



**M.A. (ECONOMICS) PART-I**  
**SEMESTER-I**

**PAPER V (OPTION-I)**

**ECONOMICS OF AGRICULTURE**

**SECTION-B**

**Department of Distance Education**  
**Punjabi University, Patiala**

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**LESSON NO :**

- 2.1 : Systems of Farming
- 2.2 : Agrarian Reforms and their Role in Economic Development Farm Size and Productivity Relationship in Indian Agriculture
- 2.3 : Concept of Production function, Input-Output, Input-Input and Product-Product Relationship in Farm Production
- 2.4 : Risk and Uncertainty in Agriculture
- 2.5 : Instability of Agriculture

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**SYSTEMS OF FARMING**

In a productive unit, we come across different arrangements with regard to three important elements which are—who owns the productive unit, who controls it and who operates it. In one case, the same person can perform all the three functions, in others, separate persons may be performing these roles separately. The difference between private sector undertakings and public sector undertakings or between single proprietorship, partnership and joint stock companies emerges because of differences with regard to the groups who are assigned these roles. In farming also, different arrangements with regard to these elements are found. Some of the alternative forms which one comes across in different parts of the world are :

- (i) Capitalist Farming or Corporate Farming
- (ii) State Farming
- (iii) Collective Farming
- (iv) Individual Peasant Farming
- (v) Co-operative Farming

**(i) Capitalist Farming**

Capitalist farming is also known as Estate farming or Corporate farming. In this system of farming, land is held in large areas by private capitalists, corporations or syndicates and is managed like modern enterprise, capital is supplied by one or a few persons, in which case it runs like a Joint Stock Company. The size of the farm is quite large and the work is carried on with hired labour, improved method of agriculture is employed and extensive use of machines is made. It leads to high degree of mechanisation. The hired workers are reduced to the status of mere industrial workers and are exploited by the capitalists. Almost whole of the cultivation is for the market, only a small proportion for seeds and feed of animals are retained at farm. The cropping pattern is generally so devised as to ensure the maximum profits for the company. This type of farming is quite popular in U.S.A. and Western Europe. In India, such type of farms has been organised in the states of Mumbai, Chennai and Mysore for the plantation of tea, coffee, rubber and sugarcane.

Capitalist farming has all the advantages of large-scale production. It fulfils the requirements of efficient production and large surpluses that is

why it can reap various technical, commercial and financial economies. It provides scope for further expansion.

But there are some drawbacks too, of this type of farming. The most disturbing outcome of this system is the unemployment generated by excessive use of machinery. This very factor reduces the bargaining power of the workers and leads to their exploitation. It suffers from the defect of per acre low yield, and evils of mechanisation. Moreover, this system is responsible for unfair distribution of income and social justice. So far as India is concerned, since land-man-ratio is low in India, it can not be accepted as the general pattern of farming. Because its adoption will lead to more unemployment in the rural areas and will make the distribution of income more unfair.

### **(ii) State Farming**

This system is different from Estate farming. In this farm organisation, the state, rather than private shareholders owns the farm. In this system, land is owned and managed by the state in accordance with the plan prepared by it. The management consists of the representatives of the state. The state performs the function of risk bearing and decision taking, while cultivation is carried on with the help of hired labour. As in state farming, in this system too, cultivators have the status of mere wage earners. The hired workers have to work under the direction of state appointed managers in accordance with the plans drawn by the state. The size of farm in this system is large and the cropping pattern may be so devised as to meet some social needs. Improved methods of agriculture are employed and extensive uses of machines are made. Thus all the advantages of large-scale production can be reaped through state farming. Some of the disadvantages of corporate farming like exploitation of labour and reduction in employment opportunities can be controlled to some extent by the deliberate policy of the state. The profits of cultivation, if any, accrue to the state rather than to private shareholders. To that extent, it may not lead to an unfair distribution of income. Of course, the disadvantage caused by lack of incentive of ownership, both on the part of supervisors as well as workers does persist. This pattern of farming is also subject to some evils which the large-scale farming is subjected.

State farming is an important feature of the Russian economy. Some state farms does exist in India also. India being a democratic country of low land-man-ratio, it can not be accepted as the general pattern of farming. However, this will also generate unemployment and more than that, this farm organisation is against the principles of freedom to own property and freedom of enterprise.

### **(iii) Collective Farming**

In this system of farm organisation, the ownership of land, stock and capital assets belong to the community as a whole and generally, there are no individual holdings and no private property in land. The scale of operation is large and the degree of mechanisation is often high. The members themselves work as labourers on the farm with little use of outside labour, which is resorted to only in special circumstances. The members elect a board of management, which controls, supervises, plans and administers all farm operation. However, appointment of managers from outside the farm by government is quite common. This board plans the cropping pattern, purchase of farm inputs, arranges for the marketing of crops and keeps in touch with the government for various guidelines about production etc. It also arranges for various social services for the members of the collective farm e.g. education, medical facilities and recreation.

Methods of distribution may differ in different collective farms. But, in general, the share of a member is determined on the basis of 'Labour Days' contributed by him. Final earnings of each labourer are determined according to the quality as well as quantity of work put in by him. Thus, an unskilled worker works for more hours as compared to skilled workers to earn one Labour Day. While production is collectively undertaken, distribution and consumption are on individual basis.

As the incentive of individual ownership is absent in case of a collective farm other types of monetary incentives and motivation schemes are introduced for the workers.

Collective farms are part of the political system and are therefore organised at the behest of the government of the day. Government's ultimate control over the collective farm is thus obvious. Collective farms therefore suffer from the same defects from which the state farms suffer.

Collective farming has been adopted by some countries notably by the Palestine and Mexico, Collective farms are quite common in Russia. Collective farms help in modernisation of agriculture, generate more marketable surplus, ensure more employment and also an equitable distribution of income. However, collective farming does not fit with the socio-political matrix of Indian society. It violates the principles implied in the working of a democratic free and open society. However, the Kumarappa Committee considered it suitable for the development of reclaimed wastelands on which landless labourers could be settled.

#### **(iv) Individual Peasant Farming**

Peasant farming is same as the private enterprising in an industry. In this farm organisation, the tiller is the proprietor. He possesses permanent, inheritable and transferable rights in land. He himself controls it i.e. he himself takes decision about cultivation and also works on it, assisted by the members of his family. He does not engage outside workers to cultivate

the farm. Therefore, this is also known as family farming.

He manages the farm according to his own will, plans and produce the crop and retains or sells a part or whole of this crop without any outside interference.

The unit of cultivation is small. In some cases, the size can be so small as may not permit the optimum use of family labour or the pair of bullocks or the available farm implements and other assets. The small size of the farm also hinders the adoption of modern technology. A considerable proportion of the produce is for home consumption, although in some cases, the whole produce may be sent to the market, and with the cash obtained, food and other requirements might be purchased. So, we can say the peasant farming generally leads to subsistence farming and in few cases commercial farming.

In this farm organisation, incentive for hard work generated by ownership, effective supervision, possibility of quick decisions, relatively greater employment per acre and relatively greater intensity of cropping are advantageous. If this farm organisation is universally adopted in an economy, it will ensure greater social justice among the farmers. In the past, the Ryatwari system prevalent in India, was similar to Peasant Farming, but with the multiplication of intermediaries, the system got degenerated into Tenant Farming.

The Kumarapa committee favoured individual peasant farming to constitute the general pattern of socio-economic structure of Indian agrarian society. It suggested that peasant farming on proper units of cultivation under a scheme of rights on land would be the most suitable form of cultivation. The Committee recommended Peasant's farming as the general pattern of farming for India and Co-operative farming for small and marginal holdings or uneconomic holdings. Consequently, Government of India, accepted Peasant Farming as the general pattern of farming in India, however supplemented by co-operative and joint farming enterprises.

#### **(v) Co-operative Farming**

The application of the principles of co-operation in the cultivation of land is called co-operative farming. A co-operative farming is a voluntary organisation of individual landowners for the purpose of joint cultivation of land. The individual ownership of land which is pooled for the purpose of cultivation does not disappear. It stands in official records. The ownership of land confers a social status on its proprietor. It also enables the cultivator to lead an independent life wherein he is master and has not to work according to the directions of others in the village. A member can withdraw from it and can resume the individual cultivation if he so chooses.

The members of the co-operative farming society elect the managing body on the basis of one member-one vote. The elected body thus controls

the cooperative farm. This body plans the crop pattern and arranges for the procurement of farm inputs and for the sale of the produce in the market. Whole of the land is considered as one farm for the purpose of crop planning. As the size of the farm is large, the use of modern machinery and improved agricultural practices is quite possible. The members, who work on the farm, are paid for their work put in on the farm. The profits of the farm are distributed among members according to the land and other assets contributed by them. However, some reserves are kept for further development purposes by the society.

### **Co-operative Farming in India—Meaning and Feasibility**

For the reorganisation of our rural economy, co-operative farming system has been suggested by the Indian Delegation to China and Japan and All India Co-operative Planning Committee. According to Dr. Otto Schiller. “The term co-operative farming is often used as a form of farm management in which land is jointly cultivated. It is called co-operative joint farming in case, where the ownership of land pooled together is preserved as a title and the value of land contributed is one of the factors which is taken into account when the land is shared. It is called co-operative collective farming, in case wherein addition to land all other resources of the members are pooled together and the ownership of land disappears is so far as the farming income is divided among the members only according to the work done by each member.” The All India Co-operative Planning Committee has classified co-operative farming societies into four categories :

- (1) Co-operative better farming;
- (2) Co-operative joint farming;
- (3) Co-operative tenant farming; and
- (4) Co-operative collective farming.

**(1) Co-operative better farming society :** In this form, agricultural land is not pooled by its member for the cultivation. Each member cultivates his land individually. The members joint hands for bringing about improvements in various farming operations. A co-operative better farming society manages to get for its members the improved inputs like seeds, fertilizers, machinery and implements at reasonable rates. It arranges to procure credit for its members and improved services in matter of marketing, storage and processing of farm products. The members pay for these services individually, which they receive from the society.

**(2) Co-operative Joint Farming Society :** A Co-operative Joint Farming society is one which involves pooling of land belonging to the individual members for their joint use as joint unit for cultivation, but property rights rests with the owner of land. This is the most comprehensive form of co-operative farming where all the agricultural operations ranging from

purchase of inputs to sale of output are carried on jointly and also voluntarily.

All these members of the society elect the management. Each member is paid wages at stipulated rates according to the work done by him on the farm.

**(3) Co-operative Tenant Farming :** In this form of society, a group of persons obtain land jointly from the government (generally) either through an outright purchase of or lease. Such a land is divided into its members who cultivate the land individually. The society arranges for its members various improved inputs and manages for the marketing of produce of its members. Each member is entitled to the product of his land and he pays to the society, the rent for land cultivated by him and for various services provided by it. Such societies are suitable at places where new land is brought under cultivation.

**(4) Co-operative Collective Farming :** The farmers pool and jointly cultivate in this form of society. The members lose their individual ownership over the land. The society supervises its cultivation. The members get wages for the work done by them and profits according to the land contributed by them. Bonus is also paid to members in proportion to their wages. Land, livestock and other equipments are joint, work is common and the management is elected by members. Withdrawal of land is not possible. The collective farm is large-scale farm and is highly mechanised.

Co-operative better farming is not permanent and any farmer can join or leave the society any time he likes. Besides it, this society does not increase the size of the farms and therefore is not effective in developing agriculture. Co-operative tenant farming, too, keeps the size of the farm rather small. This system is suitable, its members are landless labourers. The system may be used for reclaiming land, which may be entrusted to a society of ex-soldiers or landless labourers. Co-operative collective farming society also does not fit well with India's socio-political matrix. To be more specific, it can be adopted only in purely socialistic countries. Therefore the type of co-operative farming that has been suggested by Congress Agrarian Reforms Committee (Kamarappa Committee, 1949) Indian delegation to China and Japan (1954) and the National Commission on Agriculture, is the co-operative joint farming. In fact, this farm organisation seems to be most acceptable method of increasing the size of the farm itself. By increasing the size of the farm, it will permit various economies of large-scale production to be reaped. No existing owner is dispossessed of his land and yet the farm size becomes larger. Thus, we should have co-operative joint farming as the main farm organisation in the country.

### **Case for Co-operative Farming**

For increased agricultural production, it is essential to raise the yield per acre. With the present small and uneconomic holdings it is not possible to increase to yield to any appreciable extent. Hence the size of the holding

should be considerably enlarged before approved method of cultivation, irrigation etc. can be applied. Hence, with a view to enlarge the size of holding so as to secure the economies of large-scale, to mobilize the surplus labour resources in order to counter-act capital and finally to increase the production substantially, the co-operative mode of farming is advocated.

