fertilizerapplication.

### 7.3 FERTILIZERS

The use of fertilizers is indispensable for accelerating the growth of agricultural output in the short period. The classical researches of CalonelMacarrison and B.V. Nath in India and Mackeridge and Bottomely proved that crops raised with organic manure are superior in their nutritive value then those with artifical manure. According to an estimate, the use of one tonne of plant nutrients would be equivalent to adding about 4 hectares crop land in terms of additional production. Thus, it is one of the profitable mean of land use and sustained agricultural production. In this regard National Commission on Agriculture has rightly said, "It has been the experience throughout the world that increased agricultural production is related to the increased consumption of fertilizers."



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### 7.3.1 Types of ChemicalFertilizers:

Chemical Fertilizers are of three types as:

- 1) NitrogenousFertilizer.
- 2) PhosphaticFertilizer.
- 3) PottasicFertilizers.

1) Nitrogenous Fertilizers: It comprises salt petre, mitre, ammonium sulphate, sodium nitrate and area, etc. It impart a green colour to leaves and encourages the development of foliage. As regards cereals, it tends to produce succulence or tenderness in theplant.

2) Phosphatic Fertilizers: It comprises of bones and rock phosphates. When powdered rock phosphate is applied to the soil, phosphoric acid becomes readily available. It helps in the root development of crops, hastens maturity of crops. In case of cereals, it increases resistence to disease and in proves the quality of crops.

**3) PottasicFertilizers :**These comprises of potassium chloride and potassium sulphate. It helps the transference of food materials from one part of the plant to another. It also provides green colour to the leaves and tend to increase plumpness in grains.

### 7.3.2 Time of Application of Fertilizers:

The time of application of fertilizer often makes a considerable difference in its utilization by the crop. Plants absorb a large quantity of nitrogen, phosphoric acid and potash during the early stage of growth. Therefore, fertilizers should be applied to the most of crops at before or the sowing times. These need not to be applied to annual crops in their latter stage of growth. A late application of nitrogen to a crop increases the nitrogen content. But crops of long duration require its application twice or thrice at suitable intervals. As regards the phosphoric fertilizer, it should be applied before or at the time of planting the crop. Potash is applied at the time of planting and to a limitedextend.

### 7.3.3 Methods to ApplyFertilizers:

The following methods are generally used to apply fertilizers.

- i) Broadcasting during the preparation of thesoil;
- ii) Placing in rows either before or at the time ofplanting;
- iii) Side dressing the crop during growingseason.
- iv) Applying LiquidFertilizers.

### 7.3.4 Production of Chemical Fertilizers:

Since 1950-51 Indian Fertilizer industry has continuously expanded. The total production capacity which was 0.31 million tonnes in 1950-51 has reached to 9.04 million tonnes in 1994-95. and further 10.1 million tonnes in 1994-95. In the production of Nitrogenous Fertilizer India ranks fourth largest producer in the world. In recent years. India's fertilizer scenario has undergone a dramatic change. Since domestic production could not suffice to meet the entire demand, a substantially large part of domestic consumption till now was being meeting byimports.

### 7.3.5 Consumption of ChemicalFertilizer:

Proper use of fertilizer alone can enhance the productivity of soil. But Indian soil is deficient in nitrogen and phosphorus and this deficiency can be removed by using more fertilizers. Thus, increased consumption of fertilizers is an important element of new strategy. However, the consumption of fertilizers has increased steadily. At the beginning of first plantheconsumption was only 0.13 milliontonnes as shown in table.

Consumption of Chemical Fertilizer			
Year	Quantity (million tonnes)		
1950-51	0.13		
1960-61	0.29		
1966-67	1.10		
1970-71	1.18		
1980-81	5.52		
1984-85	8.21		
1986-87	8.74		
1987-88	8.79		
1988-89	11.04		
1990-91	12.54		
1991-92	12.73		
1992-93	12.15		
1993-94	12.83		

The consumption of fertilizer during the first three years of seventh plan fell short of targeted level due to unfavourable weather and unprecedented drought in 1987-88. The fourth and fifth years of the plan have been very good years for development of crops as encouraged by the onset of good monsoon in time and farely even distribution of rainfall in the country. As a result, consumption of fertilizers increased both in sharif and rabi seasons to 12.43 million tonnes during 1980-81 and to 12.73 million tonnes in 1991-92 and further to 13.85 million tonnes in 1993-94.

Despite the massive increase in fertilizer consumption the fact remains that fertilizer use per hectare of land is still much less in India as compared to many other countries of the world, on an average, India consumed 39.4 kg. of fertilizer per hectare of land during 1986-87, corresponding figure was 436 kg. in Japan, 508 kg. in Belgium, 1.144 kg. in NewZealand.

### 7.3.6 Constrains or Problems:

The major constrains of fertilizer use can be identified as below:

1) Return Non-Remunerative - The use of fertilizers is considered non-remunerative in the case of interiorcereals.

2) Non-Availability of Fertilizers - A significant proportion of farmers have denied the use of fertilizers because of their non- availability.

**3)** High Prices of Fertilizers - The small and medium farmers do not use fertilizers due to its high prices. The cultivators lack sufficient capital to make this type of investment in fertilizeruse.

4) **Risk Element -** Risk element implies the fear of heavy losses case of failure of rains. This sort of fear is also experienced by bigfarmers.

### 7.3.7 Suggestions to increase consumption offertilizer:

Some significant measures to increase the consumption of fertilizer are:

- i) Fixation and operation of support price and procurement price of food grains.
- ii) Regulation of fertilizer application by testingsoils.
- iii) Irrigation facilities should be created.
- iv) Soil and moisture conservationtechniques.
- v) Minimization of damage by disease, insects, rodents, etc. in the field ofstorage.

# 7.4 PESTICIDES

It is beyond any shadow of doubt that new seeds have increased the per hectare yield of various crops. Biologically, the crops sown through use of new seeds are more prone to disease. The use of fertilizers for their production also increases the susceptibility of these crops to diseases.

Role of Agricultural Inputs -Seeds, Fertilizers and Pesticides

It is estimated that every year nearly 10 per cent crops are damaged due to in sufficient plant protection measures. The adoption of HYV of seeds has further increased the importance of such measures. For instance, during 1976-77, about 20 per cent of the cropped area suffered from pests and diseases while area treated with pesticides was only 7.2 per cent. The crops that suffered most were groundnut 47%, cotton 28%, paddy 24% and sugarcane 25%.

Consumption of pesticides was almost negligible in the early fifties. At the beginning of first five year plan, consumption of pesticides in the country was only 100 tonnes. At per cent about 33,000 tonnes of pesticides per annum are consumed by the country. However, there are great inter-state differences in the level consumption.

In Tamilnadu more than 1.8 kg of formulated pesticides on each hectare of cropped area is consumed. While Madhya Pradesh consumes 1/10<sup>th</sup> of 9 kg of formulated pesticides on one hectare of cropped area.

Effective adoption of plant protection measure in the country suffered from tow handicap viz. lack technical skills in the use of pesticides, in effectiveness of individual operation. In a view to tackle the problem it has been envisaged that during 1993-94 5,000 extension functionaries and 3,000 farmers have been planned to be trained in IPM for rice andcotton.

A National Conference on IPM was held in March 1994 to finalize the IPM training / demo programmers with State authorities. Similarly, use of bio-pesticides is now being actively studied. Technical and Financial support of international agencies like FAO, UNDP and ADB - CABI is being sought to promote IPM inIndia.

### 7.5 EXERCISE

- 1) Explain the importance of agriculturalinputs.
- 2) Discuss the importance of High Yielding varieties (HYV) seeds & fertilizers.
- 3) State the various problems of uses of fertilizers and pesticides.



# **TOOLS AND EQUIPMENTS**

### **Unit Structure:**

- 8.0 Objectives
- 8.1 Introduction
- 8.2 Traditional Tools and Equipments
- 8.3 Modern Tools Equipments
- 8.4 Exercise

### **8.0 OBJECTIVES**

- 1) To study the traditional tools and equipments of agriculture.
- 2) To study the modern tools and equipment and their importance in agriculture.

### 8.1 INTRODUCTION

Modern agriculture depends heavily on engineering, technology and the biological and physical sciences. Irrigation, drainage, conservation and channeling are all important fields to guarantee success in agriculture and require the expertise of agricultural engineers. Agricultural chemistry deals with other issues vital to agriculture, such as the use of fertilizers, insecticides and fungicides, soil structure, analysis of agricultural products and the nutritional needs of farm animals. Plant breeding and genetics represents and invaluable contribution to agricultural productivity. Genetics has also introduced a scientific basis in animal husbandry. Hydroponics, a method in which plants thrive without soil by chemical nutrient solutions can solve other additional agricultural problems.

The packaging, processing and marketing are closely related activities also influenced by the development of science. The methods of rapid freezing and dehydration have increased the markets for agricultural products. Mechanization, the outstanding feature of agriculture in the late nineteenth and twentieth century has relieved much the work of the farmer. Even more significantly. Mechanization has increased efficiency and productivity of farms. Planes and helicopters are used for agriculture purposes, such as planting transportation of perishable goods and fighting forest fires and crop fumigant to control insect pests and diseases. The radio and television transmit vital weather data and other information of interest to farmers.

### A) Tool for ploughing:

Country plough: Tillage is the basic operation in farming. It is done to create favorable conditions for seed placement and plant growth. This is done mainly with a bullock drawn plough made of Acacia wood. Usually, small farmers and farm owners of scattered lands are unable to use tractors and in that case country ploughs are highly preferred. The basic components of the plough are a shoe. a share, a body, a handle and a beam. The handle is 0.6-1 m long, 5-7.5 cm thick and 7.5-12.5 cm wide and is fitted to the body of the plough. The shoe, used in the plough, can be of different shapes and sizes. The share is prepared from amild steel bar.0.6-7.5 m in length and 1.5-2.5 cm in width. The share is fixed to the shoe or body by means of a U-clamp or ring shaped clamp. The share point projects beyond the shoe by 5-7.5 cm Beams generally vary in length from 2.4-3 m. It needs some skill in driving bullocks, hence operated only by male labourers. Average life of the implement is 1 yr and costs Rs. 1000/unit. As country plough is a bullock drawn implement drudgery will be a burden on theanimals.

### **B)** Tools for intercultural operation:

1) Weeder : The tools is used for removing deep-rooted weeds along with their rhizome weeds like Agruampul (Hariyali grass) and other grasses were easily removed with the help of this weeder and mammutty. The tool made up of iron has a handle (length 50 cm and 8 cm diameter) and working area i.e. comb like structure has a length of 25 cm and 30 cm diameter). The farm labourers first pierced the soil with the help of this weeder and lift the soil upwards. Another attendant should remove the uprooted weeds from the soil using other farm implements called mammutty (spade). About 2 acre/day could be covered by the tool. Other advantages like loosening of the soil, earthing up are achieved during weeding operation. Male labourers mostly operate it. Average life is 10 yrs and costs Rs.120/unit.

**2)** Dry land weeder : It is innovatively constructed with a front cycle wheel attached with gorruweeder blade at the back. With the help of hand bar farmer's drive the weeder from the back and one attendant pull the hand bar joined with a thread from the front. It is used for removing weeds. The weeder blade has a length of 30 cm and width of 3 cm. It is operated by two men labours. Average life is 5-6 yrs and costs Rs. 400/unit.

**3) Spade:** It is used for formation of bunds, ridges and furrows and irrigation channels. Handle is made up of Acacia sp wood and the working area is made up of iron. Handle is of 65 cm length and working area has a length of 22 cm and breadth of 18 cm. mostly operated by male labourers. Its average life is 5 yrs and costs Rs. 150/unit.

### C) Harvestingtools

**1)** Sickle: Used in harvesting most of the crops like cereals, pulses and millets, pulses and millets. Sickle was designed 'C' shaped/ curved with the view to ease the harvesting operation. Hence, it is preferred more than other tools and implements. With the help of sickle the ear heads, branches or even whole plant could be harvested. Working area is made up of iron and handle is made up of wood of Acacia sp. Working area has 20 cm height and 3 cm width. Handle is of 15 cm height and 5 cm width. Operated by both male and female worker. Its average life is 5 yrs and costs Rs. 25/unit.

**2)** Knife: It is very small and handy. Made up of iron was used in harvesting the pulses crop like black gram (Vignamungo), green gram (Vigna radiate), horse gram (Macrotylomauniflorum), Bengal gram (Cicerarietinum) and ear heads of millets like sorghum (Sorghum bicolor), cumbu (Pennisetumglacum), ragi (Eleusinecoracana), etc. Working area has a curved surface of 8 cm and handle has a length of 5 cm. Operated both by male and female labourers. Its average life is 5 yrs and costs Rs. 10/unit.

**3)** Tamarind Harvester: It is used in harvesting fruits like tamarind (Tamarindusindica), lemon (Citrus sp). amla (Phyllanthusemblica), etc. It consists of a wooden handle made of bamboo and a hook curved made of iron. Using this harvester, farmer can avoid climbing tree to harvest fruits. With the long wooden handle, without any drudgery, farmers can harvest the fruits easily. Length of bamboo stick is 200 cm and the working area is an iron knife having a curved surface of 10 cm. Mostly it is operated by both male and female labourers. Average life is 8 yrs and costs Rs. 30 / unit.

**4)** Lemon harvesting tool: Used for harvesting lemon (citrus sp) fruits and to collect the fallen fruits under the tree without thorn injury. The toll is made up of iron rod. Lemon harvesting tools consists of 3 parts is top one is hook, middle handle and lower cup like structure. Handle is a long iron rod of 10 cm to which hook and cup like structure are attached at the top and bottom end, respectively. Hook is a curved 'C' shaped structure of 10 cm attached to the hand at top most end facilitates harvesting of lemons from the trees. Cup like structure is of round in shapeand has a diameter of 10 cm attached to the handle of the bottom end. Using hook harvesting of fruits at greater height in the trees could be possible and cup like structure help in collecting fallen lemon fruit underneath the trees safe without any thorn injuries. Both men and women operate it; its average life is 10 yrs and costs Rs. 125 / unit.