Optimum utilization of land and other resources becomes possible with the pooling of many holdings together. This enables the members of a co-operative farm to reap all the economies of large-scale production i.e. commercial, financial, technical etc. without surrendering their ownership rights. Improvements which could not be adopted at individual level, e.g., digging of a well, setting up of a tubewell, fencing or drainage etc. can be easily introduced on a co-operative farm. In the words of Indian delegation to China and Japan, "In co-operative farming, the farming can be done on large-scale and hence it will obtain all the economies of large-scale production i.e. reduction in cost, specialisation and managerial skill."

Co-operative farming is also advocated for the purpose of re-clamation of land. It is said that nearly 100 million acres of land is lying waste which can be reclaimed.

Co-operative farming has been advocated on the ground of increasing capital formation and savings. The possibilities of savings in capital formation are restricted in small units which are based on family farming.

Co-operative joint farming will ensure a closer co-ordination between farmers and the state since the latter will find it easier to deal with societies rather than with the individual farmer, for purpose of guidance, information and implementation of its policies. These societies will also facilitate correction of correct statistics in the field of agriculture.

Co-operative farming has also been advocated on the ground that, the co-operatives will provide opportunities of working together for various groups of people and thus bring about increasingly an emotional integration of the people into a living entity. Social and religious institutions are considered as an obstacle in economic development of a country. It may, to some extent, try to cut across caste, religious and other social barriers.

A co-operative farming society is also advocated on the plea that it makes possible to perform off farm activities. It can, e.g., take up the processing of some agricultural products like rice shelling, gur making etc. An individual cultivator may not be in a position to take up these jobs either because of financial constraints or because of inadequacy of raw materials. The Indian delegation to China and Japan recommended co-operative farming's advantages in the following words, "The pooled area constitutes single farm and the pooled labour a single family for purpose of management. It becomes possible to intensify agriculture over the entire area of farm and undertakes improvements of labour intensive nature without consideration of cost. Fruits and vegetable growing can be taken up. Dairying can be

developed. A part of surplus labour force can be utilised for the improvement of village communications and housing for provision of other social amenities including education of children and adults etc. The requirements of draught cattle will be considerably decreased and the available fodder supplies could be fed to milk cattle to increase the milk supply. The capital resources could be made available for the development of cottage and small-scale industries. Co-operative farming would, thus, open us new avenues of employment and consequently improved standard of living.”

Co-operative farming has also been advocated on the ground that it will increase the area of cultivation. The strips between holdings become available for cultivation and a bigger saving in land results.

### **Case against Co-operative Farming**

The Co-operative farming system is opposed on many grounds :

Co-operative farming generally refers to large scale farming which encourage use of sophisticated machinery in agriculture. Large-scale use of machinery is not desirable or beneficial in Indian agriculture because of under-employment and unemployment in rural areas. However, advocates of co-operative farming do not agree with this view. In their view, the fear of unemployment it rather unfounded. The argue that some of machinery used in agriculture e.g. tubewells, will increase employment further all machinery may need not be labour displacing. It has also been argued that the mechanization of agriculture will lead to the creation of secondary and tertiary industries in which some of the displaced agricultural labour will be able to find employment. The Planning Commission has also stated that, “In agriculture sector except under certain conditions in the present stage of development the possible economic advantages of mechanization may be more than offset by the social costs of unemployment.”

Land is not only a source of earning, but is also a symbol of social status. Nobody is willing to give it up. In the membership of a co-operative or a collective farming the farmer worries about the loss of his land, independence and prestige. It is because of these reasons, cultivators would never like to join co-operative farming societies voluntarily. Choudhary Charan Singh has also opposed co-operative farming on these grounds, “Land to a farmer is much more than money or shares in company that it is land which is producer’s food and all kinds of wealth and while other forms of property may be destroyed, land abides for ever.” In co-operative farming, no doubt, the ownership of land is not surrendered. However, the incentive generated by ownership is lost.

The problems of distribution in co-operative farming society may arise. The members of society are partly paid for their work and partly for the land and assets. Work undertaken by the members may be different in nature and there may be no method to standardise it. Besides it, land may

vary in fertility and similarly other assets may differ in nature. Obviously, it will be very difficult to determine a norm for payment, which will be considered fair for every member.

### **Progress of Co-operative Farming in India**

Co-operative farming has been given an important place in India's various five year plans for the re-organisation of rural economy. In the First Five Year Plan, co-operative farming was viewed as a method by which small and medium farmers could bring into existence a sizeable number of large farms which would lead to the application of scientific knowledge, an increase in capital investment and a rise in the productivity of land. At the end of the First Plan, there were 1,400 co-operative farming societies. Efforts during the Second Plan were also directed towards providing a sound foundation for the development of co-operative farming. There were 5,501 co-operative farming societies covering about 5,83,762 acres of land at the end of Second plan. During the Third Plan period, 2,749 new co-operative farming societies were formed against a target of 3,180 societies. In 1974, there were 4,985 joint farming societies in India and had a membership of about 1.22 lakh.

Under old ceiling law's, exemption was granted to co-operative societies. Therefore, landlords set up Co-operative farming Societies to evade ceiling laws. In many cases, these societies were formed to get various concessions e.g. input subsidies. Such co-operative societies were only an excuse for genuine co-operative societies. Since 1974, the progress of co-operative societies has been almost negligible. The progress of co-operative joint farming in India has failed to take roots because of the fear of ultimate loss of the pooled land, lack of responsibility, fear of unemployment, problem of distribution of rewards to its members and too much interference by the bureaucracy. Thus the best course, under the circumstances, according to Bergamann and Schiller, is to encourage peasant farming, and take various steps to minimise the infirmities from which this organisation suffers. Farmers should be encouraged to set up co-operative service societies in order to save themselves from exploitation of various unscrupulous elements.

**AGRARIAN REFORMS AND THEIR ROLE IN  
ECONOMIC DEVELOPMENT**

‘Agrarian Reforms’ is a wide concept. It not only includes land reforms, but also other concerned problems and aspects related with agriculture. “It includes the establishment of strengthening of essential governmental cooperative or commercial agencies or services relating to agricultural credit supply, marketing extension and research.” Sometimes the term is used as synonymous to land reforms. But agrarian reforms, which of course include land reforms, “are a part of an integrated programme of measures designed to eliminate obstacles to economic and social development arising out of existing defects in the agrarian structure.”

In the present lesson of Agrarian Reforms we will like to know, what is the need for agrarian reforms. Under what considerations and objectives these are to be implemented. What is the scope of agrarian reforms, and lastly what is their role in economic development.

**Need and Importance of Agrarian Reforms**

Countries with lower rate of economic growth are in general characterised by a large proportion of its population depending for its subsistence on agriculture, therefore among the actions intended to release the forces which may initiate or accelerate the process of economic growth, agrarian reforms usually receive priority.

**(a) Need for Agrarian Reforms**

Agricultural productivity depends upon two main factors, the technological factors and the institutional factors. Technological factors include inputs and methods to be used in cultivation, such as, improved seeds, fertilizer, machinery. along with irrigation etc. And institutional factors relate with the existing framework of agrarian structure. The agrarian structure in our country is characterised by pre-capitalist and capitalist in Northern India while it is still feudal and semi feudal in eastern part of the country. Apart from large disparities in land ownership, it is causing concentration of land in few hands. The prevailing mass poverty in rural areas is hampering the growth of industry in urban areas. Therefore redistribution of land in favour of the landless and the less privileged classes to have more equal distribution and social justice and reorganisation of land for optimum utilisation of scarce land resources is needed.

The agrarian structure which we inherited from the British had the following defects :-

- (i) the existence of large proportion of land under tenancy system;
- (ii) insecurity of tenure among small cultivators;
- (iii) the existence of large number of intermediaries between the state and the cultivator due to existing land tenurial system;
- (iv) A high rate of rent which left least incentive to cultivators to produce more, particularly in share cropping;
- (v) low yield per hectare and prevalence of poverty among the rural farmers and cultivators;
- (vi) insecurity and lack of will to work hard;
- (vii) no incentive to invest in land for its improvement;
- (viii) institutional barriers to cultivation, because of the existence of caste system and inhibition to work among high castes;
- (ix) traditional money lending system leading to severe indebtedness and;
- (x) nature of farming, i.e. agriculture was taken just as a way of life and not as an occupation.

Thus, the semi feudal and feudal mode of cultivation, as put by Amit Bhaduri, is a barrier to economic development. Need was felt for overall agrarian reforms which include land and institutional reforms like :

- (i) Abolition the intermediaries;
- (ii) to conform the ownership rights on the cultivating tenants in land under their possession;
- (iii) to consolidate the holdings with a view to making easier application of modern inputs;
- (iv) to impose ceiling and floor on agricultural land holdings so that cultivation is done in most economical manner, and;
- (v) to improve the terms and conditions on which land is held for cultivation by the actual tiller with a view to ending exploitation.

### **(b) Importance of Agrarian Reforms**

Production and distribution are two aspects of the economy which determine its growth and development. A right type of agrarian structure helps to achieve development with social justice, the national goal. Agrarian reforms have manifold significance as follows :

#### **(i) Promotion of Economic Incentive :**

Optimum utilization of land and more and more investment in land is possible only when there is security of tenure and the cultivator is granted ownership right on his holding. Also when there is certainty that his produce will not be snatched by the land lord he will use more inputs to increase production. Agrarian reforms by ensuring fixity of land rent and better tenurial relations, guarantee that the rewards of one's labour will not be

grabbed by others. The two basic pre-requisites of increasing agricultural production viz. increasing use of modern inputs and hard work are prompted by affective implementation of agrarian reforms.

### **(ii) Increase in Employment opportunities**

In the initial stages of economic development agriculture must absorb the ever increasing labour force. In the later stage of economic development industrial sector also comes for the rescue that by paying slightly higher wages this ever increasing surplus labour can be diverted to industrial sector. But this process happens only for a limited time. In the early stages it is not capable of employing effectively all the surplus labour in agriculture. Thus it is the economic necessity of the developing countries to maximise the achievable level of agricultural production, while farmers using hired labour extend their operation where marginal productivity is equal to marginal wage, the owner cultivators depending upon their own family labour, may like to achieve maximum production i.e. where marginal productivity is zero. This is particularly true in labour surplus less developed countries where alternative employment opportunities are lacking.

### **(iii) Removal of Poverty**

Land and agrarian reforms are helpful for removal of poverty in developing countries both directly and indirectly. Tenants, share croppers and small farmers are direct beneficiaries of these measures. With consolidation of fragmented holdings at one place and imposition of ceiling and floor limit on the farm size, use of modern implements becomes possible. It directly leads to increase in agricultural production which results in shift in their economic and social status. Increase in agricultural production leads to economic development by supply of inputs to the agro-based industries and in general increase in income of rural poors.

Theoretically, increase in agricultural production in general and food grains in particular, is desirable to reduce the ever increasing number of people below the poverty line. It releases the forces conducive to economic development. In early stages of economic development the income elasticity of demand for food is near unity which means that the output of foodgrains must increase at the rate by which income is increasing. Besides, population in these economics is increasing at the rate of 2 to 2.5 percent per annum. Thus, to meet the current needs only the food grains production must increase at the rate of 5 to 6 percent. And all this is possible when there is proper implementation of the agrarian reforms.

### **(iv) To Achieve Social Justice**

Agrarian reforms are desirable to achieve social justice. The land policy that changes tenurial relations in favour of the actual tiller means that the cultivator and the small farmer is assured of getting the fruits of their labour. Thus these reforms check exploitation. Special land reforms such

as ceiling on land holdings, distribution of surplus and waste land, consolidation of holdings and organisation of cooperative forms intend to raise economic and social status of the tillers. It will result in equality in distribution of income and wealth.

### **(v) To Achieve Planned Economic Growth**

A rational agrarian system which ensures the fruits of one's hard labour is also conducive to achieving planned targets. Elimination of the heterogeneous and tenurial relations will result in some uniformity of the system by establishing direct link between the tiller and the actual cultivator. Thus, it smoothens the process of planning with the help of the cooperation of the masses. Besides this a uniform tenurial system is also helpful in the implementation of certain agrarian policies in the country.

Precisely we can say, that because of the existence of exploitative nature of tenurial system agriculture as an occupation has remained backward with low productivity. Hence need was felt to introduce agrarian reforms, since these have much importance especially for the developing economies like India.

### **Objectives of Agrarian Reforms**

As discussed earlier the purpose of agrarian reforms is two fold. On the one hand it aims to make more rational use of the scarce land resources by introducing some land reforms and on the other, more important, it is means of redistributing agricultural land in favour of the less privileged classes to improve their lot. From this we can say that there were two major objectives of agrarian reforms viz :

- (a) Social justice; and
- (b) Economic efficiency;

Social justice means equality so that all the cultivators should get fair treatment without any exploitation. Economic efficiency is related with organisational changes which may help increasing agricultural output. Conditions of tenancy during the British period were not conducive to increase and improve agricultural production. So the thrust area of the objectives was providing security of tenure, fixation of rents and conferment of ownership rights which may provide congenial atmosphere in which the agriculturists feel sure of reaping the units of their labour.