### **D) Post-Harvesttools:**

1) Grain separator: The tolls is used before winnowing horse gram (Macrotylomauniflorum). After drying the plants are threshed with the help of tractors. After threshing, farmers with the help of kodunkol shake the plant materials forcibly so that the threshed materials and the grains are separated. Then the grains were collected from the ground and cleaned

Tools and Equipments

manually. The toll consists of long handle made up of wood attached with a single or double iron rod. Handle has a length of 200 cm and iron rod of length 10 cm. It helps in separating the threshed materials and grains making the winnowing operation easier. Also, farmers can handle this tool by standing straight without bending. Thus reduces drudgery. It is operated by both male and female labourers. Its average life is 20 yrs and costs Rs. 30 /units.

2) Wooden thresher: It is used for threshing operation in crops like black gram (Vignamungo), green gram (Vigna radiate). horse gram (Macrotylomauniflorum), etc. The tool, made up of wood has a handle of length 20 cm and flat rectangular working board of 20 cm length and 12 cm breadth. Wooden thresher cases the manual threshing operation. Both male and female labourers operate it. Average life is one yr and costs Rs. 15/unit.

**3)** Stone roller: Stone roller is used in threshing of pulse crops like green gram (Vigna radiate), horse gram (Macrotylomauniglorum) and black gram (Vignamungo) and cereals and millets etc. It is a circular roller of length 95 cm and diameter of 30 cm. Threshing with stone roller is quicker and effective compared to manual threshing. Usually operated by male labour the average life is 20 yrsand costs Rs.100/unit.

**4) Bamboo winnower:**It is used in cleaning and winnowing pulse grains. Highly preferred for its shape and varied utilities in crops such as pulses, cereals, millets and oilseeds. It is made up of bamboo stick is coated with cowdung paste to fill up the holes/gaps. It is 'U' shaped and has a length, breadth and depth 35 cm25 cm 3 cm. Operated generally by household women. Its average life is 2 yrs and costs Rs. 20 /unit.

5) Pulse siever :The tool is used for separating the unstilted full grains from the splitted pulse grains. Also removes stones and other wastes. It is made of iron. Working base area has 40 cm diameter and height 8 cm. The base has numerous rectangular grids of 0.3 mm diameter. Usually household women operate the tool leisurely. Its average life period is 10 yrs and costs about Rs 50/-unit.

6) Stone grinder: The tool being both cheaper and effective in grinding makes it preferable in rural areas. It is used for milling all kinds of cereals. Also used in crushing leaves during the preparation of leaf formulations and grinding rice (Oryza sativa), cotton seeds (Gossypiumsp), etc. is made up of stone. It has a height of 140 cm and the diameter of working area is 15 cm. Usually operated by household women its average life is 10 years and costs Rs.100/unit.



7) Milling tool: It is used for the process of milling, leaf extract preparation etc. Handle is made up of wood and working area is made up of iron. It has a length of 150 cm and diameter of 15 cm. Mostly women labourers operates it; its average life is 10 yrs and costs Rs. 200/unit.

### E) Measuringtools:

1) **Pukka:** It is made up of iron and used for measuring the grains of cereals, pulses and oilseed. It can measure a weight up to  $l^{1/2}$ kg. It has a length of 18 cm and diameter of 16 cm. Both men and women operateit.

2) Marakaal : It is made up of iron used for measuring the grains of cereals, pulses and oilseeds. It can measure a weight of 4 kg. It has a length of 30 cm and diameter of 28 cm. Both male and women operate it. Average life is 20 yrs and costs Rs.100/unit.

3) Naali : It is made up of iron and used for measuring the grains of cereals, pulses and oilseed. It can measure a weight of 1 kg. It has a length of 15 cm and diameter of 10 cm. Both male and women operate it. Average life is 20 yrs and costs Rs. 35/unit. Easy to measure grains without taking the help of weightunits and can be handled easily.

### F) OtherTools:

1) Floor cleaner :Easy in the separation of grains from plant materials and cleaning works in threshing floor. The tool is made up and used for cleaning the threshing floor. After the threshing operation in crops like horse gram, the plant parts are removed with the help of the floor cleaner leaving the grains alone in the floor. This tool has a long handle and comb like base to ease the separation of plant materials after threshing. Length of handle is 200 cm and the base comb like structure has 30 cm height and 20 cm width. Operated mostly by male labourers, its average life is 10 yrs and costs Rs.140/unit.

#### Tools and Equipments

**2) Bamboo Pan:** It is made up of bamboo stick and used for the collection of plant products and broadcasting of seeds. It has a depth of 12 cm and diameter of 25 cm. Both men and women operate it. Handling and transportation of FYM and grains are made easier and quicker with help of the tool. Average life is 1-2 yrs and costs Rs. 25/Unit

### **Summary:**



Indigenous tools and implements are considered successful because these



are economical, feasible and sustainable. It can spread quickly and easily from one region to another. Even these tools are common in use generally un-preferred since they lower the efficiency and increase tiredness of the operator. By using the modern wisdom, these traditional implements needed to be standardized keeping in mind the economy of rural poor. Proper designing in accordance with the farmers requirements surely popularize these tool and implements in nearfuture.



# **8.3 MODERN TOOLS ANDEQUIPMENTS**

The machines are elements that are used to direct the action of forces based energy work, for his part in the agricultural, motor mechanisms used in this work lighten the production and improve farming techniques. Among the most widely used agricultural machines working in the fields mentioned :

1) Tractor: is a very useful agricultural machine with wheels or designed to move easily on the ground and pulling power enabling successful agricultural work, even in flooded fields. It has two brake

pedals and is preparing to pull sledges. There are two types of tractors: the track of stability and strength, and wheels, able to travel to by road, has a higher speed than thetrack.



2) Walking Tractor: agricultural machine is a single axle and is operated by handles, have median motor power and strength led to horticultural and ornamental work, can work in strong fields, but is preferably used in construction of gardens.



**3)** Combine: or mower is a powerful engine agricultural machine, comb cutter to cut plants mature grain and a long rake that goes before the machine and rotates about a horizontalaxis.



# AGRICULTURAL EQUIPMENT

Farm equipment is a group of devices designed to open furrows in the ground, shredding, spraying and fertilizing the soil.

4) **Plough:** agricultural equipment is designed to open furrows in the earth consists of a blade, fence, plough, bead, bed, wheel and handlebar, which serve to cut and level the land, hold parts of the plough, set shot and to serve as handle. There are various types of ploughs but the best knownare:

Mouldboard plough, formed by the grating blade and mouldboard disc plough, disc concave formed by deep grooves to open shallow ploughing to remove the topsoil. Subsoil plough to remove the soil depth.



5) **Drag:** Agricultural equipment is designed to break up the parts and parcels of land that have been removed by the plough, are composed of a frame, which can be made of wood and metal teeth and the latch that attaches totractor.



6) Sprayer: It is farm equipment designed to spray, is composed of a liquid tank pressure pump. Cap, mouth, tank and pressure valve, belts, hose faucet and nozzle where the liquid to spray out, is insecticide, fungicide or herbicide. The hand sprayer is placed in the back of the sprayer and this has placed in the mouth and nose a special mask to prevent strong odours dismissed by the substance that expels the sprayer willharm.



7) **Tillage Planter:** is a machine to place the seeds on the seedbed without priortillage.



8) Fertilizer: agricultural equipment is designed to distribute fertilizer is composed of three main parts: the hopper of storage of fertilizer, the drop tube of fertilizer and fertilizerdistributor.



9) **Packing:** agricultural equipment is designed for packing cereal straw or other baled forage grasses (also called bales oralpacas).



### **METHODOLOGY:**

The methodology used will be active, participatory, with the use of simulations and case studies to facilitate the subsequent transfer of learning. The method used is inductive, based on knowledge and experience of the attendees. At the same time use focusgroups.

### 8.4 EXERCISE

- 1) Explain the various traditional tools & equipments used for agriculture.
- 2) Describe the various modern tools & equipments and states its uses.
- 3) Explain the importance of agricultural tools and equipments for agriculture.

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### **IRRIGATION**

#### **Unit Structure:**

- 9.0 Objectives
- 9.1 Introduction
- 9.2 Source of irrigation
- 9.3 Importance of irrigation
- 9.4 Types of irrigation methods
- 9.5 Exercise

#### 9.0 OBJECTIVES

- 1) To study the various sources of irrigation.
- 2) To understand the importance of irrigation for agriculture.
- 3) To study the various methods of Iirrigation.
- 4) To study the advantages and disadvantages of drip and sprinkle irrigation.

#### 9.1 INTRODUCTION

A hundred and fifty years ago, about 1850, two or three million acres of land were irrigated by large numbers of indigenous irrigation works. These works were in the nature of small tanks in southern India, inundation canals in northern India and reconditioned canals like the Cauvery delta system in Madras and the Yamuna canals. About five million acres were under well irrigation at that time mostly in northern India. The first major irrigation work constructed in India was The Ganga Canal in Uttar Pradesh, opened for irrigation in 1854. This was followed by the Upper Bari Doab canal in the Punjab and the Godavari delta system and the Krishna delta system in Madras. Then came the Sirhind canal in the Punjab, the Lower Ganga and the Agra canals in Uttar Pradesh and the mutha canals in Bombay, the last named being from a storage reservoir. A number of other large irrigation works were constructed towards the end of the last and beginning of the present century and again after the end of the First World War.

Subsoil waters have been used in India for irrigation from time immemorial by means of ordinary percolation wells. During recent years, electrically driven tube wells have opened up a new method of utilizing ground-waters on an extensive scale. Tube well irrigation is generally more costly than irrigation by gravity canals from diversion projects. But for areas not otherwise commanded it is a useful means of irrigation in regions with good underground supplies.

#### 9.2 SOURCES OF IRRIGATION

#### **9.2.1 Canals:**

Although canal irrigation was introduced on a large scale only during the last century, it has already become the principal source of irrigation in the country because of its cheapness and the ease and certainly with which water is supplied. The irrigation canals of northern India rank amongst the greatest and most beneficent triumphs of modern engineering in the whole world. The canals in India are of two types,viz.

- 1. Inundation Canals, which are drawn directly from the rivers without making any kind of barrage or dam at theirhead to regulate the flow of the river and the canal. Such canals are intended to use the excess water of rivers at the time of floods. When the flood subside, the level of the rivers falls below the level of the canal heads and therefore, the canals dry up. The water supply of such canals is uncertain. They have, therefore, been converted into perennialcanals.
- 2. Perennial Canals are those which are constructed by putting some form of barrage across the river which flows throughout the year and diverting its water by means of a canal to the agricultural fields, both far and near. Most of the canals in India areof this type.

About half of India's net canal irrigated area lies in Uttar Pradesh, Punjab, Haryana and Andhra Pradesh, Bengal, Tamil Nadu, Bihar, Rajasthan, Madhya Pradesh, Karnataka, Assam, Maharashtra, Orissa, Jammu and Kashmir and Gujarat. In that order of importance account formost of the remainingabouthalf.

#### 9.2.2 Wells:

Wells provide the most widely distributed source of irrigation in India. A well is a device by means of which water is obtained from the subsoil. Well irrigation is of importance in: (i) that part of the Ganga valley which is in closeproximity to the north-east and eastern extension of the Deccan, such as, the eastern districts of U.P. particularly Gonda, Basti, Bahraich, Faizabad, etc. (ii) In Bihar well irrigation is in vogue in Shahabad, Gaya, Patna, Saran etc. districts as these areas lie beyond the command of canals, (iii) Submontane regions on the eastern and southern sides of the Western Ghats, particularly in Kolhapur, Solapur, Ahmednagarand Poona districts in Maharashtra, and in eastern part of NilgiriandCardamom hills, especiallyin Ramanathapuram, Madurai, Coimbatore and areas between Tiruchirapalliand Guntur. (iv) Region of black cotton soil especially where it is deep as in the Malwa tract of M.P. (v) In the valleys of Narmada and Tapti rivers. In other words, this method of irrigation is mostly used in the alluvial plains where soft nature of thesoil helps in easy digging of wells. Some or the other type of lift is always required for using the well- water for irrigation whereas old methods like mot and rehtare still practised widely in many areas, power driven pumps have become exceedingly popular in mostparts.

#### 9.2.3 TubeWells:

Tube wells are common in areas where the water table israther deep, say, over 15 metres. The sub-soil water is exploited through deep wellpumping. Indo-Gangetic valley and in certain coastal deltaic areas tube well iscommon.

1. The flow of water in the subsoil is adequate to meet the surface demand, thus ensuring a stable water table. (2) The depth of the water table below the ground does not ordinarily exceed 50 ft. (3) For lifting the water cheap power/ electricity is available over the tract which economises and popularises lifting operations. (4) The area should be in alluvial formations where water-bearing strata are found at various depths. (5) The soil should be of good quality so that high costs involved in the operation of tube well arecompensated.

#### Area of Tube Well Irrigation:

Tube wells are usually been constructed in the Ganges plain, where a large basin with sufficient underground water supply with facilities of replenishment due to heavy rainfall in the Terai, exist. The waterin this basin occurs as a continuous reservoir which is connected with the strata below the Terai.

Here tube wells have been developed both on the north having the depth of 90 to 150 metresand south of Ghagra. The States like Punjab, Haryana, Bihar and Gujarat have number of tube wells in different location.

These are also very popular source of irrigation in the alluvial plains of north India where groundwater is plentiful and construction of wells and tube wells easy. These sources predominate in Gujarat(78.4 per cent of net irrigated area), Uttar Pradesh (70.5 per cent), Goa (69.6 per cent), Rajasthan (67.9 per cent), Punjab (61.3 per cent) and Maharashtra (61.2 per cent). In Madhya Pradesh, Bihar, Haryana, Tamil Nadu and Orissa, wells and tube wells provides water to 40 to 55 per cent of net irrigatedarea.

#### 9.2.4 Tank Irrigation:

Tank irrigation is the most feasible and widely practised method of irrigation all over the Peninsula, where most of the tanks are small in size and built by individuals or groups of farmers by raising bunds across seasonalstreams.

In West Bengal, Orissa and Bihar tanks are mostly of excavated type and used also for raising fish besides irrigation. The drawbacks include high rate of evaporation and occupation of fertile land particularly as the depth of most of the tanks is shallow and the water spreads over a large area. Most of the tanks are non-perennialand supply water only for one crop in theyear.

#### Areas of Irrigation:

Tanks irrigation is mostly practicedin peninsular India including run on Maharashtra and Gujarat. Tanks are a special feature of the Deccan because: (i) The rivers of the Deccan are not snow-fed and they are not solely dependent upon the rain waters, (ii) There are many streams which

become torrential during the rainy season but dry up in the season when the rain ceases, (iii) The undulating character of the region together with a rocky bed makes the construction prohibitive, (iv) Moreover, as the hard rock do not suck up water, we cannot dug wells. But the tanks can be easily made by means of making dams in hollow spaces in which rainwater is stored in large quantities for distribution in dry season, (v) Lastly, the scattered population of the tract also favours the system of tank irrigation to save rain-water which could have ultimately flowed toocean.

Tank irrigation has reached its highest perfection in south, especially in Andhra Pradesh and Tamil Nadu. State of West Bengal and Rajasthan too have some irrigation tanks, particularly in their southern and south-eastern regions respectively. Punjab, UP, Bihar have also sometanks.

Significance of tanks as source of irrigation has declined and now only 6.1 per cent of net irrigated crops get water from tanks. It is easier to construct tanks in the undulating peninsular India. Tank irrigation is, therefore, confined to the southern States. Largest net irrigated area by tanks is 503 thousand hectares in Tamil Nadu according to 2009-10 data. Tank irrigation is also important in Orissa, Maharashtra, Karnataka, Kerala and WestBengal.

#### 9.3 IMPORTANCE OFIRRIGATION

#### Irrigation:

Water along with HYV seeds and fertilizer forms a significant input to raise agricultural production. Thus availability of water is possible either from rain of surface flow or below ground. In India, availability of irrigation is highly scanty and more than 70 per cent of agriculture is depend on rainfall is confined to very fewmonths

i.e. June to September. Moreover, rainfall in most parts of country is very low. Where, it is high, the available soil moisture is not adequate to support multiple cropping. Hence, there is an urgent need for providing assured supplies of irrigation.

#### **Importance of Irrigation:**

The role of irrigation can be assessed from the followingpoints.

#### 1) To Reduce the Dependence on Rainfall:

As it is known that Indian Agriculture is the gamble of monsoon and more than 70% of the cropped area depends on rainfall. Moreover, i.e. June to September while the other months remain dry, sometimes rainfall is delayed and sometimes it is prematured. In 60<sup>th</sup> cases, it is harmful. Therefore, proper irrigation facilities can help in solving the problem created by insufficient, uncertain and irregular rains.

**2. To Raise Land Productivity:** Assured water supply to land through irrigation makes possible to raise the land productivity. Besides, this

method has a special significance as Indian modes of production are primitive and outdated with low yield per hectare. Sufficient water supply enable the application of other modern inputs like chemical fertilizer, high yielding varieties of seeds, etc.

**3. To help correcting imbalance:** The rainfall in our country is not properly organised resulting uneven distribution at different places. In fact, Indias climate geography is governed by its location in the tropical and subtropical zones while others are dry areas. These disparities can only be narrowed down by artificial means of irrigation.

**4. Modernization of Agriculture:** A traditional agriculture of India with assured water supply can go a long way to practice intensive agriculture. Such a change in farming techniques will help to impart stability to their work. As a result, outlook of the farmer will change and agriculture will be no longer being a gamble ofrains.

**5. Multiple Cropping Possible:** Assured irrigation facilities makes possible to grow more than one crop in year in most parts of the country. Since India has a tropical and sub-tropical climate, it possesses more potentialities to grow more crops but due to irregular and uncertain condition of rainfall, it is not possible. Thus, irrigation ensures multiple cropping and further increasing at agricultural production.

**6. Help to small Farmers:** In our country, small and marginal farmers constitute big majority. They are dependent on agriculture sector for their livelihood. They can be helped if they are provided adequate assured water supply. They will raise their farmincome.

7. To Release Land for Non-Crop use: Assured supply of irrigation would rise the production which in turn, imply lesser use of land. This would make available more land than present for such purpose like animal husbandry, forestry andhorticulture.

**8.** To Avoid Imports of Food stuffs: In India, growing population demand food stuff for its consumption. In the absence of food grains, imports are to be made. That means, import of foodgrains makes the balance of payment unfavorable. To curb imports self- sufficiency in food stuff is highly needed. This can be achieved by raising agricultural production through increasing irrigationfacilities.

#### 9. To get Better Fruits of New Agricultural strategy:

The successful implementation of HYV programmes largely depends on timely availability of water supply. Besides, crops like rice, sugarcane and jute, etc. require regular and sufficient water supply.

Accordingly, irrigation is an important factor responsible for increase in rural employment also. This further adds to the importance of irritation as an agricultural inputs.

In overall economic development the agricultural sector will continue to play a vital role, since the sector still accounts for about 30 per cent of the GDP and almost two-thirds of the population still depends on this sector for livelihood. To accelerate GDP growth rate, a long term trend growth rate 3% in Indian agriculture should be desirable goal. To achieve it, a number of key problems in the agricultural sector will need to be resolved.

The declining trend in the rate of investment in agriculture in the recent years needs to be reserved. Specific provisions are required for operations and maintenance of public capital assets. Public investment in irrigation, rural communication and schemes for prevention and control of land and water degradation will need to be increased. The resources for this purpose can be augmented only by scaling down the massive subsidies provided for water, electricity and fertilizer. To encourage, private investment in agriculture, thrust of reform policies should continue to improve relative incentives in favour of agriculture.

For raising rainfed / dry land crop yields more emphasis is required for the use of location specific varieties suited to such agro-climatic conditions. Progress of integrated watershed process development projects for promotion of water conservation and diversified production system need to be closely monitored. Arable land is shrinking due to continuous soil erosion. Land water conservation technologies need to be vigorously pursued to raise productivity in marginal land rented land holdings.

The seed revolution, which appears to have tapered off after encompassing only the cereal segment, has pulses, oil seeds, vegetables and fruits. This is especially important in the view of the rise in average income levels having pushed up demands for non- cereal food items. The marked seasonality in these commodities (fruits, vegetables, oils) needs to be moderated to ensure pressures. A pre-requisite for successful development of this sector is provision of adequate and more modern storage and warehousing facilities. Furthermore, investment and induction of new technology in the agro processing section requires to be accelerated.

The present system of agricultural credits needs to be substantially improved. To ensure adequate availability of funds of small and poor farmers, the high cost of intermediation will need to be moderated.

Emerging new post-harvest technologies for agricultural products will require and improve data base for important tree crops, especially in view of their enhanced export potential. While tariff, trade and exchange rate reforms have strengthened incentives for agricultural exports. There are still many regulations in habiting exports of agricultural products, which need to be phased out. Appropriate policy for investment in technological up gradation for food processing merits a highpriority.

#### 9.4 DIFFERENT TYPES OF IRRIGATION METHODS

Agriculture is the nerve of any country as it is needed for survival of living beings. For growing crops, irrigation is major process. Irrigation is described as the artificial application of water to the land or soil. It is the substitute or supplement of rainwater with another source of water. It is used in dry areas and during periods of insufficient rainfall. It is considered as basic infrastructure and vital input required for agricultural production. Major aim of irrigation systems is to help out in the growing of agricultural crops and vegetation by maintaining with the minimum amount of water required

#### 9.4.1 Type of Irrigation Technique in India:

In India, the irrigated area consists of about 36 per cent of the net sown area. There are various techniquesof irrigation practices in different parts of India. These methods of irrigation differ in how the water obtained from the source is distributed within the field. In general, the goal of irrigation is to supply the entire field homogeneously with water, so that each plant has the amount of water it needs, neither too much nor too little. Irrigation in India is done through wells, tanks, canals, perennial canal and multipurpose river valleyprojects.

#### 1) Surface Irrigation:

In this technique water flows and spreads over the surface of the land. Varied quantities of water are allowed on the fields at different times. Therefore, flow of water under surface irrigation comes under wobbly flow. Consequently, it is very difficult to understand the hydraulics of surface irrigation. However, suitable and efficient surface irrigation system can be espoused after taking into consideration different factors which are involved in the hydraulics of surfaceirrigation.

- 1. Surface slope of the field
- 2. Roughness of the field surface
- 3. Depth of water to be plied
- 4. Length of run and time required
- 5. Size and shape of water-course
- 6. Discharge of the water-course
- 7. Field resistance toerosion

If the surface irrigation method is perfectly selected, it fulfills following requirements:

- 1. It assists in storing required amount of water in the root-zone- depth.
- 2. It reduces the wastage of irrigation water from the field in the form of run-offwater.
- 3. It reduces the soil erosion tominimum.
- 4. It helps applying uniform application of water tothe fields.
- 5. Amount of manual labour required isless.

- 6. It is suitable to the size of the field and at the same time it uses minimum land for making ditches, furrows, strips,etc.
- 7. It does not avert use of machinery for land preparation, cultivation, harvesting.

Surface irrigation technique is broadly classified as basin irrigation, border irrigation, furrow irrigation and uncontrolled flooding.

#### Phases of surface irrigation:



This divided into the four componentsystems: (1) water supply,

(1) water conveyance or delivery, (3) water useand (4) drainage.

2) Basin irrigation: Basin irrigation is common practice of surface irrigation. This method is employed for watering orchards (Basak, 1999). It is useful especially in regions with layouts of small fields (Shah et al. 2002). If a field is level in all directions, is encompassed by a dyke to prevent runoff, and provides an undirected flow of water onto the field, it is herein called a basin. A basin is typically square in shape but exists in all sorts of irregular and rectangular configurations. It may be furrowed or ridged, have raised beds for the benefit of certain crops, but as long as the inflow is undirected and uncontrolled into these field modifications it remains abasin.



**3) Furrow Irrigation:** In furrow irrigation technique, trenches or 'furrows' are dug between crop rows in a field. Farmers flow water down the furrows (often using only gravity) and it seepsvertically andhorizontally to refill the soil reservoir. Flow to each furrow is individually controlled. Furrow irrigation is suitable for row crops, tree crops and, because water does not directly contact the plants, crops that would be damaged by direct inundation by water such as tomatoes, vegetables, potatoes and beans. It is one of the oldest system of irrigation. It is economical and low-tech making it particularly attractive in the developing world or places where mechanized spray irrigation is unavailable orimpractical.

#### Furrow technique:



In different situations, different furrow methods are used. They are mainly of fivetypes:

- 1. SloppyFurrow
- 2. LevelledFurrow
- 3. ContourFurrow
- 4. SerialFurrow
- 5. CorrugatedFurrow

There are numerous advantages of furrow technique of irrigation.

- 1. Large area scan beirrigatedatatime.
- 2. It saves labour since once the furrow is filled, it is not necessary to give water a second time.
- 3. It is a reasonably cheapermethod.
- 4. Plants get proper quantity of water by thissystem.

Furrow irrigation is also beneficial for growing of tree crops. In the early stages of tree planting, one furrow alongside thetree rowmay be sufficient, but as the trees develop then two or more furrows can be constructed to provide sufficient water. Sometimes aspecialzig-zag system isused to improve the spread of water.

Major drawback of furrow system of irrigation is ensuring uniform dispersal of water over a given field. To tackle this problem, some farmers engage in field levelling to remove any small hills that would have been bypassed by the gravity flow of the water. Other problem with furrow irrigation is the increased potential for water loss due to runoff. Building retention ponds along the edges of fields can help capture this run-off, allowing it to be pumped back to the upslope side of the field for use in further irrigationcycles.



4) Uncontrolled flooding: There are many cases where croplands are irrigated without regard to efficiency or consistency. These are usually situations where the value of the crop is very small or the field is used for grazing or recreation purposes. Small land holdings are generally not subject to the range of surface irrigation practices of the large industrial farming systems. The assessment methods can be applied if desired, but the design techniques are not generally applicable nor need theybe since the irrigation practices tend to be minimallymanaged.

5) Free Flooding: This flooding system of irrigation is used from ancient times. Flooding method consists in applying the water by flooding the land of rather smooth and flat topography. In current irrigation practice, several flooding methods have been developed. In free flooding method, water is applied to the land fromfield ditches without any check or guidance to the flow. The land is divided into plots of suitable size depending on porosity of soil. Water is spread over the field from watercourse. The irrigation operation begins at the higher area and proceeds towards the lower levels. The flow is stopped when the lower of the field has received the desired depth of water. The field end watercourse is properly spaced, the spacing depends on the topography,oiltexture,depthofsoilandsizeofstream.

#### Free Flooding for erodible soil:



This technique is beneficial for newly established farms where making furrows is very expensive. This method is economical and can be effectively used where water supply is in plenty. This method is suitable for the fields with irregular surface in which other techniques are difficult to apply. Major drawback of this method is that there is no perfect control over the flow of water to attain high efficiency. Sometimes the flow of water over the soil is too rapid to fulfil soil moisture deficiency. On the other hand, sometimes water is retained on the field for a very long time and consequentlythewaterislostininfiltrationordeeppercolation.

#### 6) Border Strip Method:

In this technique of irrigation, a field is divided into number of strips. The width of strip varies from 10 to 15 metres and length varies from 90 m to 400 m. Strips are separated by low embankments or levees. The water is diverted from the field channel into the strips. The water flows gradually towards lower end, wetting the soil as it advances. The surface between two embankments should essentially be level. It assists in covering the entire width of the strip. There is a general surface slope from opening to the lower end. The surface slope from 2 to 4 m/1000 m is best suited. When the slope is steeper, special arrangementis made to prevent erosion ofsoil.

#### 7) Dripirrigation:

In the area of irrigation process, drip irrigation is modern technique. It is also called trickle irrigation, which was originally developed in Israel in the early 1960s and became popularin areas of water scarcity. The drip irrigation is the most competent and it can be practised in array of crops, especially in vegetables, orchard crops, flowers and plantation crops (Mamata Swain, 1999),

Drip irrigation was used to the ancient custom in certain parts of India of irrigating a tulsi plant kept in the courtvard. During the summer months, the plant was irrigated by a hanging pitcher containing water and a minute hole at its bottom to allow the trickling of water on to the plant. The tribal farmers of Arunachal Pradesh practised a primitive form of drip irrigation system using a slender bamboo as the conduit for water flow. The use of drippers insub-surface irrigation network was first experimented in Germany in 1869. The noticeable growth of the petrochemical industry during and after the 1950s aided manufacturing of plastic pipes at a cost much cheaper than the cost of metallic or cement concrete pipes. Plastic pipes are convenient forwater conveyance under pressure and the plastic material are easily formed into the desired configuration. These features of plastic made the field-scale use of drip irrigation practicable. The drip system was developed for field crops in Israel in the early 1960s and in Australia and North America in the late 1960s. The area under drip irrigation system in the USA is about 1 M ha, followed by India, Spain and Israel. In India, there has been a tremendous growth in the area under drip irrigation during the last 15 years. At present, around 3.5 Lakh ha area is under drip irrigation with the efforts of the Government of India, while it was only40 ha in 1960. Maharashtra (94,000 ha), Karnataka (66,000 ha) and Tamil Nadu (55,000 ha) are some of the States where large areas have been brought under drip irrigation. Many crops are irrigated by the drip method in India with the tree crops occupying the maximum percentage of the total area under drip irrigation, followed by vine crops, vegetables, field crops, flowers and othercrops.