### **Scope of Agrarian Reforms**

Indian National Congress Resolution, 1935 stated that, "there is only one fundamental method of improving village life namely, the introduction of a system of peasant proprietorship under which the tiller of the soil is himself the owner of it and pays revenues direct to the government without the intervention of any zamindar or taluqdar."

Land reforms are one of the major component of agrarian reforms

which include improvement in the land tenure system as well as reforms in other institution which are related with land and its utilisation such as consolidation of holdings, ceiling and floor limit on size of holding, methods of farming and supply of agricultural credit etc.

In the words of G. Myrdal, "It is planned and institutional reorganisation of the relation between man and land and no type of re-organisation of ownership and tenancy of land can be maximum benefited except when it is combined with certain policy efforts." Prof. Zahir Ahmed is right when he says that, "Land and agricultural reforms policy should include not only the redistribution of property rights in land but also measures such as the implement of conditions of tenancy, agricultural credit, cooperative organisation, marketing and advisory services."

The scope of agrarian reforms, therefore, includes :

- (A) Land Reforms; and
- (B) Institutional Reforms

**(A) Land Reforms aim at :**

- (a) abolition of intermediaries.
- (b) tenancy reforms which include.
  - (i) regulation of rent
  - (ii) security of tenure and
  - (iii) conferment of ownership rights on tenants
- (c) ceiling on land holdings;
- (d) consolidation of holdings and prevention of further subdivision and fragmentation and
- (e) organisation of cooperative farms

A detailed discussion on various land reforms is being done in separate lessons. Here it is not possible to elaborate all the above mentioned reforms in detail though land reforms are one of the major component of the entire land policy related with agrarian reforms.

**(b) Institutional Reforms**

Institutional Reforms include all those reforms related with agricultural productivity, its produce, marketing, storage and warehousing facilities, minimum support prices, insurance against failure of crop, agricultural credit and finance, irrigation works, agricultural taxation and agricultural labour etc.

The National Planning Commission (1945) resolved that, "No intermediaries between the state and the cultivators should be recognised; and that all their rights and titles should be acquired by the state paying such compensation as may be considered necessary and desirable, where such lands are acquired, it would be feasible to have collective and cooperative organisation." Further the committee not only recommended the elimination of intermediaries but also the imposition of ceiling on

holdings and consolidation of holdings.

The *Congress Agrarian Reforms Committee* with Shri J.C. Kumarappa as its chairman, made for the first time a detailed survey of the agrarian relations prevailing in the country and made comprehensive recommendations covering almost all the major issues relating to land reforms. The committee submitted its report during 1949 and recommended that :

- (1) The main principles which govern the agrarian policy of the country are that :
  - (a) the agrarian economy should provide an opportunity for the development of the farmer;
  - (b) there should be no scope of exploitation of one class by another;
  - (c) there should be maximum efficiency in production;
  - (d) the scheme of reforms should be within the realm of practicability.
- (2) In the agrarian economy of India there should be no place of intermediaries and land must belong to the tiller, subject to certain conditions.
- (3) Only those who put in physical labour and participate in actual operations would be deemed to cultivate personally;
- (4) Sub-letting of land should be prohibited except in the case of widows, minors and other disabled persons;
- (5) There should be ceiling on the size of holding whenever any one farmer should own and cultivate. Further a differential approach has to be deemed towards land holdings on the basis of the size of holdings.
- (6) The committee favoured individual peasant farming to constitute the general pattern of socio-economic structure of the agrarian society.

It further recommended that, individual farming should be limited to holdings above the basic holding. Holdings smaller than the basic or economic size should, in the course, of time be brought under a scheme of co-operative and joint farming.

Later on the recommendations of Kumarappa Committee became the basis of the government policy regarding agrarian reforms during the process of planning and development of the Indian Economy.

### **(iii) Role of Agrarian Reforms in Economic Development**

Just after independence the Indian Government realised that the land tenurial system we inherited from the Britishers was not conducive to agriculture production. Rather it was hampering the growth of the economy. So to initiate the process of economic development agriculture sector was

given special preference in five year plans.

Agrarian reforms have become an integral part of the scheme of agricultural development and rural reconstruction since the inception of the economic planning in the country. As put in the Second Five Year Plan the objective of the agrarian reforms was to create conditions for evolving the agrarian economy with the high level of efficiency and productivity and to establish an egalitarian society by eliminating social inequality. Similarly, in the Seventh Five Year Plan it was realised that, “effective implementation of agrarian reforms was essential for achieving higher agricultural growth and for successful attack on poverty and unemployment. Updating of land records is necessary to protect the interest of farmers and for improving the access to credit and inputs.” It was further stated that these reforms will be an integral part of the anti poverty strategy. Tribals and Scheduled Castes will be protected from alienation of their land.

During the Eighth Five Year Plan also to achieve an egalitarian social structure, re-structuring of agrarian relations was emphasised. It was meant to eliminate exploitation due to existing land relations. The ultimate goal was to improve the socio-economic conditions of the rural poors by widening their land base so that it may help increasing agricultural productivity and production. Similarly concrete policies related with agricultural credit, marketing, minimum support prices, transport etc. are revised from time to time and implemented in modified form.

As already mentioned in earlier paragraphs that agrarian reforms are meant for improvement in agricultural production and productivity, they are equally important for speeding up the rate of economic development.

Indian economy is facing the problem of poverty, unemployment, high rate of inflation, over population etc. Agrarian reforms can help in removing poverty, by raising the level of income of the rural masses, they increase employment opportunities. When the owner cultivators use their family labour rather than using hired labour. Similarly agrarian reforms lead to achieve the goal of economic development with social justice, by ensuring the cultivators that their reward of hard labour will not be taken away by the landlords. These reforms check exploitation of one oppressed class by the other dominant rich class. Ceiling on land holding and the distribution of surplus land among the landless labourers also signifies the importance of social justice. In India land reform measures have become particularly more important in view of the inequality in distribution of income and wealth. Further, a rational agrarian system which ensures one's hard labour is also conclusive to achieving planned targets. Planning by inducements which is a necessary feature of democratic countries, assumes the cooperation of the masses. An unexploitative tenurial system will naturally enlist the cooperation of the actual tillers towards this end. Besides, a uniform tenurial system is also helpful in the implementation of certain

other agrarian policies in the country.

Thus role of agrarian reforms in economic development is important in the sense that they help

- promoting economic incentives;
- removal of poverty;
- increase in employment opportunities;
- achieving social justice and
- achieving planned economic growth.

But their role in economic development can be maximum when these reforms are implemented in true spirit. Even the land reforms are showing poor and slow progress at the level of implementation. Wolf Ladezinsky has pointed out some of the difficulties in the way of successful implementation of these reforms, like paucity of land records, prevalence of very small size of holdings and land hunger, lack of peasant initiative and his inability to comprehend the complex laws and lack of alternative employment opportunities etc. Planning Commission has attributed poor performance of agrarian reforms with ever increasing political interference on one side and indifferent attitude of bureaucracy on the other.

Thus, if we want to achieve the socio-economic goals attached along with agrarian reforms these unwanted hurdles should be overcome. And the reforms should be implemented in true spirit. Ladezinsky has rightly pointed out that there is no need of passing fresh laws while the existing ones, cannot be implemented.

## **FARM SIZE AND PRODUCTIVITY RELATIONSHIP IN INDIAN AGRICULTURE**

Farm size is an important element in determining the earning capacity of a farmer as well as the efficiency of the farm unit. It is a question of high debate among the economists and farmers that what should be the appropriate size of farm. Some people advocate the larger size of the farm for efficient operations. Others favour small size on the ground of social justice.

Third world countries generally depend upon agriculture and production of primary goods. The great majorities of farm families in these developing countries with low income live on undersized and inadequate units. Poverty in agriculture in most of the third world countries is as much a problem of farm size as of any other single factor. Therefore, appropriate size of farm has a direct relationship with productivity. But, it is difficult to define as appropriate size of the farm. It may vary from region to region and country to country. It depends upon the size of the region, population pressure, fertility of land, climate, cropping pattern and so on.

To study in detail the relationship between farm size and productivity,

we have divided this lesson into four sections. In section-I measurement of the size of farm is discussed. Section-II deals with some theoretical aspects of farm size and productivity. Section-III deals with the inverse relationship between farm size and productivity and farm size and profitability is a part of section IV.

### **I. Measurement of Size**

There are generally four methods in vogue to measure the size of a farm. These are discussed below :-

- I. Usually it is measured on the basis of acreage. This method is used by agricultural census of many countries of the world. A 300 acres farm is said to be larger than 150 acres. Acreage as a measure of size has the merit that it can not be concealed and is crucial input. But this is not always a suitable measure except in few identical areas of single crop farming. With this measure, we cannot compare accurately two areas with dissimilar systems of farming, as it does not take into consideration the intensities of production. The only merit in using this measure is that it cannot be concealed and is also free from annual fluctuations and changes in composition.
- II. Amount of work (man-work units) necessary to raise crops and take care of the live stock on the farm is also used as a measure of a farm size. But this method also faces limitations. Labour employed may not be of the same quality and productiveness. Farms on which labour has been used inefficiently would appear to be larger in size than those on which labour use has been efficient. Further a comparison of capital intensive farm using less labour is not possible with labour intensive farm using more labour.
- III. Total capital employed on the farm may also be used as a measure of farm size. The value of all inputs of land, machinery equipments and so on are added together to determine the total capital employed on the farm. But this measure is again not free from limitations, as capital is one input among many others.
- IV. The volume of gross output is considered as the most useful measure of the size of a farm. But it does not take into account the soil and weather variability. Comparison of year to year changes in volume of output are difficult because of shifts in prices of farm products.

### **II. Large Vs Small size of Farms :**

We have some advantages of large scale farming in agriculture. These advantages stress from technical, financial and marketing economies. Here

the capability of farmer is also important to organise to manage the farm of a large size. All the technical advantages open to small sized farms is also open to large size farms, while all the advantages open to large sized farms are not available to small sized farms. This is why, large sized farms are more economical in working and conducive to greater efficiency than the small sized farms. It is claimed that large farms enjoy economies of production, management, finance and marketing.

Production economies are reaped by large sized farms on account of use of upto date machinery, division of labour and specialization, better utilization of by products and benefits of research. Therefore, on large farms, a higher proportion of capital and land is available for direct productive use with a consequence of reduction in overhead costs per unit of product produced. Marketing economies arises from the facilities for buying and selling on large scale. While buying the agricultural inputs, large farmers get preferential treatment in prices in discount and rebates. Large farmers also get advantages while selling their produce. They fetch the higher price on many grounds. Similar economies occur in the financial sphere on account of better credit worthiness of large farmers. He is generally able to borrow money with greater ease and with less expenses. Large farmer is better placed as far as the self finance is concerned.

Some of economies tend to be offset by inefficiencies, if the size is extended beyond a limit. As the farm size increases beyond a certain size, the difficulties of supervision and organisation decreases the efficiency of a large farm. The small family farm employing little or no hired labour in a favourable position. Not only does the financial interest of the family workers ensure the qualitative intensity of their work but the more intimate relationships existing on small farm to gain more than loss from the absence of potential benefits of division of labour and the use of machinery.

Further, in most cases, the small farming is more intensive and large farming is more extensive. With the result of that higher gross production per acre is generally obtained from the smaller farms.

Since large sized farms lead to concentration of economic power and hence are antisocial. But, small farm size as it exists in most of the under developed countries exhibit serious disadvantages.

- I. The small size of the farm makes it impossible for the farmer to use the best available tools and the best methods of production. Thus, instead of method of production determining the size of unit, it is the size of the farm that determines the method adopted by farming.
- II. A very small farm in unable to provide full time remunerative employment to family members.
- III. The marketing economies are absent in the case of small

farming. The small farmer is exposed to the exploitation of the army of middlemen.