In drip irrigation, water is applied near the plant root throughemitters or drippers, on or below the soil surface. The soil moisture is kept at an optimum level with frequent irrigations. In this method irrigation water is conveyed on the surface in 12 to 16 mm diameter tubing's fed from large feeder pipes. The water is allowed to drip or trickle slowly through the nozzle or orifices at practically zero pressure. In this way the soil in the root-zone of crops is constantly kept wet. Drip irrigation results in a very high water application efficiency of about 90-95 percent.

#### 7.1 Major component of dripirrigation:

- 1. Pumpstation
- 2. By passassembly
- 3. Controlvalves
- 4. Filtration system
- 5. Fertilizertank/venturi
- 6. Pressuregauge
- 7. Mains/Sub mains
- 8. Laterals
- 9. Emittingdevices
- 10. Microtubes.



Pump station takes water from the source and provides the right pressure for delivery into the pipesystem.

Control valves control the discharge and pressure in the entire system.

Filtration system cleans the water. Common types of filter include screen filters and graded sand filters which remove fine material suspended in thewater.

Fertilizer tank / venturi slowly add a measured dose of fertilizer into the water during irrigation. This is one of the major advantages of drip irrigation over othermethods.

Mainlines, sub mains and laterals supply water from the control head into the fields. They are usually made from PVC or polyethylene hose and

#### Iirrigation

should be buried below ground because they easily degrade when exposed to direct solar radiation. Lateral pipes are usually 13-32 mmdiameter.

Emitters or drippers are devices used to control the discharge of water from the lateral to the plants. They are typically spaced more than 1 meter apart with one or more emitters used fora single plant such as a tree. For row crops more closely spaced emitters may be used to wet a strip of soil. Many different emitter designs have been produced in recent years. The basis of design is to produce an emitter which will provide a specified constant discharge which does not vary much with pressure changes and does not blockeasily.

In India, there has been a fabulous growth in the area under drip irrigation during the last many years. At present, major area is under drip irrigation with the help of the Government of India. Reports indicated that Maharashtra (94,000 ha), Karnataka (66,000 ha) and Tamil Nadu (55,000 ha) are some of the States where large are as have been brought under dripirrigation. Manycrops are irrigated by the drip method in India with the tree crops occupying the maximum percentage of the total area under drip irrigation, followed by vine crops, vegetables, field crops, flowers and othercrops.

#### 7.2 The advantages of drip irrigation areunder:

- 1. Possibility of using soluble fertilizers and chemicals.
- 2. Fertilizer and nutrient loss is minimized due to localized application and reducedleaching.
- 3. Water application efficiency ishigh.
- 4. Field levelingis not necessary. Fields with irregularshapes are easilyaccommodated.
- 5. Recycled non-potable water can be safelyused.
- 6. Role in frequency of irrigation.
- 7. Soil erosion islessened.
- 8. Weed growth is lessened.
- 9. Water distribution is highly uniform, controlled by output of eachnozzle.
- 10. Labour cost is less than other irrigationmethods.
- 11. Variation in supply can be regulated by regulating the valves anddrippers.
- 12. Plants remain dry, reducing the risk ofdisease.
- 13. Usually operated at lower pressure than other types of pressurized irrigation, reducing energycosts.

#### 7.3 The shortcomings of drip irrigationare:

- 1. Initial cost can be more in thistechnique.
- 2. The sunrays can affect the tubes used for drip irrigation, shortening their usablelife.
- 3. If the water is not properly filtered and the equipment not suitably maintained, it can result inblockage.
- 4. For subsurface drip the irrigator cannot see the water that is applied. This may lead to the farmer either applying too much water (low efficiency) or an insufficient amount of water; this is particularly common for those with less experience with drip irrigation.
- 5. Drip irrigation might be inadequate if herbicides or top dressed fertilizers need sprinkler irrigation foractivation.
- 6. Drip tape causes extra clean-up costs after harvest. Users need to plan for drip tape winding, disposal, recyclingorreuse.
- 7. Waste of water, time and harvest, if not installed properly. These systems require careful study of all the relevant factors like land topography, soil, water, crop and agro-climatic conditions and suitability of drip irrigation system and its components.
- 8. In lighter soils subsurface, drip may be unable to wet the soil surface for germination. Requires careful consideration of the installation depth.

One of the main purposes of drip irrigation is to decrease the water consumption by reducing the leaching factor. However, when the available water is of high salinity or alkalinity, the field soil becomes gradually unsuitable for cultivation due to high salinity or poor infiltration of the soil. Consequently, drip irrigation converts fields into fallow lands when natural leaching by rain water is not adequate in semi-arid and aridregions.

Most drip systems are designed for high efficiency and have little or no leakage. Without sufficient leaching, salts applied with the irrigation water may build up in the root zone. On the other hand, drip irrigation avoids the high capillary potential of traditional surface-applied irrigation, which can draw salt deposits up from deposits below. Drip irrigation systems cannot be used for damage control by nightfrosts.

#### 8) SprinklerIrrigation:

In the sprinkler technique of irrigation, water is sprinkled into the air and allowed to fall on the ground surface just like rainfall. The spray is done by the flow of water under pressure through small orifices or nozzles. The pressure is generally obtained by pumping. Through proper selection of nozzle sizes, operating pressure and sprinkler spacing the amount of irrigation water required to refill the crop root zone can be applied almost uniform at the rate to suit the infiltration rate of soil.



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In agriculture, almost all crops are suitable for sprinkler irrigation system except crops such as paddy and jute. The dry crops, vegetables, floweringcrops, orchards, plantation crops like tea, coffee are all suitable and can be irrigated through sprinklers techniques of irrigation.

The sprinkler irrigation is categorized according to the functions which are mentioned as under:

- 1. The main irrigation system
- 2. The supplementary irrigationsystem
- 3. The protective irrigationsystem.

The sprinkler irrigation system is effective for irrigation on uneven lands and on shallow soils. It is also suitable to coarse sandy terrain where the percolation loss is more and where as a consequence, the frequency of irrigation required is more. The sprinkler irrigation system is appropriate in rising and falling land where land shaping is expensive or technically not practicable. The elimination of fertile soil cover by land shaping is not advisable. Sprinkler irrigation system can also be espoused in hilly regions where plantation crops aregrown.



Historical facts signified that though sprinkler irrigation system is known since 1946, yet the farmers started adopting it in huge scale only since 1980s. It began in the hilly areas of Western Ghats in States of Kerala,

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Tamil Nadu and Karnataka and in the North eastern States mainly for plantation crops like coffee, tea, cardamom, rubber. Gradually it spreads to the water scarcity and light soil States of Rajasthan and Haryana in addition to the black soil area of MadhyaPradesh.

#### 8.1 Advantages of Sprinkler irrigation

- 1) Elimination of the channels for conveyance, therefore no conveyanceloss.
- 2) It is suitable to all types of soil apart from heavyclay.
- 3) It is appropriate technique for irrigating crops where the plant population per unit area is very high. It is most suitable for oil seeds and other cereal and vegetablecrops.
- 4) It saveswater.
- 5) With this technique of irrigation, there is control of water application convenient for giving light and frequent irrigation and higher water applicationefficiency.
- 6) Sprinkle irrigation increases in yield.
- 7) There is a mobility of system.
- 8) It may also be used for undulatingarea.
- 9) It saves land as no bunds are required.
- 10) This technique influences greater conducivemicro-climate.
- 11) Areas located at a higher elevation than the source can be irrigated.
- 12) In this technique there is a possibility of using soluble fertilizers andchemicals.
- 13) In this method of irrigation there is less problem of clogging of sprinkler nozzles due to sediment ladenwater.
- 14) The overall cost of labouris generally reduced in this method of irrigation.
- 15) Erosion of soil cover which is common in surface irrigation can bereduced.

#### 8.2 Disadvantages of Sprinklersystem:

- 1. In this technique, initial cost of implementation is high.
- 2. High and constant energy requirement foroperation.
- 3. Under high wind condition and high temperature distribution and application efficiency is poor.
- 4. Highly saline water causes leaf burning when temperature is higher than 95F.
- 5. When lands have been already leveled and developed for surface or other irrigation methods sprinkler irrigation is not so economical.
- 6. There is loss of water due to evaporation from the area during irrigation.

#### 9.5 EXERCISE

- 1) Explain the importance of irrigation in agricultural development.
- 2) Explain the various sources of irrigation and discuss various types of irrigation.
- 3) Explain briefly about methods of irrigation and state its advantages and disadvantages.
- 4) Explain the traditional methods of irrigation.
- 5) Write short note on-
- 1) Disadvantages of sprinklerirrigation.



# 10

### FARM BUSINESS MANAGEMENT-I

#### **Unit Structure:**

10.1. Objectives

- 10.2. Farm business management: An Introduction
- 10.3. Meaning, offarm business management
- 10.4. Objectives offarm business management
- 10.5. Nature of farm business management
- 10.6. Summary
- 10.7. Exercise
- 10.8. Reference list

#### **10.1. OBJECTIVES:**

- 1. Introducing the subject of agribusiness management.
- 2. Understanding the meaning of agribusiness management.
- 3. To study the objectives of agribusiness management.
- 4. Understanding the nature of agribusiness management.

## 10.2. FARM BUSINESS MANAGEMENT: AN INTRODUCTION

Agriculture has been a business since ancient times. But its form is being used primarily as a means of subsistence or a way of life. In backward economies and to some extent developing economies, agriculture is still looked at in the same light. Developed countries, however, see agriculture as a mere occupation. When it comes to farming, traders seem to be thinking more and more profit keeping in mind the point of view. In recent times, even in developing countries, attitudes towards agriculture are changing. This change has made it necessary to manage agriculture in a scientific manner as a business. From this came the concept of farm management.

Technological improvements in agriculture have greatly increased the importance of farm management. The use of hybrid seeds, irrigation facilities, improved implements, various fertilizers, chemicals, etc., has led to radical changes in the nature of agricultural production. Raising your family is not the only limitation. The farmer wants to meet his basic needs as well as produce for the market. Its aim is to sell agricultural

commodities in the market and buy other commodities and to raise the standard of living not only at the level of subsistence but also at the level of subsistence. Due to this change in the attitude of farmers, agricultural production is now becoming commercial. In commercial agriculture, the importance of farm business management has increased in the sense that science helps in achieving the objectives of the farmer. In recent times not only subsistence farming but also competitive environment, various problems in agribusiness, features of Indian farm business etc. have been taken into consideration by the farmers. Will. By studying farm business management and using its principles, the farmer will be able to make the right decision in agribusiness. In the same vein, farm business management science has gained importance in agribusiness.

# 10.3 MEANING AND CONCEPT OF FARM BUSINESS MANAGEMENT:

Agriculture is a business that has been going on for years. Agriculture is an important and revolutionary stage in human evolution. Agriculture has been seen as a means of subsistence for thousands of years. Despite this, agricultural systems have evolved in recent times. Due to this, its function, scope and importance have not been fully recognized. Different people have thought of this scripture from different points of view, interpreted it. According to some, farm management is no different from the art of cultivating land. Some scientists are of the opinion that agricultural economics is no different than production economics. According to some, agricultural economics and law were one and the same. The common man thinks that agricultural management is to supervise the farm labor or to carry out the work as per the order of the employer if he is a salaried manager. There is another point to note regarding the term 'agricultural system'. Farm business management science involves both organization and management of agriculture. But we say 'agricultural management science' for convenience. Combination is the act of making a plan. 'Arrangement' means to carry out this plan, to carry out as planned. The farm manager has to do both.

#### **Definition of Farm Business Management:**

Since agronomy is a new science, it is difficult to define it in its entirety. Many agricultural management scientists have interpreted this science from their own point of view. Not all of that is perfect. But many of these interpretations will give you an idea of what kind of scripture this is.

1) According to Adams, Farm Management - The subject is the presentation of business and scientific findings in their application to farming for the purpose of indicating the way to the greatest continuous profit. Farm Management The method is the utilization of sound principles in the selection, organization and conduct of an individual farm business for the purpose of obtaining the greatest possible profit".

2) According to Warren, "The Science of organization and the Farm Business Management-I management of the farm enterprise for the purpose of securing the greatest continuous profit."

3) According to Efferson, "The Science which considers the organization and operation of the farm from the point of view of efficiency and continuous profit."

4) According to Forster, Farm Management Inlaybe defined as a study of the ways and means of organizing land, labor and capital and the application of technical knowledge and skill in order that the farm may be made to yield the maximum net returns".

5) According to Yang, Farm Management is a science which deals with the proper combination and operation of production factors including land, labor and capital and the choice of crop and livestock enterprises to bring about a maximum and continuous return to the most elementary operation units. of farming.

6) According to Mr. Gray, "the art of successfully managing agriculture is farm business management, and this success is measured by the profitability test."

7) Prof. According to Efferson, "farm business management is the science that guides us to achieve commercial goals in agriculture.

According to another interpretation given by the same author, "farm business management is the science that studies the organization and operation of agriculture in terms of efficiency and sustainable profit."

Leaving aside the variety of interpretations, the following can be said about agricultural management.

- 1. Farm business management seems to consider the organization and management of agriculture.
- 2. More and more profit i.e. commercial approach seems to be kept in mind while farming.
- 3. Agricultural production capacity seems to be given more priority.
- 4. The ideal distribution of the resources required for farming is also taken into consideration. The ideal distribution of resources and its efficient and efficient utilization is always seen as leading to profit or moving towards profit.