IV. Small farmers also face problems for getting credit at reasonable rates of interest.

**Returns to Scale Farm Size :**

The farmer is always interested in the additional profit he gets by increasing the scale of production i.e. farming is done on large scale. Because his sole aim in profit. But, how does the scale of production is related to productivity? To explain it, we consider a production function to study the scale relationships.

$$Y = f(X_1, X_2, X_3, \dots, X_n)$$

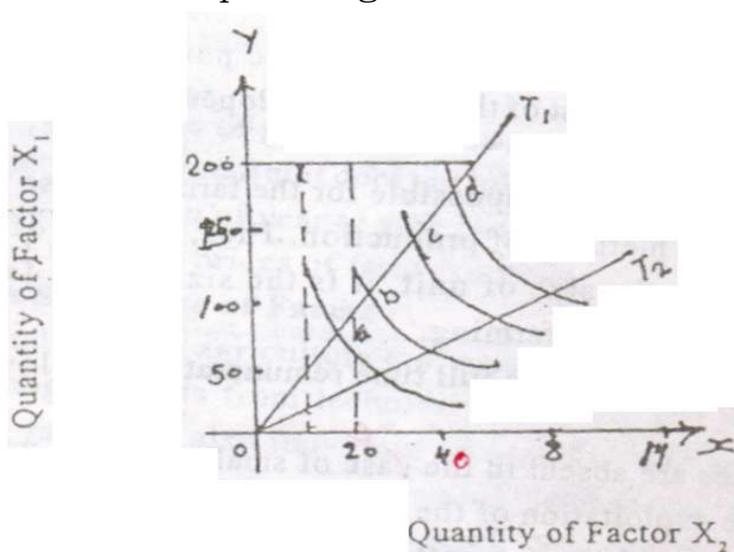
Where all resources are variable. Pure scale relationships exist only when all resources which go into production are increased in same proportion.

In the case of proportionality relationships, following type of production function is considered.

$$Y = f(X_1, X_2, X_3, \dots, X_n)$$

In this production function, resources on the left of the vertical bar are variable, whereas those on the right are constant. In such relationships, we are interested in knowing whether the marginal productivity of one factor is constant, increasing or decreasing as that factor is added to the fixed collection of other factors. In pure scale relationships, we are interested in knowing whether the product increases in (1) the same proportion (2) a greater proportion or (3) in a small proportion, when all factors are increased in same proportion.

Distinction between proportionality and scale relationships has been made more clear with the help of a diagram.



In this figure we have drawn four contours representing the possible combinations of  $X_1$  and  $X_2$ . The proportionality relationship can be illustrated by keeping the input of resources of  $X_1$  fixed at 200 and  $X_2$  is varied from 20, 40, 80, 140. The resource input  $X_2$  is depicting here productivity because when its input is increased from 20 to 40 units, i.e. increase of 100 percentage, output increase only from 100 to 200 or by 100 percents.

The scale relationships are indicated by line  $OT_1$  and  $OT_2$ . The constant returns to scale are traced out along both scale lines  $OT_1$  and  $OT_2$ . The vertical distances  $Oa$ ,  $ab$ ,  $bc$  and  $cd$  on scale line equal between intersections with the contours.

### **Farm size Productivity and Farm Efficiency :**

For over two and half decades, economists have been engaged in a debate on the relationship between farm size, productivity and profitability. While farm productivity implies output per unit of land, farm efficiency or farm profitability refers to the surplus of the value of output over all costs (including the imputed value of inputs contributed by the farmer or his family). On a priori reasoning, economists asserted that the small farms in India were far more productive than large holdings because of intensive cultivation. Since 1954-55, the studies in economies of farm management undertaken by the Government of India provided a statistical base for the economists to work out the relationship between farm size on the one side and productivity and efficiency on the other.

Prof. Amartya K. Sen summed up the entire debate on farm size, productivity and profitability in the following three propositions.

- I. When family labour employed in agriculture is given an imputed value in terms of the ruling wage rate, much of the Indian agriculture seems unremunerative.
- II. 'By and large' profitability of agriculture increase with the size of holding. Profitability being measured by the surplus (or deficit) of output over costs including the imputed value of the labour.
- III. 'By and large' productivity per acre decreases with the size of holding.

The first of these propositions asserts that much of Indian agriculture is unprofitable. The second point relates to efficiency or profitability to farm size and Sen's conclusion is that the profitability of agriculture increases with the size of holding and that is why large sized farms are preferable. The third proposition seems to contradict the second; for it asserts that on the basis of productivity per acre, the small farms are preferable while the first two propositions are about farm size and

profitability, the last one is about productivity and farm size. Sen's observations provoked considerable debate on the subject.

**(a) Inverse Relationship between Farm Size and Productivity :**

Let us consider the third proposition first. It has generally been asserted that the relationship between farm size and productivity is inverse, that is, productivity per acre is high on the small farm and it declines with increase in the size of farms. While Khusro confirmed the existence of the inverse relationship after analysing the farm management data. Ashok Rudra, challenged the statistical validity of the inverse relationship. While G.R. Saini, confirmed the existence of inverse relationship between farm size and productivity in traditional agriculture.

The common explanation of inverse relationship between farm size and productivity is in terms of higher inputs of family labour in small farms. Sen argues that, in a labour surplus economy such as India the opportunity cost of family labour is low and, therefore, the small farms use abundant family labour and extend the cultivation up to the point where the marginal productivity of labour may approach to zero or may even become's zero, while in the case of large farms which use a high proportion of hired labour equals the ruling wage rate. In the case of small farms, the output per acre is maximized, while in case of large farms using hire labour, output per unit of labour is maximized.

While the application of heavy dose of labour to small farms is obviously a factor for the inverse relationship. Sen's assumption of law of opportunity cost of labour as the factor responsible for liberal application of labour in small farms is not accepted by Saini and others. For one thing, small peasant farms coexist with medium and large farms which engage high proportion of hired labour. This implies that the opportunity cost of peasant family labour is the market wage rate and that peasant family will attempt to equalize its opportunity cost of work in self-employment in the family farm with the wage it can get elsewhere. Naturally, it is not correct to argue that the small farm will use labour till marginal productivity of labour becomes zero or almost zero. Secondly, there is plenty of empirical evidence to show that the opportunity cost of labour on the small farms is not significantly different from market wage. The explanation of inverse relationships in terms of low opportunity cost of family labour does not appear to be correct.

In this connection Deepak Mazumdar writes, "The higher output per acre in smaller farms is really a function of higher input of per acre—the other factors varying more or less in the same proportion as labour. There is greater intensity of cultivation on smaller farms than on the larger farms. Besides, heavy input of labour on small farms is not one crop only but on two or more crops produced on the same piece of land during a given production year. This further explains the higher productivity on smaller farms.

We may conclude in Saini's words, By and large the inverse relationship between farm size and productivity is a confirmed phenomenon in Indian agriculture and that its statistical validity is adequately established by an analysis of the disaggregated farm management data.

**(b) The Inverse relationship and the Green Revolution :**

The green revolution in agriculture is characterized basically by capital intensive technology in which hybrid seeds, use of chemical fertilizers, existence or creation of assured irrigation, etc. play a significant role. Even though a new agricultural technology, is not size neutral, the access to capital and use of inputs for small and large farms has not been same accordingly the distribution of gains between them has been uneven. Saini used the Farm Management data for the states of Punjab and Uttar Pradesh to find out the impact of green revolution on the inverse relationship. His important findings can be summarized as follows :

- I. A comparison of the co-efficients over time shows that they have moved nearer unity in the late sixties and early seventies-pointing to the gradual closing up of the productivity, gap between the small and large farms. This is in favour of big farmers.
- II. In the mid fifties there was inverse relationship between farm size and income per acre but the inequalities of income arising out of unequal distribution of land were to some extent reduced by productivity differences between small and large farms in favour of the former. The new technology shows a positive relationship between farm size and farm income per acre in late sixties and early seventies. This shows that as farm size increases, the income increases more than proportionately. This will widen inequalities in rural areas.

Their conclusions clearly show growing disparities in income distribution because of the setting of new technology and call for the application of suitable policy measures to correct these trends.

**IV. Farm Size and Profitability :**

Let us now take up the relationship between farm size and profitability. Amartya Sen who started the whole debate initially has argued, that much of Indian agriculture appears unremunerative and that profitability of agriculture increase with the size of holdings. As indicated earlier, Sen's thesis is based on the assumption that if family labour is given an imputed value in terms of ruling wage, much of Indian agriculture would become unremunerative.

Saini analysed Farm management data for Uttar Pradesh and Punjab and found that the marginal value product of labour was not positive but

was also higher than the labour cost proving clearly that much of Indian agriculture is not necessary unremunerative, at least on the group of valuation of family labour at the ruling wage rate. A scrutiny of profit and loss figures for different size classes of farm indifferent regions shows that Sen's first proposition is not correct. Saini found the following facts.

- I. A good proportion of even the smallest sized farms showed positive profit.
- II. Losses are to be found not only in small sized farms but also in bigger land holdings.

The unremunerative nature of Indian agriculture may, therefore, have to be found elsewhere and not in the valuation of family labour at the ruling market wage. One possible cause is the imputation of a high value land in terms of rental value or in terms of interest. If rental value of owned land is deducted from cost, the losses of farms are converted into profits or losses disappear. In Saini's own words, "The evidence strongly suggests that the observed unremunerative character of Indian agriculture can be traced to and explained in terms of imputation of a value to owned land rather than the valuation of family labour at the ruling wage rate.

Sen's second proposition is obvious : with the increase in the size of holdings and with large application of human labour, capital equipment, fertilizers etc. profitability increases.

### **Conclusion :**

From the foregoing discussion, the following conclusions emerge.

1. There is general statistical validity of the inverse relationship between farm size and productivity per acre in traditional agriculture.
2. Prof. A.M. Khusro demonstrated the existence of constant return to scale in Indian agriculture in the 1961. He writes, "Above the 5 acres size there is nothing to choose between large farms and small farms in respect of cost efficiency and productivity; that Indian agriculture is, typically a scene of constant returns to scale, and the ceilings are size-natural.
3. Data pertaining to 1950's indicated an inverse relationship between productivity and farm size : but the picture is likely to be totally transformed by the data of the 1960's and the later period in view of the impact of green revolution.
4. The transition from a traditional agriculture to modern agriculture characterized by capital-intensive technologies will shift the inverse relationships between farms size and productivity to one of tending towards constant returns to scale over time. Thus under traditional agriculture in which the inverse relationship existed, the small farmers were able, to some extent to reduce the inequalities of income arising out of

unequal distribution of land among cultivating household. But with the change in favour of modern agriculture in the initial stages of emergence of a capital-intensive technology the inverse relationship between farm size and productivity still holds.

5. G.R. Saini has further demonstrated 'that the relationship between farm size and productivity, though important-does not bring into sharp focus the growing inequalities among farm households—in the mid fifties there existed an inverse relationships between farm size and income per acre. After the setting in of the green revolution this inverse relationships has undergone a significant changes. The inverse relationships has now yielded place to a positive relationship. It shows that as farm size increases income increases more than proportionately. This sufficiently indicates that after the setting in of the green revolution the income gap between the small and large farms has widened.

**Concepts :**

Here, we discuss some concepts, which have some application and importance while studying this lesson.

**Farm Productivity :**

It is the farm output per unit of land.

**Farm Profitability :**

It is the surplus of value of output over all costs (including the imputed value of inputs contributed by farmer or his family.)

**Economic holding :**

A holding which allows a man a chance of producing sufficient to support himself and his family in reasonable comfort after paying him necessary expenses.

**Optimum holding :**

It refers to the maximum size of holding which a family should possess. Three times the family holding was considered to be an adequate size of optimum holding.

**Family holding :**

Term was used by the panel of Reforms. While estimating the family holding they used income as the basis. Holding which ensured a net income as the basis. Holding which ensured a net income of Rs. 1200 (1980 prices) and was not less than a plough unit (cultivated with a pair of bullock) of its multiple in area, might be considered a family holding.

**CONCEPT OF PRODUCTION FUNCTION : INPUT-OUTPUT, INPUT-INPUT  
AND PRODUCT-PRODUCT RELATIONSHIP IN FARM PRODUCTION**

The principle of rationality, one of cornerstones of economic theory, states that human beings will, given enough information, seek to maximize their gains by obtaining the highest possible return for any given resource or else will seek to economize (minimize) using the smallest quantity of a resource to obtain a given return. In a market economy, each producer continuously adjusts his production to get the highest profits. The production process and the decision-making underlying it constitutes a dynamic, ever changing situation.

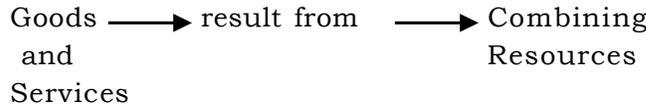
Production is concerned with the supply side of market. In the production process, various inputs are transformed into some form of output. Combining seed, fertilizer, labour, equipment and land to produce wheat is an example of production. In production analysis, we study the least cost combination factor-inputs, productivities and returns to scale. The producer is confronted with three basic types of problems: how much to produce, how to use resources for production and what to produce. The discussion of these principles of resources allocation is the matter of the present lesson.

A production function expresses the technological or engineering relationship between the output of a product and its inputs. In other words, the relationship between the amount of various inputs used in the production process and the level of output is called a production function. For example, a farmer growing wheat combines soil, fertilizers, pesticides, water, seeds, labour and capital (farm equipment, etc.) to yield a crop of wheat. Some of these inputs may be fixed in supply viz. the land available and the existing amount of capital. The other inputs may vary and accordingly the level of output may be expected to vary.