#### **10.4.OBJECTIVES OF AGRIBUSINESS MANAGEMENT**

#### 1) To increase production-

Farm business is still largely subsistence farming. Therefore, the yield is very small. Of course, not all needs can be met. It is important to increase production to get maximum profit.

#### 2) Planning for profitable / commercial farming -

Planning is essential if you want to do any profitable business. The same principle applies to agribusiness. The maximum profit is achieved through proper planning.

#### 3) Management of inputs -

Fertilizers, seeds, pesticides, water supply tools and implements are used in agribusiness. Applying the right amount of fertilizer, systematic spraying of pesticides, selection of suitable seeds, avoidance of excess water, use of necessary implements are all considered in farm business management to make agribusiness profitable.

#### 4) Make full use of the tool -

In any business, land, labor, capital and combination are the factors that play an important role. Only a proper combination of these four components can produce a good product. Therefore, adequate and efficient use of these tools is essential.

#### 5) Development of allied agriculture activities-

The development of other occupations along with agriculture is important in farm business management. In this farm business management it is always beneficial to start animal husbandry, dairy development, poultry, fisheries, floriculture, processing industries. Considering India's natural condition and maximum profit, it is appropriate to consider allied agriculture activities along with agriculture. Because these businesses are interdependent. This adds to the total income.

#### 6) Adoption of new devices and techniques -

Agriculture development requires reforms in agriculture. Technological improvements have increased agricultural productivity in many parts of the world. Work that is not done with the help of manpower or creates problems is done quickly with the help of machinery. Also, if you do not get the support of nature, you will have to bear huge losses.

#### 7) Generating Employment -

In agriculture in a modern way with a business approach requires both skilled and unskilled workers. Both skilled and unskilled workers can be engaged in farm business and allied agriculture activities. This creates a lot of employment opportunities at the village level.

#### 8) Measures on Rural Unemployment -

Along with laborers, literate and illiterate men and women as well as needy people of all ages get employment from agribusiness. Farm business management provides employment opportunities to people in rural areas. Therefore, the objective of controlling poverty and unemployment automatically succeeds.

#### 9) Migration control -

Migration in the city is largely controlled due to employment generation at the village level. Farm business management provides employment to the rural people throughout the year. So there are limits on migration. It helps to reduce many of the problems that arise in the city. Disintegration of villages is not only an economic problem but also a threat to rural life.

#### 11) Maximum use of land -

Land is an important component of agricultural production. Production cannot take place without the cooperation of the land. Land is a natural and free gift. Land supply is almost inflexible. Land grading is not the same. Therefore, it is important to make full and efficient use of available land. This important objective is achieved through farm business management.

#### 12) Need of Time -

The percentage of urban population is increasing day by day. Farming in the city is partly difficult. It is imperative to bring maximum land in rural areas under commercial cultivation.

#### 13) Support for Economic Equality -

Economic inequality in rural areas is due to unequal distribution of land. Large landholders more benefits than small landholders. Adopting agribusiness will benefit small landholders and reduce economic inequality. The power to contribute to economic equality lies in farm business management.

#### 14) Avoiding demand-supply discrepancies -

There is a big difference between other sectors of the economy and agriculture. Control of goods produced in other areas can be controlled. But in the case of agriculture, it is difficult. When the crop is plentiful and the nature of the commodity is perishable, the prices of commodities go down. And when prices are high it is exactly opposite. This creates a discrepancy between supply and demand. This discrepancy will be easily avoided if a business approach is developed in agriculture.

#### 15) Relation between price and cost -

One of the characteristics found in agricultural production is the infinite correlation between commodity prices and costs. This disparity in price and cost leads to inequality in income. In the case of perishable goods, price has little to do with cost. The goods appear to have been sold at a lower price within the spoilage. Efforts are made in farm management to prevent this.

#### 16) Relation between Expenditure and Income -

The decision of a farmer to cultivate a field is based on the estimated yield of that crop. The rate at which commodity prices fluctuate does not

increase or decrease the cost. Changes in the cost of farming occur early. Therefore, how to increase the income according to the demand-supply is considered in farm business management.

#### 17) To motivate the product -

Growth cannot be accelerated without increasing agricultural production during economic growth. Farm business management will be important for sustainable production considering the adversities in the agricultural business.

#### 18) For grain storage transaction requirement-

In an agrarian economy, commodity prices have an impact on other factors. In such economy, stabilization of commodity prices is essential for general price stabilization. Grain storage transactions can be mentioned as the most useful tool to achieve this. This requires maximum productivity. Maximum production is possible through farm business management.

#### 19) Curb hoarding-

In case of maximum production, the government has accepted the responsibility of buying and selling grain storage transactions, thus limiting such transactions as stockbrokers. This helps in creating artificial scarcity as well as getting lower rates to the producers.

#### 20) To increase sales and sales -

Maximum agricultural production leads to increase in sales. As a result, sales increase. It seems to have an effect on the overall economy. It seems to have helped in the export of agricultural commodities.

#### 21) Cereal Self-sufficiency -

Achieving maximum productivity from farm business can help the country become self-sufficient in food grains. As a result, it may help to get rid of the oppressive conditions of the country from which the food is to be imported.

#### 22) Increase in Gross Income in Agriculture-

The adoption of management in farm business helps in creating consistency of production in agricultural commodities by producing the right quantity of goods and selling the goods at the right price. The country is moving towards self-sufficiency in food grains and can benefit the people in many ways. As a result, farm business will be seen as a prestigious business for the farmers by raising its status.

#### **10.5. NATURE OF FARM BUSINESS MANAGEMENT -**

The principle of maximizing profits in agriculture is called farm business management. In this agricultural economics is studied. The cost per hectare and per quintal is calculated from the profit earned on how much is spent. It deals with agricultural related occupations. It is managed with Farm Business Management-I land, labor, cropping pattern and investment in mind. Farm business management is a science that differs from others in its nature.

#### 1) Micro Approach -

Although agriculture is one and the same business, due to the available resources, capacity, natural conditions, each farm is different and unique. The science works to study the field at a partial level considering the fact that the problems may be different. The approach of this science is partial, given the fact that different fields are less likely to be the same in terms of agricultural fertility, availability of resources as well as farmer efficiency, etc. Of course, the science provides a detailed guide on the organization of tools, their distribution, and ultimately how to maximize production in a field that produces within the limits of specific conditions.

#### 2) Consider the field as a whole -

The field is studied as a major component without studying agriculture in general or in a broader context. Since the ultimate goal is to get the maximum output from the entire field, decisions are made on this subject with the field as a unit. Activities like food grain production, horticulture, animal husbandry, dairying etc. can be undertaken in the field. From all these activities, all aspects of the field to get maximum production and income, for this, proper combination of various tools are considered by this branch. It also provides guidance on how to best integrate this business into the various confines of the field.

#### 3) Wide area -

The diameter of agricultural management is very large. Because it covers many subjects from natural sciences to social sciences. Therefore, an expert in this subject needs to know the principles of his own science, besides knowledge of many other subjects related to agricultural production. Naturally, the scope of this science has become wider.

#### 4) Applied Sciences -

The practical side of farm business management is very important. The task of this science is to examine the practicality of the research and conclusions drawn by many other branches and then to provide information on how they can be applied in specific situations.

#### 5) Consideration of benefits -

Other sciences related to agriculture study the facts. But it does not consider whether or not a particular process can be profitable. The emphasis of farm business management is on economic efficiency i.e. maximizing profits in the field. For example, agricultural engineering will do the job of explaining the comparative quality of machinery used in agriculture. But in a particular agricultural situation, the combination of which of the following machines would be beneficial is considered in farm business management.

Farm business management as a whole is an attempt to apply commercial principles in the work of agriculture from a farmer's point of view.

#### Management resources in farm business-

There are various things involved in starting agriculture as a business. The management of farm basically depends on how we are utilizing the resources like Land, Water, Labour, and Capital.



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#### 1. Equipment Evaluation -

#### A) Land :-

First of all, to inspect all the land on the farm, you have to look closely at the number of plots in the field. Its information should be written in tabular form. It includes the type of soil in each plot, soil type, soil holding, irrigation facilities, drainage system, soil chemical analysis etc. The information should be extracted in the form of a table.

#### B) Water and drainage system: -

Where did you give water to each plot, what did you give, how much did you give, when did you give it? It should be seen whether it is given on time or not, from a management point of view, one should try to reduce the cost by saving water.

#### C) Labor :-

How many seasonal approvals are available when the farmer / manager is considering labor? What are the qualities? This should be taken into consideration. How much human hair is available each month? It needs to be planned. Consider how many houses and wages are available and how much wages have to be paid. This will estimate the amount of cash required.

#### D) Capital :-

This component includes farms, buildings, animals, machinery, tools, water tools. What is the area under agriculture? How much garden area? At this level, it is necessary to consider how much area will be under which crop, how many permanent items will be required accordingly, how

much capital investment will be required in it, and how much current Farm Business Management-I capital will be required.

#### E) Chemical fertilizers :-

Plan the amount of fertilizer to be applied to each crop according to the area. Fertilizer quantity should be given to the crop by allocating capital for this purpose. Scientific compost should be made from animal dung, cow dung, wastages in agriculture, etc. also crops like dicotyledonous crops should be taken to meet the need for fertilizer. If there is an arrangement to live on the farm, then by installing a biogas farmer can get triple benefit of (1) power generation (2) fertilizer (3) gas for cooking

#### 2. Identification of alternative product :-

It is important to know the technology based on off-farm tools. Traditional farming business continues in India. The earlier idea of farming for subsistence has been replaced by the idea of doing business as an industry. It requires the adoption of management science. An important step in this is to make the manager / farmer aware of new ventures, new technologies. Only then will he be able to extract low cost produce from his farm and make maximum profit. E.g.

- 1) Cash crops should be taken in more areas instead of food crops. Eg sunflower, soybean, tur, pomegranate, dried fruit trees etc.
- 2) Use more productive or hybrid seeds than using local varieties of the crop.
- 3) Rent a tractor instead of cultivating with oxen.
- Planning of disease / pest control measures on the crop or spraying of pesticides / insecticides as recommended in case of disease / pest infestation.
- 5) Scientific composting of farm excrement using dung, animal manure. If there is a system of living on the farm then by installing a biogas machine and using the dung to get the triple benefit of (1) power generation (2) fertilizer (3) gas for cooking.
- 6) Irrigation of crops by drip irrigation system with a view to economical use of agricultural water; This saves water, if the cost of watering is saved then the area under water can be increased.
- 7) Increase the income by raising some crossbred cows for milk production business with a view to utilizing the by-products of agriculture along with crop production and utilizing the available time of the family member. If a business like crossbred cows is difficult in terms of capital investment, then goat rearing, raising chickens, small business like silk production. Thus gaining knowledge of various activities (production of different crops) and use of improved techniques on agriculture. From that, the farmer should choose the technology that suits his farming business.

#### 3. Specifying the objectives of agribusiness :-

The main objectives of agribusiness management have already been stated. Apart from that it has some objectives.

A) Increase production by making maximum use of available resources.

B) Adopting new techniques in agriculture and incorporating those activities which are profitable into the activities for the progress of farm business.

C) When selecting any venture, the selection should be confirmed by comparing it with other ventures. Choosing the most economically viable venture is more likely to increase profits.

Even if the farmer decides to grow any crop in a joint venture and decides to make maximum profit, are the required resources available? If not, can they be obtained? Can alternative arrangements be made if not available? If there are any difficulties in marketing the goods after production, what should be done about it? Also, what are the possible risks in producing agricultural products? How intense is it? The farm manager or the farmer must know all this.

#### 4. Difficulties in getting the tools required in farm business -

First of all, the important material in the instrumentation is the capital goods. Any farmer has to have some basic things to do in order to cultivate. E.g. Plows, plows, plows, bullocks, bullock carts, minor implements and materials but if the area of agriculture is maximum then there is a tendency to buy more tools and implements. Many studies have shown that as a farmer's land holding area increases, so does his capital investment. In particular, as the horticulture sector grows, so does the amount of capital investment. Even if this is true, was this capital investment appropriate after deducting the cost of crop production or milk production? You have to make sure. E.g. suppose a farmer has 10 acres of land. Should he keep the bullock cart? And how much does it cost? Is there such a large amount of cash? If not, will I get the loan amount? These questions are facing the farmers. If a pair of oxen can be used for 100 to 120 days of cultivation on 10 acres of land, then should the oxen be left empty for the remaining days? If it is left empty then the cost of feeding the bull will have to be borne. If a pair of oxen does not have farm work on that day, then it is possible to hire or transport goods on another's farm on that day, then the farmer can afford to keep an ox pair. Otherwise he should not keep oxen on the farm. There are many such things to consider. There are some difficulties in getting agricultural capital used. E.g.

- 1) If he decides to use his own capital goods, then he should buy only those things which are necessary for the farm and which will be used for most of the year.
- 2) Do you have the seeds of the crops that you have decided to grow on the farm? If not, make sure it is available in the market. There are also constraints in getting seeds in the market. e.g.

#### Seed : -

A) Not getting on time

- B) Belongs to an unaffordable brother.
- C) Not getting the caste you want.
- D) Not available before sowing season
- E) If expensive seeds are taken and no rain falls during the sowing season, sowing does not take place.

And since most of the crop varieties are hybrids, if they are not sown in the current year, the germination capacity of the seeds in the next year will not be as good.

This delays crop planning. Therefore, it is not possible for a farmer to decide which crop to keep under which area.

#### Fertilizers: -

In order to maintain the soil credit, farmers use organic manure through compost. If you want to apply cow dung to all the crops, you don't have to buy that much on your own farm. Estimate the total need for manure. The same can be said for composting. The account will be planned as per the recommendation but if it is not available or available in small quantities, it will not give the expected income. The following are the problems with chemical fertilizers.

A) There are no goods in the market at the time of purchase.

- B) Not getting the company and the type of fertilizer you want.
- C) Fertilizer prices being unaffordable.
- D) Fertilizer availability should be in the place of a large co-operative society, in the place of a sugar factory in the taluka, but when there is insufficient stock during the critical period, fertilizer is not available as per demand and a lot of help is required.
- F) There is no safe house or place on the farm for storing manure.

If he decides to take the crop as per the plan, he will have to make arrangements for several days before sowing the required amount of fertilizer.

#### Water: -

Water is an important factor in crop production. Crops have to be planned according to the availability of water. Since water supply is dependent on nature, perennial, semi-perennial seasonal water can be used to estimate the area to be used and decide which crop to take and how much to take. As the overall availability of the tool (numerically and quantitatively), it

should be taken on as much area as it is feasible to take the crop. Otherwise the farmer has to face huge financial loss.

#### Labor for crop production or animal care: -

Information on how much labor will be required each month for crop production and animal husbandry on the farm, how much will be available for the house and how much will be required for rent, should be prepared on the crop initiative for a month. Once the crops are sown or the animals are taken care of, the farmer will have to settle for a lower yield of the crop and livestock.

The above discussion leads to the conclusion that whether the farmer has the means to purchase the equipment, resources or resources required for each crop or undertaking, for which he wants to take or plan for the crop, undertaking or not? Is it convenient to take? Whether there is any provision for payment of rent, all these things should be put in writing on paper so that the farmer does not suffer any loss or damage.

## 5. Consideration of the problem in the market system of agricultural commodities : -

Planning on agriculture is mainly related to the market system. Commercial crops like cereals, crops, sugarcane, cotton, vegetables, fruits, eggs, milk etc. Agricultural commodities are manufactured. How much area to invest for these different crops or undertakings depends on factors such as land, capital, labor, etc., as well as the market system. Which commodity has a market price? What goods are in demand? Which goods are exported? Accordingly, the program of agricultural income should be decided.

In case of non-food grains, the problem of the farmer is the difficulty of storage of the produce once it is ready. If there is no good storage system, the goods have to be sold immediately. If the goods are taken for sale in the market, the price obtained by deducting transport, excise, commission and other expenses is getting higher, then the farmers should reduce the production cost of each unit. Only then can the crop be profitable by selling such goods.

However, in the case of vegetables and fruits, the market price fluctuates a lot. Prices go up and down on the principles of supply and demand. These goods have to be sold as they are perishable. The share in the consumer's rupee is almost half of the price received by the farmer. For this the farmer should take the following care in the production of goods while planning such crops.

- 1) Good quality goods should be prepared.
- 2) Seedlings of the same variety should be used for the same variety.
- 3) Classify the goods.
- 4) Packing and transportation should be done so that the goods do not get spoiled till they reach the market place.

- 5) Goods which are not consumed or prices fall sharply should be used as Farm Business Management-I an alternative to the Processing Products industry.
- 6) Goods should be sent to two markets instead of one.
- 7) If you do not have a vehicle for transporting goods, you can purchase your own vehicle or use it in general. Or through a co-operative society or if transport is done.
- 8) Try to send good quality goods by visiting the marketing firm which is exporting foreign goods or the co-operative society which is doing such work.
- 9) After studying the market prices of big markets like Mumbai, Ahmedabad, Delhi, Hyderabad, and Bangalore for the last 3/4 years, in which week and on which festival the goods market is better. By studying this, the planning of sowing, planting, harvesting and harvesting of the crop should be done by making a plan that the goods can be sent at the same time.

Also, while harvesting the goods, the daily market price, the inflow and outflow of the goods, this information should be collected through radio, newspaper, phone, merchant friend and its notes should be kept and accordingly the program of transporting the goods for sale should be planned.

Overall, the farmer / manager when it comes to planning the production of goods. At the same time planning the sale of goods will make the market easier.

#### 6. To know the dangers and severity of dangers in farm business :-

There may be risks in agricultural production, in the use of tools, in the sale of goods; these risks can be estimated on the basis of statistics, the extent or risk. But there may be some small errors in this estimate. Also in some farm business some matters are considered to be of uncertainty. The insurance company pays compensation as per the rules if the insurance is taken out at the risk of such things. If farmers take seasonal crops like sugarcane, tobacco, potato or fruits like pomegranate, grape, and guava from year to year, the variation can be deduced by statistical analysis of 15 to 20 year old acreage depending on the weather. And the danger can be predicted.

Drought is prevalent in Maharashtra, especially in Central Maharashtra. Studying the rainfall over the last 100 years (total rainfall figures), it is possible to estimate the number of years of severe drought and the number of years during which drought conditions occur. The year of drought can be predicted so that the risk of drought can be predicted by making major changes in crop planning to avoid financial losses. However, in recent times crop insurance schemes have been introduced for some crops. Animals are also insured.

Locust infestation, storms and fruit trees are not considered as a threat. So it is considered a natural disaster-uncertain. Agriculture, building fires,

motorcycle, jeep accidents, major breakdowns. This, however, is now considered a threat. As the incidence of such incidents is increasing, there is a provision to insure such matters through the General Insurance Corporation. The peasantry uses the same sense of danger and uncertainty. Then the fluctuations in the prices of agricultural commodities, the fluctuations in the acreage of agricultural commodities, the seasonal fluctuations in the rates of wages, etc., can be measured as to how dangerous / uncertain the phenomena are in the primary form. Statisticians like Mean, Mean Deviation, Standard Deviation, and Coefficient of Variation.

#### **10.6. SUMMARY:**

Agricultural production depends not only on nature but also on the method adopted by the farmer. In natural matters the farmer cannot control the soil, rainfall, regular rainfall, temperature, humidity, thunder, wind, excess rainfall, drought, ground water level. Sometimes nature is helpful and sometimes it is not. So there is product uncertainty. But the farmer can control how much, how and when to use unnatural or man-made tools. These tools include seeds, manure, chemical fertilizers, pesticides, pesticides, farm implements, machinery, oil engines, electric motors and many more. Over the last two-three decades, due to advances in agricultural technology, farmers have started adopting new techniques efficiently, planning, when and how to use them, implementing them and evaluating them in a gross way. Raising your family is not the only limitation. The farmer wants to meet his basic needs as well as produce for the market. Its aim is to sell agricultural commodities in the market and buy other commodities and to raise the standard of living not only at the level of subsistence but also at the level of subsistence. Due to this change in the attitude of farmers, agricultural production is now becoming commercial. In this commercial agriculture, the importance of agribusiness management has increased in the sense that science helps in achieving the objectives of the farmer.

#### 10.7. EXERCISE:

- 1. Explain the concept of farm business management with various definitions.
- 2. Elaborate the nature of farm business management.
- 3. What are the objectives of farm business management?

#### **10.8. REFERENCE LIST:**

- 1) Agribusiness Management Pvt. Dr. Waghmare and. A., Pvt. Dr. In Dhondge.W., PrachiPrakashan, Mumbai 92.
- 2) Agricultural Economics Dr. Kavimandan Vijay, Sri Mangesh Prakashan, Nagpur - 440010.



# 11

### FARM BUSINESS MANAGEMENT-II

#### **Unit Structure:**

- 11.1 Objectives.
- 11.2 AnIntroduction.
- 11.3 Principles of farm business management.
- 11.4 Factors of agricultural production.
- 11.5 Importance of farm business management.
- 11.6 Exercise.

#### **11.1. OBJECTIVES:**

- 1) To know the principles of agribusiness management.
- 2) To study the components of agricultural production.
- 3) To know the importance of agribusiness management.

#### **11.2. INTRODUCTION:**

Agriculture is a business that has been going on for years. Agriculture is an important and revolutionary stage in human evolution. Agriculture has been seen as a means of subsistence for thousands of years. Despite this, agricultural systems have evolved in recent times. Due to this, its function, scope and importance have not been fully recognized. Different people have thought of this scripture from different points of view, interpreted it. According to some, agricultural management is no different from the art of cultivating land. Some scientists are of the opinion that agricultural economics is no different than production economics. According to some, agricultural economics and law were one and the same. The common man thinks that agricultural management is to supervise the labor on the farm or, if he is a salaried manager, to carry out the work as per the orders of the employer. There is another point to note regarding the term 'agricultural system'. Agribusiness management science involves both organization and management of agriculture. But we say 'agricultural management science' for convenience. Combination is the act of making a plan. 'Arrangement' means to carry out this plan, to carry out as planned. The farm manager has to do both.

#### 11.3. PRINCIPLES OF FARM BUSINESS MANAGEMENT

The principles of farm business management can be explained as follows.

#### 1) Principal of changing quantity (Law of Variable Proportion) -

In the study of farm business management, we can see the three stages in production. The first stage is of increasing returns, second stage is of stable returns and third stage is of diminishing returns.

#### A) Stage of Increasing Returns -

As the amount of resource utilization increases, the total production as well as marginal production also increases which tends to increase returns? This tendency is seen for a short term period. From the point of view of production strategy, production can be kept increasing as long as the increasing returns of equipment adds to the production.

#### B) Stage of Stable Returns -

In this stage the amount of resource utilization increases, so total production also increases but marginal production does not increase, it remains stable. If the product is found to be beneficial there is no problem in producing as long as there is a stable returns. Of course, some of the tools used (e.g. management) become stagnant over a period of time without changing. The productivity of a device depends on the other device used with it. Therefore, due to the different availability of land, capital and labor in each field, the decisions of each are different. In short, considering the available tools, one should try to think of them as a suitable combination.

#### C) Stage of Diminishing Returns -

This is an enduring trend in agriculture. In this stage the amount of resource utilization increases, but total production does not increases as in earlier stage also marginal production starts decreasing. An experience shows that It is not always possible to increase productivity by increasing the volume of the tool. This means that there is a time when the cost of quantity does not increase enough to cover it. It is advantageous to increase the quantity of equipment as long as the cost of the quantity produced from the increased production is covered. After these limits, however, marginal production is less than marginal expenditure.. Here, it is necessary to stop the process of increasing the volume before the final limit is reached. This tendency can also lead to an idea of how much to use, such as fertilizer, labor, or machinery.

#### 2) Principle of Expenditure -

Expenditure is a crucial factor in any business. The agriculture business is no exception. Subtracting the total expenses from the total income gives the net income. One way to increase income is to keep spending to a minimum. Expenditure on certain components in agriculture, like other Farm Business Management-II occupations, is constant. This means that there is no significant difference in the cost of production, no matter how much or how little. E.g. Insurance premium. Expenditure on electricity, taxes, etc. While fixed costs are short term, long term costs are variable. The changing cost varies according to the level of production. Expenditure on fertilizers, seeds, water supply, labor, etc. will be higher only when the level of production is high. In the short run, of course, these costs have to be taken into consideration when deciding on a product. The variable cost and fixed cost in the product is fixed. The farmer has to think in terms of different times while doing profitable farming.

The following principles can generally be stated in this regard.

#### A) Short term -

In the short term profit or income is same during this period. But the effort of the farmer should be such that out of the total income received, the cost will be covered even if the diagnosis is changed. If the cost of marginal quantity is equal to the revenue from marginal quantity, then the net income will be more. If the total income is less than the total cost, there is no problem in continuing production. Production can be increased as long as the revenue at the border is more than the cost at the border. Even if short-term losses occur, efforts should be made to keep losses to a minimum without stopping production. This is often the case in agriculture. When the marginal receipt is less than the average total expenditure. The reason for this is that even if the gain is small, it covers the cost of changing the average, so the loss is minimal. (In commercial farming this is fine but in Indian conditions many farmers have to cultivate with nilaja, then there is profit or loss, because there is no other option but to cultivate. Also hope to make up the shortfall next season. It is natural to be confused.)

#### B) Long term -

It is not advisable to make continuous losses during this period as it is very long. In this case, it would be better not to produce. The gross income during this period should be profitable ie fixed and adjustable to cover the variable expenses . Not only that, maximizing profits should be the main objective during this period and production decisions should be made accordingly. It works even if the cost is not covered in a short period of time. Because changing the diagnosis costs money. But in the long run, it is necessary to cover both these costs and make a profit.

#### 3) Principle of component replacement -

Farmers use various equipments while farming. Before getting production or income farmer has to pay for these equipments then he gets income. Some of these tools can be replaced up to a limit. This means that one component can be reduced and another component can be used. But doing so should not reduce production or, in other words, replacement should either increase the cost or decrease the cost. It results in decrease or

increase in production. E.g. Using a tractor instead of oxen for plowing the land, harvesting with the help of machine instead of laboring, milking with machine instead of milking by hand etc. Thus, when using different components for production, the farmer has to choose from the various options that are available to him, considering which option is the least cost combination. This requires a comparative study of marginal replacement rates (i.e., the number of substituted components divided by the number of multiplied components). This is where the replacement rate and cost i.e. the process of replacing the components is most beneficial.

#### 4) Alternative / Opportunity Cost Principle

Land, capital and labor are the main means of production. If these factors are easily available to farmer, then there is no question of choosing activity of agriculture like crop production, poultry etc. Farmer can easily engage in any agriculture activity. But in reality the availability of factors or equipments are limited. Although the land is large, the labor force is limited. Or sometimes both land and capital are scarce. Therefore, the question arises as to which agriculture activity will bring more profit. In that sense, the principle of alternative spending is a guide. In a situation where the amount of labor, land and capital adds to the product, the profit will be highest, and it will be appropriate to choose the same business. One should choose the activity which gives the maximum marginal gain without considering the maximum average gain due to the factor...Suppose, if it is possible to do three occupations namely Crop production, Dairy and Poultry and for this farmer has a capital of Rs.5000 for this. A net profit of Rs.1,100 is spent on the production of five quantities of capital in the same amount of Rs.100. Assuming that, in such a scenario, since the highest net profit and average return from crop production, it seems obvious that it should be chosen. However, considering the extent to which each amount of capital (Rs. 100) contributes to the three businesses, the net profit increases. This means that if all the five quantities are spent on three different businesses for marginal gain without spending on a single crop production, the net profit will increase. Therefore, when choosing a business, one should consider the attainment of boundaries. The tools that the farmer has can be used as an alternative. That tool should be used considering which business might be the best. Of course when we decide to use it for a business we cancel out its other uses. The idea of alternative spending is helpful when making this decision. If the tool was used for further alternative use instead of specific use, the benefit would be called alternative expenditure. It should be used in the business where the tool is giving the highest net profit.