Although an individual farmer cannot alter a production function, he can choose between alternative functions. A producer must choose which of the many possible ways of producing a particular product he will use. Technology also contributes to output growth as the productivity of various inputs depends on the state of technology. The point which needs to be emphasized here is that the production function describes only efficient levels of output; that is, the output associated with each combination of inputs is the maximum output possible, given the existing

level of technology.

Thus, we can express the relationship in the following way:



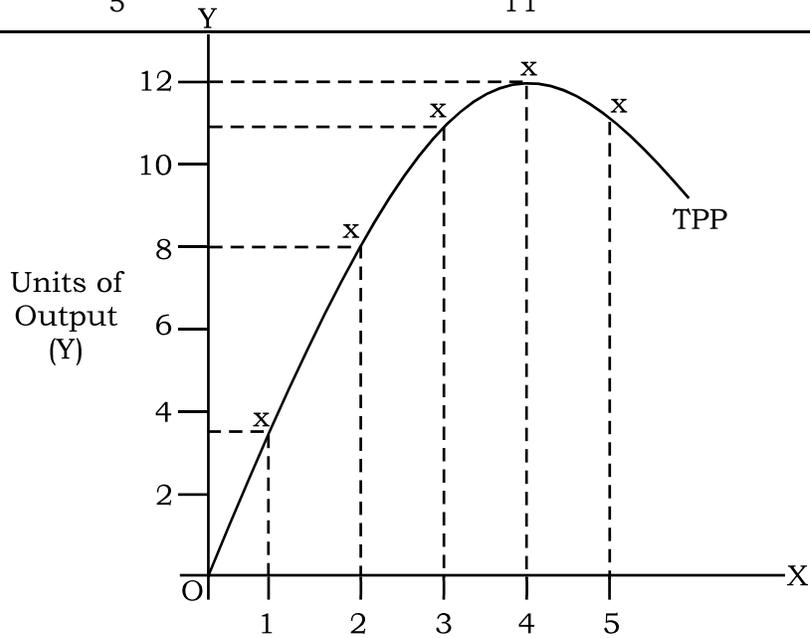
Using Y to symbolize goods and services and X to symbolize resources, we could write the production concept as a simple mathematical expression, called a production function.

$$Y = f(X)$$

This is read as Y (Output) is a function of X (the resources used). Output is measured in units of total physical product (TPP) produced from the units of resources (X). Total physical product varies with the quantity of resources used in production. Table 4.1 illustrates the production situation.

**Table 4.1 : The Production Function :  $Y = f(X_1/X_2, \dots, X_n)$**

Units of $X_1$ used	TPP Units of Y Produced
0	0
1	3
2	8
3	11
4	12
5	11



Units of inputs ( $X_1$ )  
fig 4.1

Here we consider just one firm producing only one product, using just one variable resource with all other resources fixed. The production function fitting other illustration is a modification

$$Y = f(X)$$

to

$$Y = f(X_1/X_2, \dots, X_n)$$

of our general function where  $X$  is a specific resource used in various amounts with a set of fixed resources  $(X_1, \dots, X_n)$ . Through repeated studies, some consistent characteristics among input-output relationships have been observed. When only one input is varied ( $X_1$ ) while all others are held constant ( $X_2, \dots, X_n$ ), TPP (Total Physical Product) will at first increase rapidly, then increase less rapidly and finally decrease. Since production economics rests on that observation, it is essential to explore it in greater depth.

#### **DIMINISHING RETURNS**

If there were no diminishing returns, there would be no limit to the amount of wheat that could be grown on an acre of land. Theoretically, the nation's demand for wheat could be met by sowing more and more wheat and putting more and more fertilizers on that one acre. We know that it is impossible because of diminishing returns, a phenomenon that has become so established as a basis for economic studies, that we call it the law of diminishing returns.

**The Law of Diminishing Returns:** When successive equal units of a variable resource are added to a given quantity of a fixed resource, at some point the addition to total output will decline.

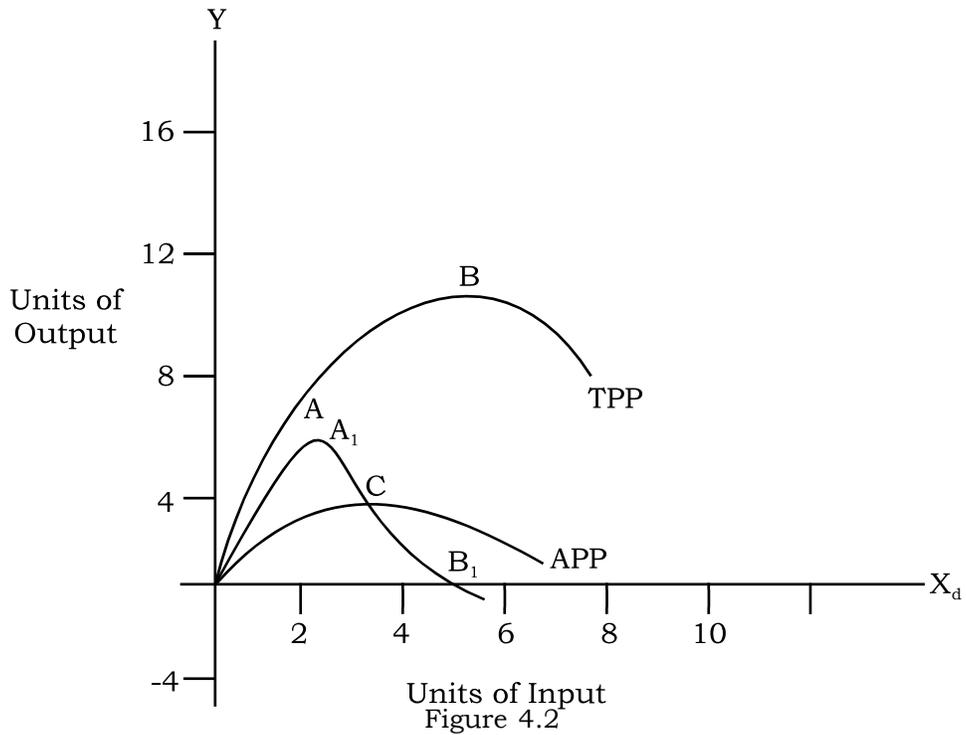
**Table 4.2 : Diminishing Return**

Variable resource	Fixed Resource	TPP	Addition to TPP	Output per Unit of $X_1$
$X_1$	$X_2, \dots, X_n$	Y	$MPP = \frac{\Delta y}{\Delta x_1}$	$APP = \frac{y}{x}$
0	1	0	--	--
1	1	3	3/1=3	3/1=3
2	1	8	5/1=5	8/2=4
3	1	11	3/1=3	11/3=3
4	1	12	1/1=1	12/4=3
5	1	10	-2/1=-2	10/5=2

Note that in Table 4.2, we have added successive units of  $X_1$  say nitrogen fertilizer, to set a fixed  $X_2 \dots \dots X_n$ , say one acre of land including everything else needed. The production of  $Y$ , say wheat changed with each unit of  $X_1$  used. TPP first increased at an increasing rate from 0 to 3, then 3 to 8, but with the third unit of  $X_1$ , TPP only increased to 11; or the addition to the total was less for the third than for the second unit of  $X_1$ . The MPP column shows the addition to the total for each successive unit of variable resources used. It is possible to use so much to the variable resource that production is reduced. Too much nitrogen, in other words, will harm yields.

By graphing the information in Table 4.2, we show the relationship among TPP, MPP and APP more clearly (figure 4.2). Though the relationship will hold in all cases but it should be kept in mind that the hypothetical data so selected was to illustrate the relationship as clearly as possible.

Certain relationships will always exist between TPP and MPP. Look at Table 4.2 and Figure 4.2 TPP from  $X_1=0$  to  $X_1=2$  increased at an increasing rate and MPP was increasing. After the second unit of  $X_1$ , the addition to TPP declined so that after point A, TPP increased at a lower rate. The MPP reached its peak at point A' i.e. at the same point where TPP began its slower rate of increase. Between A and B, TPP continued to increase, and MPP between A' and B' continued to decline but was always a positive point. With each successive unit of  $X_1$ , less was added to output. Between the fourth and fifth unit of  $X_1$ , the additional input did not increase output. When TPP was greatest, at point B, MPP = 0 at point B'. The relationship of APP to MPP should also be observed. APP always increased as long as it was less than the MPP because the marginal output pulled the average up. Each student is an expert in this concept as applied to grades. Instantly, a student knows that the grade he receives on the last test will improve his average as long as the grade is greater than the average. APP will be greatest at point C, when APP = MPP and will always be greater than zero so long as there is any output.

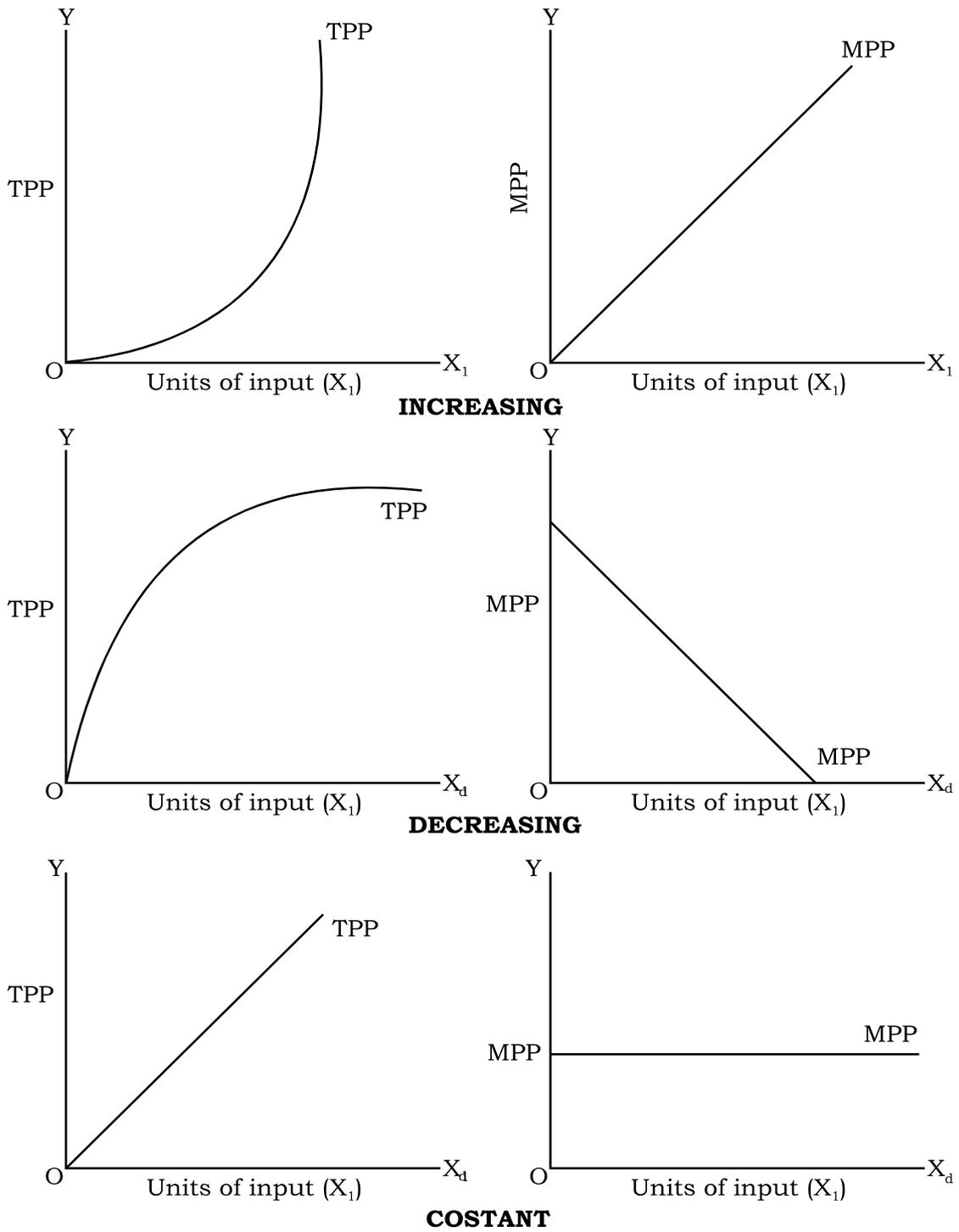


**Productivity Possibilities**

Productivity has a special meaning and cannot be considered the same as production. Production is the total output. Productivity is the relationship between output and inputs used ( $Y/X$ ) and is an efficiency measure : when per unit output increases, productivity increases.

**Table 4.3 : Increasing, Decreasing and Constant Productivity**

Increasing			Decreasing			Constant		
Units of $X_1$	TPP	MPP	Units of $X_1$	TPP	MPP	Units of $X_1$	TPP	MPP
0	0	0	0	0	0	0	0	0
1	1	1	1	5	5	1	3	3
2	3	2	2	9	4	2	6	3
3	6	3	3	12	3	3	9	3
4	10	4	4	14	2	4	12	3
5	15	5	5	15	1	5	15	3



**Fig. : 4.3 Increasing, Decreasing and Constant Productivity**

**Increasing Productivity**

As successive units of a variable resource are added to a given quantity of a fixed resource, total physical productivity increases at an increasing rate, or the marginal physical product increases (see Table 4.3 and Figure 4.3).

**Decreasing Productivity**

As successive units of a variable resource are added to a given quantity of a fixed resource, total physical product increases at a decreasing rate or the marginal physical product decreases.

**Constant Productivity**

As successive units of a variable resource are added to a given quantity of a fixed resource, total physical product increase at a constant rate or the marginal physical product remains constant.

The study of the economics of production is based on the following assumptions:

1. The producer wants to maximise profits.
2. There is a single business (farm) producing only one product.
3. There is a single infinitely divisible input, and no limit on the availability of that resource.
4. There is no uncertainty.
5. There is no change in technology or institutions.

**Stages of Production**

Economists have found that the production function can be broken into three separate parts, each with its own characteristics. The reason for this division lies in the fact that it helps us in moving towards the most efficient point of resource allocation. Identifying the three stages: Stage I, Stage II and Stage III rests on diminishing returns and the resulting relationship among TPP, MPP and APP.

**Stage 1: Stage of Increasing Returns:** In this stage, TP increases at an increasing rate upto point F which is known as point of inflexion. Marginal product also rises. Corresponding vertically to this point of inflexion, marginal product MP is maximum, after which it slopes downward from point F onwards the total product increases at a diminishing rate and MP falls but is positive. Average product curve rises throughout this stage and reaches its highest point. In this stage, marginal product of the fixed factor is negative. This stage is known as stage of increasing rate because average product of the variable factor increases throughout this stage.

**Stage 2: Stage of Diminishing Returns:** In stage 2, total product continues to increase at a diminishing rate until it reaches its maximum point H where the second stage ends. This stage is known as the stage of diminishing returns

as both the average and marginal products of the variable factor continuously fall. At the end of the second stage, MP of variable factor is zero at point M.

**Stage 3: Stage of Negative Returns:** In stage 3, TP curve slopes downward. This stage is called stage of negative returns as marginal product of the fixed factor is negative and MP curve goes below the X-axis. In this stage, variable factor is too much relative to the fixed factor.

### The stage of Operation

In stage 3, a producer can always increase his output by reducing the amount of variable factor as marginal product of the variable factor is negative. It is thus clear that a rational producer will never be producing in stage 3. A rational producer will also not choose to produce in stage I as there is possibility of increasing production by increasing quantity of the variable factor. Thus stage 1 & 3 represent *non-economic* region in production function. A rational producer will always seek to produce in stage 2 where both the marginal product and average product of the variable factor are diminishing. At which particular point in this stage, the producer will decide to produce depends upon the prices of factors.

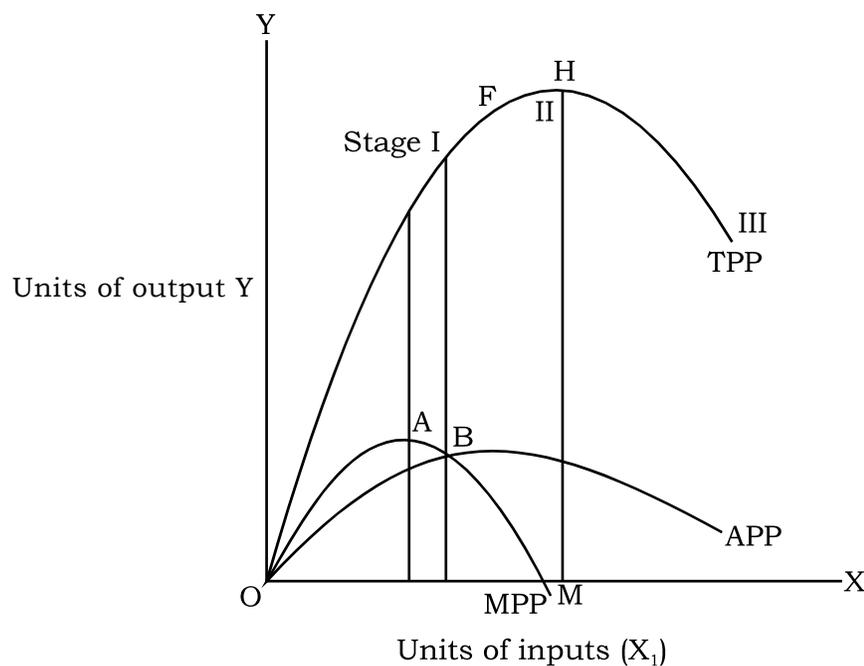


Fig. 4.4

It will always pay to use more of the variable resource,  $X_1$ , as long as the increased output, Y, from the added  $X_1$ , is worth more than the cost of the added

$X_1$  used to produce it. This has reference to the fundamental concepts of marginalism. The criteria for profit maximization is that change in output multiplied by price of output should be equal to change in input multiplied by price of input.

$$\frac{\Delta Y}{\Delta X_1} = \frac{P_{X_1}}{P_Y}$$

OR

$$\frac{\text{Change in Output}}{\text{Change in Input}} = \frac{\text{Price of Input}}{\text{Price of Output}}$$

The profit of maximization formula can be stated more simply if we multiply each side by  $P_Y$ , then

$$MVP = P_{X_1}$$

(where MVP = Marginal Value Product)

The formula for profit maximization,  $MVP = P_{X_1}$ , is the criterion or guide to determine the best level of production.

To present the input-output relationship we made several assumptions. Also, to present the relationship as simple as possible certain special situations were ignored. Some of which we shall now consider.

Profits are maximized when  $MPP = P_{X_1}$ . Though,  $MVP = P_X$ , is a necessary condition for profit maximization, the sufficient conditions is when there are diminishing marginal returns. As long as the MPP is greater than the APP, the APP will increase. Without knowing the prices of Y or  $X_1$ , it can be concluded that profits will increase, while APP is increasing. The decision on "how much input to use and how much product to produce" are not separate and different decisions. Though they are the same, yet they are different in stage II. Only for farmers in Stage I general recommendations are useful. If a producer is in Stage III, a recommendation is fairly straight forward to use less input or produce less product.

Both  $P_{X_1}$  and  $P_Y$  are necessary to determine  $MVP = P_{X_1}$ . Any change in the price of either the product or the input will give a new optimum resource level. If the  $P_Y$  goes up, it pays to use more of  $X_1$ ; if the  $P_Y$  falls, the amount of  $X_1$  used must be cut back. If the  $P_{X_1}$  falls, use more  $X_1$ ; if  $P_{X_1}$  increases, use it less.

### **Input-Input Relationship**

#### **(How to Produce)**

As already discussed, the production function indicates an alternative combination of various inputs which can produce a given level of output. While all these combinations are technically efficient, the final decision to employ a particular input combination is purely an economic decision and rests on costs. A farmer should choose that combination which costs him the least. We can modify

our basic production function  $Y = f(X_1, X_2, X_3, \dots, X_n)$ , to reflect the addition of a second variable resource,  $Y = f(X_1, X_2, X_3, \dots, X_n)$ , where  $X_1$  and  $X_2$  are the variable resources and  $X_3, \dots, X_n$  are the fixed resources. Our task is to determine the most profitable amounts of  $X_1$  and  $X_2$  to combine with  $X_3, \dots, X_n$  to produce a given level of output. All the assumptions will hold. In the input-input relationship there will be two variable inputs used to produce a given level of output.

To aid our thinking in this regard, the concept of an iso-product-curve has been developed which shows all the possible combinations of two variable resources that can produce the same amount of a product.

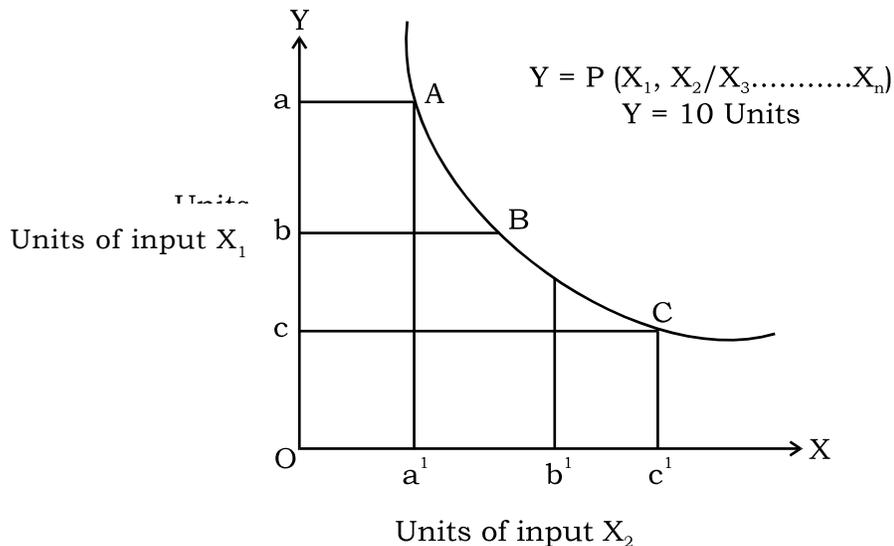


Figure 4.5 Iso-Product Curve

Figure 4.5 illustrate the iso-product curve when  $Y = 10$  units. Every point on  $Y$  (A, B, C or any other point) represents 10 units of  $Y$  that can be produced with varying combinations of units of ( $X_1$ ) and ( $X_2$ ). The marginal rate of substitution (MRS) refers to the amount of resource that can be decreased as use of another resource is increased, by one unit without affecting the output. Algebraically stated;

$$\text{MRS of } X_2 \text{ for } X_1 = \frac{\Delta X_1}{\Delta X_2}$$

The marginal rate of substitution is always stated as negative, the iso-product curve always slopes downward and to the right. A diminishing marginal rate of substitution is apparent when successive equal units of a variable input ( $X_2$ )

are substituted for another variable input ( $X_1$ ) and the successive equal units of the substitute ( $X_2$ ) gradually replace less and less of the original variable input ( $X_1$ ).

As it has already been mentioned that, the final decision to employ a particular input combination is purely an economic decision and rests on costs. An entrepreneur should choose that combination which costs him the least.

To aid our thinking in this regard, economists have developed the concept of iso-cost (equal cost) line, which shows all combinations of inputs  $X_1$  and  $X_2$  that can be employed for a given cost (in rupees) for the iso-cost line represents all possible, combinations of two variable inputs that can be bought with a given amount of money.

The slope of the iso-cost line is determined by the price ratios. Any change in the prices results in a different slope (see Figure 4.6).

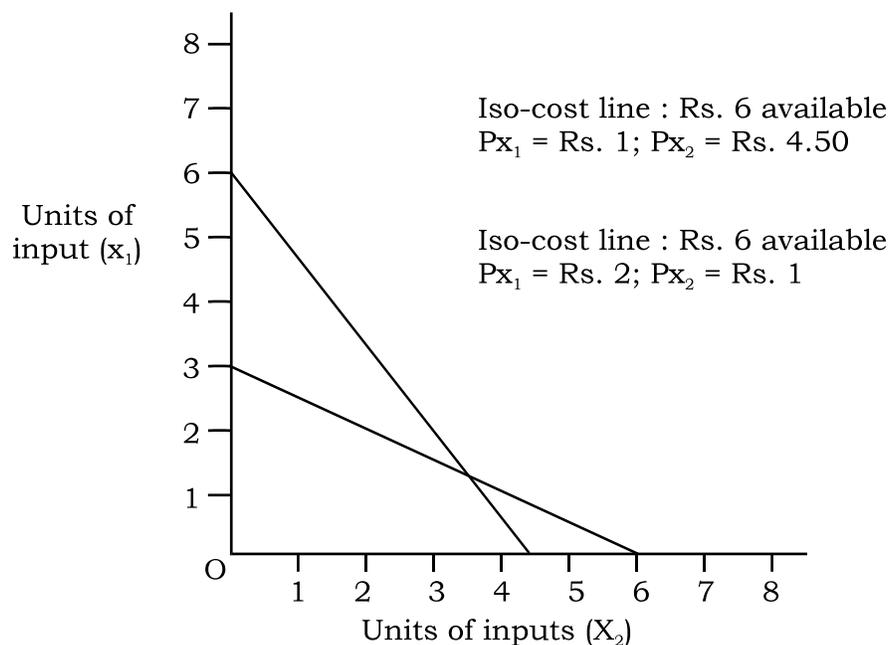


Fig. 4.6

### Profit Maximization Criterion

If our objective is to maximize profits at a given level of output, then cost minimization is identical to profit maximization. We will seek the least cost combination of resources to produce the given level of output. To determine the least cost combination, we need to know the price of each factor and the marginal rate of substitution between factors. When that is known, we can determine the profit maximizing combination by finding the point where the marginal rate of

substitution is equal to the increase of price ratios.

$$\text{MRS of } X_2 \text{ for } X_1^0 = \frac{P_{X_2}}{P_{X_1}}$$

$$\frac{\Delta X_1}{\Delta X_2} = \frac{P_{X_2}}{P_{X_1}}$$

By connecting the input Combination points, we can construct an iso-product curve. Using the least cost, we conduct the iso-cost line. The point of tangency shows us the optimum resources combination.