#### 5) The principle of business alignment -

A variety of occupations can be done in agriculture. The farmer has to make a selection considering the cost involved, the price of the product and the relationship between the businesses. The interrelationships of business are different. Some businesses are independent. That is, they do not affect each other much. A farmer with limited resources will not choose such business. Because it is a natural expectation that one business
should help another. The reason for adding dairy business to agriculture is Farm Business Management-II that fodder is available to cattle. So cow dung can be used as manure. We call such businesses ancillary businesses. It is worthwhile to choose a business that is more complementary. Uncertainty and risk are high in agricultural production. Changes in natural elements are a source of uncertainty. In addition, changes in the price of inputs required for a particular business, changes in the price of manufactured goods also add to the uncertainty. Therefore, these aspects need to be considered while determining the business fit when deciding the method of crop production. E.g. It is true that the use of hybrid seeds gives higher yields. But these crops are prone to diseases and pests. This also has to be considered. A farmer who places more importance on safety will reduce improvements that are more risky. When choosing a business or crop type, the effect of time between the costs involved and the costs involved cannot be underestimated. E.g. Limited land can be used regularly for crop production. Or if you plant an orchard, you can get it only after investing money for a few years. Today, the decision to pay a higher price for a dairy cow or to spend some time rearing a calf for less money is a similar one. In this context, one has to consider the present value of future acquisitions.

# 6) Principles of Agricultural Decision Process -

The farm is considered as the unit in the farm management process. The principle of maximum profit is the main reason behind all these decision making processes. In this context, it is decided how to organize the resources in agriculture and how to conduct various activities in agricultural cultivation. Basically, the work of this science is to apply the principles of economics and agricultural science to the organization and activities in the field of agriculture. Crop production, animal husbandry, mechanization, labor planning are all part of agriculture allied activity. And in it, financial principles are the guide in making the right decision. This means that there is no separate principle for each of these parts, but each element applies to all parts. And all the principles apply to each part. (There is no separate principle or rule for each part of the business; each principle applies to all parts of farming and all principles apply to each part of farming.)

#### 7) Principles of Important Decision Making -

Given the nature of modern farming, farmers need to make timely decisions. These decisions relate to the allocation of available resources, efficient use and ultimately maximization of revenue. The certainty that exists in other professions makes the decision making process very regular. But due to the dependence on nature, there is uncertainty in agricultural production and hence the accuracy of the decision is important. What to Produce, How to Produce, How much to produce are the three important decisions.

The following are some of the things that farmers have to decide under them.

#### a) Cropping Pattern-

The farmer has to decide which crops to grow in a particular season. This decision can be taken only after considering the quality of the land, natural conditions, market conditions, price trend of agricultural commodities etc.

#### b) Animal Breeding -

Whether the business is main or complementary, the farmer has to decide how it will look like. The most suitable type is selected from various occupations like animal husbandry and dairy business, poultry farming.



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#### c) Product level -

After deciding which product to take, it is important to decide the level of production of that crop. Of course, the nature of the demand for a commodity, its price, durability, etc. influence this decision.

#### d) Method of cultivation-

One has to decide which method of cultivation to adopt to produce the specified variety. Much will depend on the availability of resources, the knowledge of the farmer, the approach, the norms of the region.

#### e) Area under crop -

It is important for the farmer to decide how much area of land to cultivate after deciding on the type of crop and other matters. Against the backdrop of natural uncertainty and market volatility, it may be inappropriate to place more area under any one crop. The decision will also depend on the size of the holding area. In a country like India where there are small holding areas of affordable size, this decision has a lot of limitations.

#### f) Tool / Equipment / Factor ratio-

Land, capital and labor are important tools in agricultural production. Of these, the supply of land is limited. The combination of such a tool has to decide the amount of labor and capital, which will reduce the cost and increase the income.

#### g) Tool / Equipment / Factor matching and replacement -

Integration of means requires replacement of labor and capital. The main purpose behind tool replacement is to strike a balance between natural means of production and man-made tools. When replacing labor and capital, one has to consider the availability of labor. Excessive replacement of labor is not appropriate where the use of capital can make the labor force useless. But the fact that the device increases efficiency cannot be ignored. Therefore, the decision to combine these two tools properly is very important.

#### h) Thoughts of Reforms -

Agricultural production is determined not only by the means of cultivation but also by various reforms. In case of soil erosion, the farmer has to make a decision keeping in view the far-reaching consequences of land conservation measures, digging and constructing wells, fencing the farm, and taking measures to maintain fertility.

#### 11.3.1. Activities in Farm business Management -

One of the major components of farm business management is field management. Field management means trying to achieve the objective of agricultural production by making maximum use of limited resources like land, human labor, capital.farm business management is a practical process. It is not a single action, it is very complex and fast. It is important to set goals for the proper use of the tools available in farm business management. And it is important to complete it on time. At present, the purpose of farming for Indian farmers is not only subsistence farming, but in recent times, their tendency has shifted towards capital formation.

In order to be successful in farm business, Farm business management process has to be carried out. This process involves the following actions.

#### 1) Inspection -

Full inspection of all agricultural land and equipment. Draw a map if possible. It is important to list all the devices, check the status or copy of each device and record it.

#### 2) Planning -

Initially crop production plan should be prepared. Estimate the area, crop variety, fertilizer, medicines, water, labor, mantra hours. No matter how much it costs, the rhythm should be such that the work day of the people who use the money properly should be appropriate. Planning should be a way to reduce costs and maximize profits.

#### 3) Evaluate -

After planning, what is the cost per hectare of each undertaking, how much income can be earned, how many working days will the householder get, how much outside labor will be required, how much other inputs will

be used? How much does it cost? Decisions can be made according to the feasibility of each venture and the profitability.

# 4) Implementation -

Once the decision has been taken as to which activities should be carried out as per the plan, it should be implemented as strictly as possible. Equipment supply, capital adequacy, market etc. Things have to go as planned. Natural disasters are not an option.

# 5) Control -

Control is required to achieve the objectives of various initiatives as planned. Management and control are required for timely and expected profit while various activities are being carried out on the farm.

# 6) Accepting responsibility for decision making and implementation

By the end of the year, the management understands what the outcome is. Analyze the farm business economically and find out how much the various components have received. From that, the test of management can be seen. All these responsibilities depend on the decision taken by the farmer / manager and the manner in which the decision is implemented. She has to accept them.

# **11.4. FACTORS OF AGRICULTURAL PRODUCTION : -**

Goods or services have to be produced to meet the needs of the consumer. The process of adding value to an existing product or service is called production. The components involved in the production process that requires certain product components to be added to the utility of the product or service are called inputs or product components. Product component is a financial term that describes the inputs used in the production of goods or services for financial gain. The equipment required for the production of a good or service is called the input or product component. This includes any resources needed to create a good or service. For example, farmers use soil, tractors, water, etc. to produce paddy. These various inputs are classified into four components of production namely land, labor, capital and entrepreneurship. We can discuss these factors as follows:

#### 1) LAND:-

The term 'land' generally refers to the surface of the earth. But in economics, it includes all that, which is available free of cost from 'nature' as a gift to human beings. Land stands for all nature, living and non-living which are used by man in production. Even though land is passive factor and it does not possess any ability to produce on its own, it is an important agent of production. Modern economists consider land as a specific factor of production, which can be put, not only to a specific purpose but to several other uses.

# **Definition of Land :-**

1) According to Prof. Marshall - "By land is meant not merely land in the strict sense of the word, but the whole of the materials and forces which nature gives freely for man's aid in land, water, in air and light and heat."

2) According to Prof. K. Mehta - "Land is a specific factor or that it is the specific element in a factor or again that it is the specific aspect of a thing."

### Land includes:-

- i) Surface of the earth like plains, plateaus, mountains, etc.
- ii) Sea, rivers, ponds, etc.
- iii) Air, light, etc.
- iv) Oil, coal, natural gas, etc.
- v) Silver, gold and other metals and minerals.

# Characteristics of Land:-

#### 1. Free Gift of Nature :-

Basically, land is available free of cost from the nature. In the initial stages, man paid no price for the land acquired by him. However, to improve the usefulness or fertility of land or to make some improvements over land, some expenditure is to be incurred, but as such, it is available at no cost from nature. Man has to make efforts in order to acquire other factors of production. But to acquire land no human efforts are needed. Land is not the outcome of human labor. Rather, it existed even long before the evolution of man.

#### 2. Supply of Land is Fixed :-

Supply of land is fixed in quantity. It means supply of land cannot be increased or decreased like other factors of production. Although for an individual, supply of land may be flexible, but at macro level, the overall supply of land is fixed. However, only effective supply of land can be increased by making an intensive use of land.

#### 3) Difference in Fertility :-

All lands are not equally fertile. Different patches of land have different degrees of fertility. Some locations are very fertile and have very good agricultural productivity, whereas some patches are totally barren and nothing can be grown there. Similarly, the degree of richness of mineral wealth varies from place to place, making the land more useful or less useful from economic point of view.

#### 4) Indestructibility of Land :-

Land is an indestructible factor of production. Man can change only the shape of a particular location and composition of its elements, but as such land cannot be destroyed. It can either be converted into a garden or to a forest or to an artificial lake. However, some parts of land get eroded due to natural factors, but that is immaterial because overall availability of land does not change.

#### 5) Immobility :-

Unlike other factors, land is not physically mobile. It is an immobile factor of production, as it cannot be shifted from one place to another. It lacks geographical mobility. Some economists, however, describe land as a mobile factor on the argument that it can be put to several uses.

#### 6) Land is a Primary Factor of Production :-

In any kind of production process, we have to start with land. For example, in industries it helps to provide raw materials, and in agriculture, crops are produced on land.

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Land is a passive factor of production, because it cannot produce anything on its own. Human element and capital inputs are required to be combined in an appropriate manner with land in order to obtain yields from it.

#### 8) Effect of Laws of Returns :-

Since land is a fixed factor of production, the laws of returns are more effectively applicable on it. Increased use of capital and labor on a particular plot of land leads to an increase in crop production at a diminishing rate.

#### 9) Alternative Uses of Land :-

Land is used for alternative purposes like cultivation, dairy or poultry farms, sheep rearing, building, etc. The use of land for any particular purpose depends not only on the return from that particular use, but also the returns from alternative uses.

#### 10) Land is Heterogeneous :-

Land like other factors of production differs from another in respect of location, fertility, nature and productivity. Two pieces of land are not exactly the same.

#### Importance of Land :-

Land is considered the primary factor of production. Land is rich in coal, water and petroleum, which are used for generating power. Land is required to construct factories and industries to carry out the production process. Land is of great importance to mankind. A nation's economic Farm Business Management-II wealth is directly related to the richness of its natural resources.

- 1) Creation of living creatures
- 2) Generating Employment
- 3) Development of Infrastructure
- 4) Land determines agricultural production.
- 5) The industrial progress and prosperity of the country depends on the availability of mineral resources, i.e. land.
- 6) Land determines the gross domestic product.
- 7) Land affects the economic development of the country.
- 8) Land maintains ecological balance.
- 9) Land directly or indirectly meets the basic needs of the people.

10) Land affects trade.

#### 2) Labour:-

Labour includes both physical and mental work undertaken for some monetary reward. In this way, workers working in factories, services of doctors, advocates, ministers, officers and teachers are all included in labour.

Any physical or mental work which is not undertaken for getting income, but simply to attain pleasure or happiness, is not labour.

For example, the work of a gardener in the garden is called labour, because he gets income for it. But if the same work is done by him in his home garden, it will not be called labour, as he is not paid for that work. So, if a mother brings up her children, a teacher teaches his son and a doctor treats his wife, these activities are not considered 'labour' in economics. It is so because these are not done to earn income.

#### **Definition of Labour :-**

- 1) According to S.E. Thomas, "Labour connotes all human efforts of body or mind which are undertaken in the expectation of reward."
- 2) Labor is the amount of physical, mental, and social effort used to produce goods and services in an economy.

# **Characteristics of Labour:**

#### 1) Labour is Perishable:-

Labour is more perishable than other factors of production. It means labour cannot be stored. The labour of an unemployed worker is lost forever for that day when he does not work. Labour can neither be

postponed nor accumulated for the next day. It will perish. Once time is lost, it is lost forever.

#### 2) Labour cannot be separated from the Labourer :-

Land and capital can be separated from their owner, but labour cannot he separated from a labourer. Labour and labourer are indispensable for each other. For example, it is not possible to bring the ability of a teacher to teach in the school, leaving the teacher at home. The labour of a teacher can work only if he himself is present in the class. Therefore, labour and labourer cannot be separated from each other.

# 3) Less Mobility of Labour:-

As compared to capital and other goods, labour is less mobile. Capital can be easily transported from one place to another, but labour cannot be transported easily from its present place to other places. A labourer is not ready to go too far off places leaving his native place. Therefore, labour has less mobility.

# 4) Weak Bargaining Power of Labour:-

The ability of the buyer to purchase goods at the lowest price and the ability of the seller to sell his goods at the highest possible price is called the bargaining power. A labourer sells his labour for wages and an employer purchases labour by paying wages. Labourers have a very weak bargaining power, because their labour cannot be stored and they are poor, ignorant and less organized. Moreover, labour as a class does not have reserves to fall back upon when either there is no work or the wage rate is so low that it is not worth working. Poor labourers have to work for their subsistence. Therefore, the labourers have a weak bargaining power as compared to the employers.

#### 5) Inelastic Supply of labour:-

The supply of labour is inelastic in a country at a particular time. It means their supply can neither be increased nor decreased if the need demands so. For example, if a country has a scarcity of a particular type of workers, their supply cannot be increased within a day, month or year. Labourers cannot be 'made to order' like other goods. The supply of labour can be increased to a limited extent by importing labour from other countries in the short period. The supply of labour depends upon the size of the population. Population cannot be increased or decreased quickly. Therefore, the supply of labour is inelastic to a great extent. It cannot be increased or decreased immediately.

#### 6) Labourer is a Human being and not a Machine:-

Every labourer has his own tastes, habits and feelings. Therefore, labourers cannot be made to work like machines. Labourers cannot work round the clock like machines. After continuous work for a few hours, leisure is essential for them.

### 7) A Labourer sells his Labour and not Himself :

A labourer sells his labour for wages and not himself. 'The worker sells work but he himself remains his own property'. For example, when we purchase an animal, we become owners of the services as well as the body of that animal. But we cannot become the owner of a labourer in this sense.