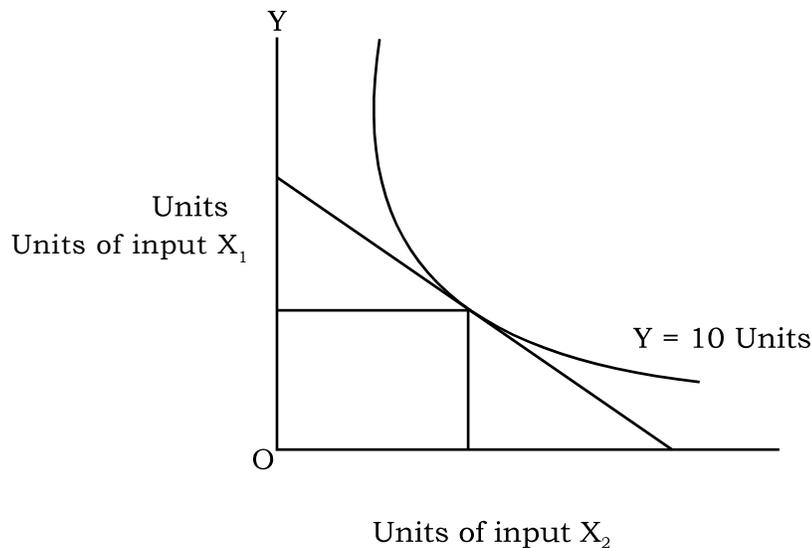


Figure 4.7

The least cost concept has a wide range of applications. Understanding it well enough to make effective use of it in agricultural production is well worth your time and effort. Any time a manager is confronted with resource allocation decisions, he will find the factor-factor principle basis to his decision-making.

When there is a change in the price relationship between two inputs, there will be a new least-cost combination of the two. The cheaper one will be substituted for the more expensive one until once again the MRS equals the inverse of the price ratio.

### **The Product-Product Relationship (How to Combine Enterprises)**

We have provided a basis for answering the first two of the three basic production questions. How much to produce? How to produce the product? What to produce? The third, "What to produce?" is the topic of this section. When

producers desire to maximize profits, they try to find those lines of production that add most to profits. Their resources will be allocated to the enterprises that give the highest returns. Our objective here is to provide an understanding of how to determine the combination of enterprises that maximize profits.

### **The Production Possibility Curve**

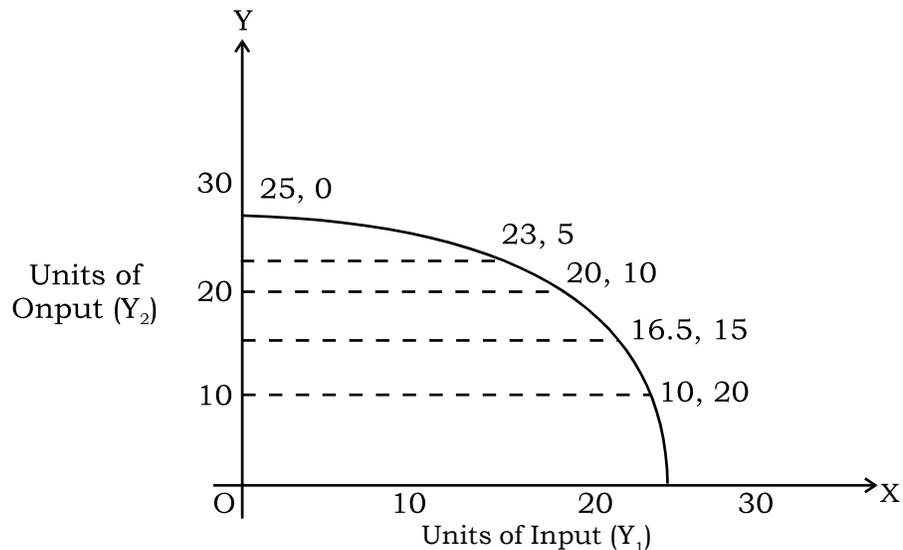
Just as two analytical tools, i.e. (a) isoquant and (b) iso-lines are required for determining the optimality conditions regarding factor-factor relationship. Similarly, a set of two tools to analysis namely (a) the production possibility curve and (b) the iso-revenue lines are needed for determining the optimality conditions concerning product-product relationship.

A production possibility curve represents all possible combinations of two products ( $Y_1$ ) and ( $Y_2$ ) that can be produced with a given amount of resources.

**Table 4.4 : Combinations of Output form Two Enterprises ( $Y_1$  and  $Y_2$ )  
when 100 units of Input are available.**

<b>UNITS OF OUTPUT</b>	
<b><math>Y_2</math></b>	<b><math>Y_1</math></b>
25	0
23	5
20	10
16.5	15
10	20
0	25

The production possibility curve using 100 units of input has been illustrated in Table 4.4. The 100 units will produce any of the combinations  $Y_2$  and  $Y_1$  listed. Such enterprise combinations data can be plotted on a diagram (Figure 4.8). Here we will plot  $Y_1$ , the output being substituted in equal increments for  $Y_2$ , on the horizontal axis and  $Y_2$ , output being substituted out of the business, on the vertical axis. Each of the output combination can be plotted and line connecting the points gives us a production possibility curve.



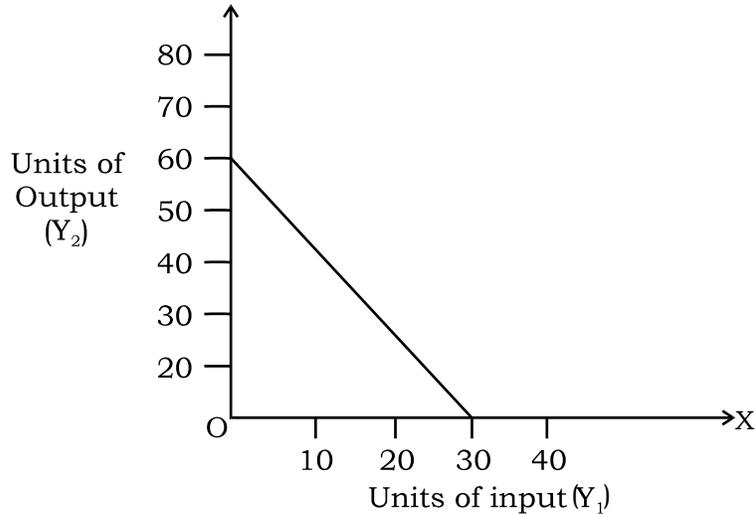
**Figure 4.8 : The Production Possibility Curve**

An iso-revenue line represents all possible combinations of two products that if sold, will give a fixed amount of revenue. For example, if the  $P_{Y_1} = \text{Rs. } 2$  and  $P_{Y_2} = \text{Re. } 1$ , then a Rs. 60 income can be obtained by selling :

Units of $Y_1$	Units of $Y_2$
0	60
10	40
20	20
30	0

When these data were plotted in Figure 4.9, the straight line connecting  $Y_2 = 60$  and  $Y_1 = 30$  is the iso-revenue line. The slope of this line is determined by the price ratios, in this case Rs. 2: Re. 1. The iso-revenue line is very similar to the iso-cost line; both indicate constant value. The slope of iso-revenue line is equal to the ratio of the prices of the commodities.

$$\text{Slope of iso-revenue} = \frac{P_{Y_1}}{P_{Y_2}}$$



**Figure 4.9 The Iso-Revenue Line**

Opportunity cost is potential income foregone from a resource as a result of using that resource for another line of production, Equimarginal returns refer to allocating resources so that the last units of resources gives the same returns from each product produced, the idea algebraically can be expressed as follows :

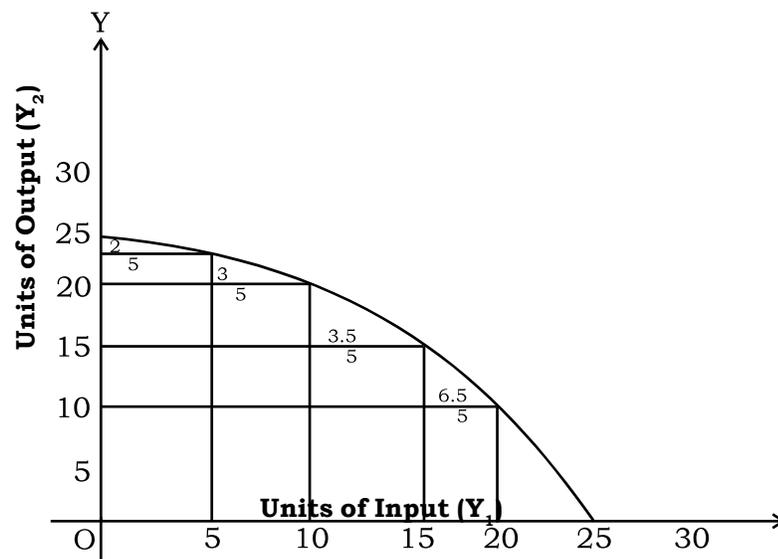
$$MVPY_1 = MVPY_2 \dots\dots\dots = MVPY_n$$

This tells us that we have allocated  $X_1$  among all our enterprises so that the value of the output resulting from using one more unit of  $X_1$  would be the same for any one of the enterprises, if there were unlimited resources, that would be true when  $MVPY_1 = MVPY_2 \dots\dots\dots MVPY_n = Px_1$ . When resources are limited the equi-marginal returns will occur before  $MVPY_1 = Px_1$ .

The Marginal Rate of Product Substitution (MRPS) is the amount one product ( $Y_2$ ) changes in quantity when the other product ( $Y_1$ ) is increased by successive equal units, when total resources used remains constant. The MRPS is computed by using this formula:

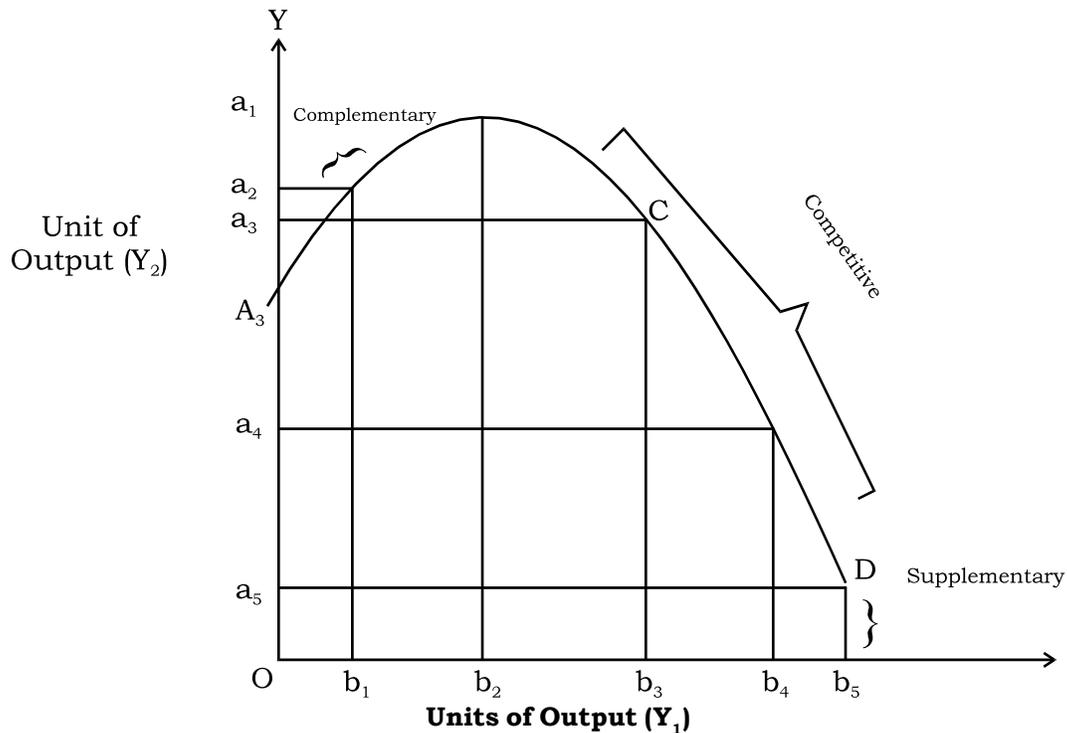
$$MRPS Y_2 \text{ for } Y_1 = \frac{\Delta Y_2}{\Delta Y_1}$$

In Figure 4.10, the MRPS gives us the slope of the production possibility curve, by taking data from table 4.8.