#### 8) Increase in Wages may reduce the Supply of Labour:-

The supply of goods increases, when their prices increase, but the supply of labourers decreases, when their wages are increased. For example, when wages are low, all men, women and children in a labourer's family have to work to earn their livelihood. But when wage rates are increased, the labourer may work alone and his wife and children may stop working. In this way, the increase in wage rates decreases the supply of labourers. Labourers also work for less hours when they are paid more and hence again their supply decreases.

#### 9) Labour is both the Beginning and the End of Production:-

The presence of land and capital alone cannot make production. Production can be started only with the help of labour. It means labour is the beginning of production. Goods are produced to satisfy human wants. When we consume them, production comes to an end. Therefore, labour is both the beginning and the end of production.

#### 10) Differences in the Efficiency of Labour :-

Labourer differs in efficiency. Some labourers are more efficient due to their ability, training and skill, whereas others are less efficient on account of their illiteracy, ignorance, etc.

#### 11) Indirect Demand for Labour:-

The consumer goods like bread, vegetables, fruit, milk, etc. have direct demand as they satisfy our wants directly. But the demand for labourers is not direct, it is indirect. They are demanded so as to produce other goods, which satisfy our wants. So the demand for labourers depends upon the demand for goods which they help to produce. Therefore, the demand for labourers arises because of their productive capacity to produce other goods.

#### 12) Difficult to find out the Cost of Production of Labour:-

We can easily calculate the cost of production of a machine. But it is not easy to calculate the cost of production of a labourer i.e., of an advocate, teacher, doctor, etc. If a person becomes an engineer at the age of twenty, it is difficult to find out the total cost on his education, food, clothes, etc. Therefore, it is difficult to calculate the cost of production of a labourer.

#### 13) Labour creates Capital :-

Capital, which is considered as a separate factor of production is, in fact, the result of the reward for labour. Labour earns wealth by way of production. We know that capital is that portion of wealth which is used to earn income. Therefore, capital is formulated and accumulated by labour. It is evident that labour is more important in the process of production than capital because capital is the result of the working of labour.

#### 14) Labour is an Active Factor of Production :-

Land and capital are considered as the passive factors of production, because they alone cannot start the production process. Production from land and capital starts only when a man makes efforts. Production begins with the active participation of man. Therefore, labour is an active factor of production.

#### Importance of Labour:-

- 1) Economic growth
- 2) Labour productivity affects everyone.
- 3) Increased productivity brings higher profit and opportunity for more investment.
- 4) Skilled and unskilled employment generation
- 5) Increasing production
- 6) Self development
- 7) Industrial development
- 8) Agricultural development
- 9) Infrastructural development
- 10) Development of the country

#### 3) Capital:-

Capital is defined as "All those man-made goods which are used in further production of wealth." Thus, capital is a man-made resource of production. Machinery, tools and equipment of all kinds, buildings, railways and all means of transport and communication, raw materials, etc., are included in capital.

Capital has a number of related meanings in economics, finance and accounting. In finance and accounting capital generally refers to financial wealth especially that used to start a business.

#### **Definitions of Capital:-**

1) According to J. R. Hicks, "Capital consists of all those goods, existing at present time which can be used in anyway, so as to satisfy wants during the subsequent years".

According to this definition, all those things which satisfy human wants are capital goods. It means that both, consumer goods as well as producer goods should be included in 'capital', as both satisfy human wants in one way or the other. But as a matter of fact, the consumer goods are not included in 'capital' because the consumer goods will be consumed in a single use only and will not be utilized for further production of wealth.

2) According to BohmBawerk, "Capital is the produced means of production"

According to this definition, only those goods are included in capital, which have been produced by human efforts.

3) According to Von Sickle and Roger, "Capital goods are the products (tools) of the past labour (efforts) used for further production."

Thus, capital is productive in the sense that it enables a worker to produce more goods or services, during the physical life of the product.

4) According to Prof. Samulson, "Capital goods are produced goods that can be used as factor input for further production."

Thus, several economists have defined 'capital' differently.

From the above definitions, following facts about 'capital' can be concluded :-

1) 'Capital' includes all those goods (items or commodities) which are used for further production of more goods, e.g., machines, tools, factory buildings, transport equipment, etc.

2) 'Capital' is the result of human efforts made, on natural resources, in the past. As suggested by CAIRNCROSS, stocks, shares, government bonds, securities, etc., are also included in 'capital' because all these yield income to the investors.

3) Capital has been classified in different ways depending upon its use (or purpose) and its actual physical status (nature).

#### **Characteristics of Capital:-**

#### 1) Capital is a Passive Factor :-

It is a passive factor of production. This is so because it becomes ineffective without cooperation of labour.

#### 2) Capital is Man Made:-

It is created by man. Its supply is increased or diminished by the efforts of man. According to John Stuart Mill, capital is the "accumulated product of past labour destined for the production of future wealth", i.e., when human labour is applied to natural resources, then capital items are generated.

# 3) Capital is not an Indispensable Factor of Production:-

Production can be possible even without capital, whereas land and labour are the original and indispensable factors of production.

# 4) Capital has High Mobility:-

Amongst all the factors of production, capital has the highest mobility. The land is immobile, labour has low mobility, whereas 'capital' has both 'place mobility' and 'occupational mobility'.

# 5) Capital is Elastic:-

Supply of capital is elastic and can be adjusted easily and quickly according to demand. On the other hand, the supply of land is fixed and the supply of labour can neither be increased nor decreased quickly.

# 6) Capital Depreciates:-

If capital is used again and again it depreciates. For example, if any machine is used for a considerable period, then it may not be suitable for further use due to depreciation.

#### 7) Capital is Productive:-

Production can be increased to a large extent if workers work with adequate capital.

#### 8) Capital is not a Gift of Nature :-

Production of capital involves some cost as it is not a natural gift, and is not freely available. It is earned with hard labour and sacrifice.

#### 9) Capital is Prospective:-

Capital is considered much prospective, as the accumula-tion of capital yields an income.

# 10) Capital is the Result of Past Savings :-

In some cases when the consumption of capital good is not simultaneous with the production, it becomes a saving, e.g., when a farmer does not consume or sell a part of his crop production, it can be used as seeds in the future.

#### Importance of Capital:-

- 1) Essential for increasing production
- 2) Increases Productivity
- 3) Importance in Economic Development
- 4) Creating Employment Opportunities
- 5) Skilled and unskilled employment generation
- 6) For developing Service sector
- 7) Industrial development
- 8) Agricultural development
- 9) Infrastructural development
- 10) Development of the country

#### 4) Entrepreneurship :-

The word "entrepreneur is derived from the French verb "entreprendre", which means 'to undertake. This refers to those who "undertake" the risk of new enterprises. An enterprise is created by an entrepreneur. The process of creation is called "entrepreneurship".

#### Meaning :-

Entrepreneurship is a process of actions of an entrepreneur who is a person always in search of something new and exploits such ideas into gainful opportunities by accepting the risk and uncertainty with the enterprise. It is the process of starting a business, a startup company or other organization. The entrepreneur develops a business plan, acquires the human and other required resources, and is fully responsible for its success or failure Entrepreneurship operates within an entrepreneurship ecosystem.

#### **Definitions :-**

- 1) According to A.H.Cole, Entrepreneurship is the purposeful activity of an individual or a group of associated individual, undertaken to initiate, maintain or aggrandize profit by production or distribution of economic goods and services.
- 2) According to J.A. Timmons, Entrepreneurship is the ability to create and build something from practically nothing.
- 3) According to Musselman and Jackson, "Entrepreneurship is the investing and risking of time, money and effort to start a business and make it successful.

#### **Characteristics of Entrepreneurship:**

#### 1) Economic and dynamic activity

Entrepreneurship is an economic activity because it involves the creation and operation of an enterprise with a view to creating value or wealth by ensuring optimum utilization of scarce resources. Since this value creation activity is performed continuously in the midst of uncertain business environment, therefore, entrepreneurship is regarded as a dynamic force.

#### 2) Related to innovation

Entrepreneurship involves a continuous search for new ideas. Entrepreneurship compels an individual to continuously evaluate the existing modes of business operations so that more efficient and effective systems can be evolved and adopted. In other words, entrepreneurship is a continuous effort for synergy (optimization of performance) in organizations.

#### 3) **Profit potential**

"Profit potential is the likely level of return or compensation to the entrepreneur for taking on the risk of developing an idea into an actual business venture Without profit potential. the efforts of entrepreneurs would remain only an abstract and a theoretical leisure activity.

#### 4) Risk bearing

The essence of entrepreneurship is the willingness to assume risk arising out of the creation and implementation of new ideas. New ideas are always tentative and their results may not be instantaneous and positive. An entrepreneur has to have patience to see his efforts bear fruit. In the intervening period (time gap between the conception and implementation of an idea and its results), an entrepreneur has to assume risk. If an entrepreneur does not have the willingness to assume risk, entrepreneurship would never succeed.

#### 5) Skillful management

Entrepreneurship involves skillful management. The basic managerial skill is the most important characteristic feature of entrepreneurship. For Effective management of an enterprise, the role of an entrepreneur is to initiate and supervise design of organization improvement projects in relation to upcoming opportunities is very much important.

#### 6) Accepting challenges

Entrepreneurship means accepting challenges amidst risk and uncertainty. While accepting entrepreneurship as a career the entrepreneur accepts the challenges of all odds and puts his efforts to convert the odds into viable business opportunities by pooling together the resources of building and running the enterprise.

#### 7) Goal-oriented Activity

The entrepreneur who creates and operates enterprises seeks to earn profits through satisfaction of needs of consumers; hence, entrepreneurship is a goal oriented activity. Entrepreneurship emphasizes results, achievements and targets achieved. It is work done not imaginary plans or paper decisions. Hence entrepreneurship is a goal oriented activity.

# 8) Value Creation

Next, we find that the process of creating value is a characteristic in describing entrepreneurship. Through entrepreneurship, new products, services, transactions, approaches, resources, technologies, and markets are created that contribute some value to a community or marketplace. We can also see value created when, through entrepreneurship; resources are transformed into outputs such as products or services during this transformation process, value is created because the entrepreneur is fashioning something worthwhile and useful. Drucker says, "Until entrepreneurial act, every plant is a seed and every mineral is just another rock.

# 9) Dynamic Process

Entrepreneurship is a dynamic function. Entrepreneurs thrive on changes in the environment, which bring useful opportunities for business. An entrepreneur deals proactively with changing markets and environment. He looks at the changes as the source of market advantages, not as a problem. Uncertainties are market opportunities for him. He capitalizes on fleeting market anomalies

#### 10) Uniqueness

Another characteristic found in entrepreneurship is that of uniqueness. Entrepreneurship involves new combinations and new approaches with which entrepreneurs are willing to experiment. Through Entrepreneurship unique products are created and unique approaches are tried. Entrepreneurship isn't merely imitating what others have done. It's doing something new, something untested and untried-something unique.

#### 11) Interest and Vision

The first factor for entrepreneurial success is interest. Since entrepreneurship pays off according to performance rather than time spent on a particular effort, an entrepreneur must work in an area that interests her. Otherwise, she will not be able to maintain a high level of work ethic, and she will most likely fail. This interest must also translate into a vision for the company's growth. Even if the day to day activities of a business are interesting to an entrepreneur, this is not enough for success unless she can turn this interest into a vision of growth and expansion. This vision must be strong enough that she can communicate it to investors and employees.

#### 12) Risk and Rewards

Entrepreneurship requires risk. The measurement of this risk equates to the amount of time and money you invest into your business. However, this risk also tends to relate directly to the rewards involved. An entrepreneur who invests in a franchise pays for someone else's business plan and receives a respectable income, while an entrepreneur who undertakes groundbreaking innovations risks everything on an assumption that something revolutionary will work in the market. If such a revolutionary is wrong, she can lose everything. However, if she is right, she can suddenly become extremely wealthy.

# 11.5. IMPORTANCE OF FARM BUSINESS MANAGEMENT:

Agricultural production depends not only on nature but also on the method adopted by the farmer. In natural matters the farmer cannot control the soil, rainfall, regular rainfall, temperature, humidity, thunder, wind, excess rainfall, drought, ground water level. Sometimes nature is helpful and sometimes it is not. So there is product uncertainty. But the farmer can control how much, how and when to use unnatural or man-made tools. These tools include seeds, manure, chemical fertilizers, pesticides, pesticides, farm implements, machinery, oil engines, electric motors and many more. Due to advances in agricultural technology over the last twothree decades, farmers have started adopting new techniques efficiently, planning and implementation of when and how, its implementation, its evaluation in a gross way. High yielding crop varieties are being developed in India by various research institutes, especially through agricultural universities. Chemical fertilizer, water use and pest control techniques are becoming available. The use of machinery instead of old agricultural implements is on the rise. Efforts are being made by the government to get fair prices for agricultural commodities. Also, facilities for capital supply for agriculture have been created from co-operative societies and banks. In such a new environment, the farmer needs to plan to get maximum yield from his farm. In recent times, not only subsistence farming, but also a competitive environment, not only planned and useful for the farmer to deal with various problems in agribusiness, but also organization skill and management skill should be maximized. Only then will he be able to do farming successfully. The study of farm business management science and its principles will enable the farmer to make the right decisions in farm business. The importance of farm business management can be summarized on the basis of the following points.

- 1. Use of technology in agriculture
- 2. Increase in commercial crop
- 3. Benefit of farm business
- 4. Change in attitude towards agriculture
- 5. Increase in farmer's income
- 6. Sustainable agricultural development

- 7. Irrigation facilities / water supply
- 8. Changes in the source of credit
- 9. Increase in agricultural exports
- 10. Increase in food grain production
- 11. Qualitative and quantitative increase in agricultural production
- 12. Changes in farming methods
- 13. Changes in cropping pattern
- 14. It is possible to take advantage of agri-tourism business
- 15. Reduction in farmer's expenses
- 16. Tendency to produce throughout the year
- 17. Promoting agri-tourism
- 18. Increase in education and training of farmers
- 19. Development of horticulture and horticulture techniques
- 20. Growth in the processing industry
- 21. Increase in rural employment
- 22. Increase in farmer's decision making ability
- 23. Efficient use of production components
- 24. Losses due to hazards and uncertainties are minimal

25. Increase in agricultural production due to commercial farming

# **11.6. EXERCISES:**

- 1) Explain the principles of agribusiness management.
- 2) Explain the various components of agricultural production in detail.
- 3) Explain the importance of agribusiness management.

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