**Figure 4.10 Marginal Rate of Product Substitutions  
Types of Product-Product Relationship**

When substituting enterprises within a business, the enterprises may help, compete or have no effect on each other, when resources are taken from one enterprise and placed in another and output of both increases, the relationship is said to be complementary. When enterprises have no effect on one another, there is a supplementary relationship. Enterprises compete when the addition in one reduces the output of the other.



**Figure 4.11 : Complementary, Supplementary and Competitiveness among Products**

Between A and C a shift of resources  $Y_2$  and  $Y_1$  results in an increase in output of both  $Y_1$  and  $Y_2$ . This portion of the curve represents a complementarity between  $Y_1$  and  $Y_2$ . The supplementarity relationship exists between B and D as we can shift some resources to produce  $Y_2$  without giving up any  $Y_1$ .  $Oa_5$  units of  $Y_2$  can be produced. Between C and D a shift of resources from  $Y_2$  to  $Y_1$  results in loss of output from  $Y_2$  in order to gain output from  $Y_1$ . This portion of the curve represents a competitive relationship in which  $Y_1$  competes with  $Y_2$  for the resources.

Profits can be maximizing only in the competitive portion of the production possibility curve. To determine profit maximization, we must know the marginal rates of product transformation and price of the products. The profit formula gives us a guide to determine whether the returns from an enterprise are greater than the opportunity costs of giving up other enterprises.

When considering just two enterprises the formula is:

$$MRT = \frac{Py_1}{Py_2}$$

For more than two enterprises, it can be stated

$$\frac{MVPX(Y_1)}{Px} = \frac{MVPX(Y_2)}{Px} = \frac{MVPX(Y_n)}{Px}$$

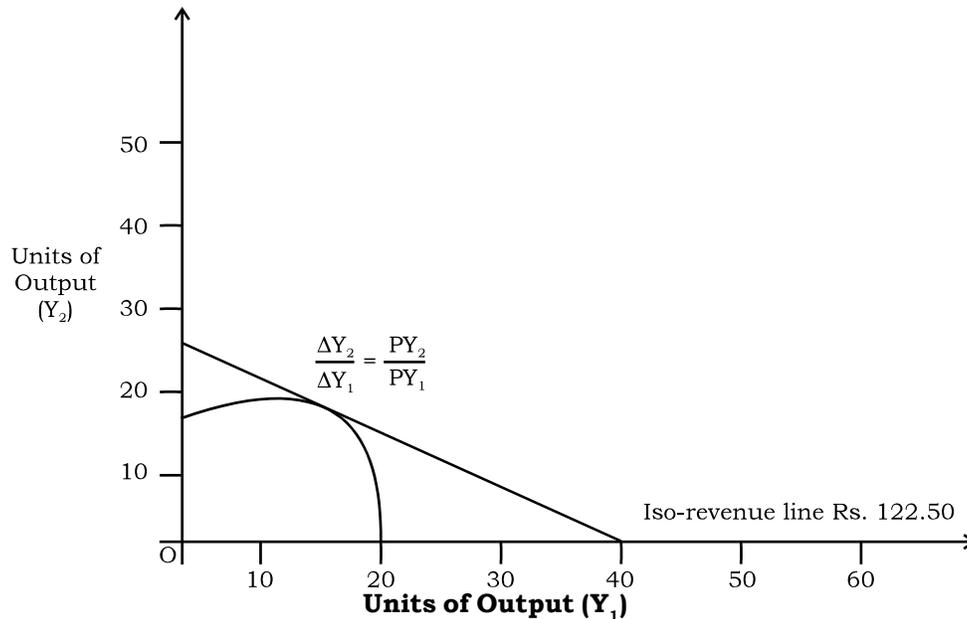
**Table 4.6 : Profit Maximization for Two Enterprises  
When  $Py_1 = Rs. 3$  and  $Py_2 = Rs. 5$**

Units of Output		MRPS			Revenue	TOTAL	
$Y_2$	$Y_1$	$\Delta Y_2$	$\Delta Y_1$	$\Delta Y_2/\Delta Y_1$	$Py_2$	$Py_1$	
18	0	-	-	-	Rs. 90.00	Rs. 0.00	Rs. 90.00
20	5	+2	5	2/5	100.00	15.00	115.00
18	15	-2	5	-2/5	90.00	30.00	120.00
.....	.....	.....	.....	.....	.....	.....	.....
15.5	15	-2.5	5	-2.5/5	77.50	45.00	122.50
.....	.....	.....	.....	.....	.....	.....	.....
12.0	20	-3.5	5	-3.5/5	60.00	60.00	120.00
0	20	-12	0	-12/0	0.00	60.00	60.00

Profit maximization for the product-product situation is  $Py_1/Py_2 = Rs. 3/Rs.5$ . By looking down MRPS column, between  $-2.5/5$  and  $-3.5/5$  there must be point where  $Rs. 3/Rs. 5 = -3/5$ . Using the data in Table 4.6, we have prepared a diagram, figure 4.12 illustrating profit maximization. The production possibility curve gives us the MRPS, and the iso-revenue lines gives us the price ratio. The point where the two are just tangent fulfils the profit maximization criterion and tells us the most profitable combination of the two enterprises.

The iso-revenue line was determined by taking the highest revenue possible Rs. 122.50, dividing it by the  $Py_2 = Rs. 122.50/Rs. 5 = 24.5$ , and  $Py_1 = 122.5/Rs. 3.0 = 40.8$ . That gives us the number of units required to generate Rs. 122.50 if only one were produced. By locating each of the quantities on the  $Y_2$  and  $Y_1$  axis and connecting the two points, we have the iso-revenue line. No combination of  $Y_2$  and  $Y_1$  production will give Rs. 122.50 income except where

$$\frac{\Delta Y_2}{\Delta Y_1} = \frac{Py_1}{Py_2}$$



**Figure 4.12 : Profit Maximization for two Enterprises when the  $PY_1 = \text{Rs. } 3$  and  $PY_2 = \text{Rs. } 5$**

### Summary

Production is the process of providing goods and services that have value to consumers. In this lesson, we have shown that a firm minimized the cost for a given output in order to maximize the profit. Production at the least possible cost requires that the additional rupee spent on additional output is equal to the output per additional rupee spent on any other input. Certain concepts like production function, iso-quants and iso-cost curves and the MRTS of one input for the other, etc. have been used to derive the conditions for achieving the least cost combination of input. The least cost combination of inputs for a particular level of output is reached at the point where an iso-cost curve is tangent to the iso-quant curve corresponding to that level of output. At this point the MRS which is also equal to the ratio of marginal product of two factor inputs, is equal to the ratio of input prices.

In order to provide an understanding of how to determine the combination of enterprises that maximized profits, the concepts of production possibility curve and the iso-revenue lines have been developed. Profits can be maximized only in the competitive portion of production possibility curve for which the knowledge of marginal rate of product substitution and price of the product is required. The

point where the two are just tangent fulfils the criterion for profit maximization and gives us the most profitable combination of the two enterprises. For the enterprises, the criterion is :

$$\frac{\Delta Y_2}{\Delta Y_1} = \frac{P_{y_2}}{P_{y_1}}$$

**RISK AND UNCERTAINTY IN AGRICULTURE**

- 2.4.1 Introduction**
- 2.4.2 Objectives of the lesson**
- 2.4.3 Definition of Risk and Uncertainty**
- 2.4.4 Difference between risk and uncertainty**
- 2.4.5 Types of risk and uncertainty**
- 2.4.6 Measures to deal with Uncertainty**
- 2.4.7 Government measures**
- 2.4.8 Suggestions**
- 2.4.9 Summary**
- 2.4.10 Glossary**
- 2.4.11 Short answer type questions**
- 2.4.12 Long answer type questions**
- 2.4.13 Suggested Readings**

**2.4.1 Introduction**

One of the important features that distinguish agriculture from others sectors of the economy is concerned with the role, played by nature in production in different sectors. Biological nature of farm enterprises add to the high role of risk and uncertainties in the short period. Vagaries of nature significantly affect agricultural production in an economy. Rain, floods, drought, diseases—all affect and afflict agricultural production. The input-output relations are totally unpredictable. The biological nature of agriculture is mainly responsible for this uncertainty. The risk and uncertainties are related mainly to production, price and inputs.

**2.4.2 Objectives of the lesson**

In this lesson we will discuss about risk and uncertainties, their types, impact of risk and uncertainties in agriculture and measures to deal with these uncertainties.

**2.4.3 Definition of risk and uncertainty**

Sometimes, the terms 'risk' and 'uncertainty' are used synonymously. However, in economic analysis, risk and uncertainty are considered different from each other. No doubt, events involving any one of the two relate to the future.

- 2.4.3.1 Risk:** The risk refers to the probability or outcomes which are measurable in an empirical manner. The hundred percent of outcome is not predictable. Therefore, the probability of outcome or loss can be established for a large number of cases or observations. As a result of past experiences, some future

outcomes can be calculated.

**2.4.3.2 Uncertainty:** In contrast to risk, uncertainty refers to future events where the parameters of probability distribution cannot be determined empirically or quantitatively. Thus, it implies to any decision or outcome which cannot be predicted. Uncertainty is purely of a subjective nature. It is not insurable, it cannot be reduced to cost as it can be done in risk.

**2.4.4 Difference between Risk and Uncertainty:** Although 'risk' and 'uncertainty' are used synonymously, however, in economic analysis, risk and uncertainty are considered different from each other. Both of the terms relate to the future. But some events can be predicted at least in probabilistic terms. Their occurrence can be foreseen, on the basis of past experience. For example, a poultry farmer knows through past experience that a certain percentage of eggs, after production- is destroyed through breakage during their transportation to the market. This type of outcome which can be anticipated with some probability is said to involve risk and not uncertainty.

Uncertainty, on the other hand, refers to those events, to the occurrence of which, no probability values can be attached. Take, for example, floods or drought or earthquakes. Even if a country or a region has been suffering from the ill effects of these mishaps in the past, yet the farmers or other agencies are not in position to make any prediction whatsoever, about their future occurrences.

According to Luce and Raiffa, "As to certainty-risk-uncertainty classification, let us suppose that a choice must be made between two actions. We shall say that we are in the realm of decision making under

- (a) Certainty, if each action is known to lead invariably to a specific outcome,
- (b) Risk if each action leads to one of a set of possible specific outcomes, each outcome occurring with a known probability
- (c) Uncertainty, if each action has as its consequence a set of possible specific outcomes but where the probabilities of these outcomes are completely unknown or not even meaningful".

This distinction between risk and uncertainty has an important bearing on the steps taken to prevent the occurrence of various unfavourable events in the future as well as for reducing the impact of these events, in case those come about. For example, for unfavourable events likely to occur with some probability (i.e. those involving risk), the producer can take out an insurance against them by paying a particular sum as premium and they include this payment in the cost of production. He will thus be fully protected against this event in case it happens. In other words, this risk is transferred to the insurance companies who will suffer only if the frequency as well as the intensity of the unfavourable event insured against is more than what they had anticipated on the basis of the past data available to them). In some cases, in fact, the farmer may not even approach the insurance company. This will be so where farmer's own past experience is sufficient to guide him about the probable loss he may suffer in the

future. He can treat this expected loss as a cost and get reimbursed for it in case the loss actually occurs. However, we may note here that the insurance premium charged by the insurance company is much less than the expected loss to an individual farmer. This is because every farmer does not suffer the loss even though he pays the premium. In agriculture, egg breakage or poultry deaths (in a year free from epidemics) are examples of risk. Here, on the basis of past experience, average egg breakage or poultry deaths can be assigned some probabilistic values. On the other hand, the occurrence as well as the results of drought, diseases, floods, price fluctuations etc. can not be foreseen with any degree of probability. These can be treated as examples of uncertainty.

#### Self check exercise

**Q1. Define risk.**

**Q2. Write a note on uncertainty.**

**Q3. What is the difference between risk and uncertainty.**

#### 2.4.5 Types of risk and uncertainty

Risk is the outcome of a number of factors including natural factors, price fluctuations and factor availability. Broadly there are four types of risk.

- (1) **Yield risk:** This risk may be due to fall in yield of crop from the normal one. The effect on yield may be caused by fluctuations in conditions such as rainfall, temperature, relative humidity, insect attack, non availability of agricultural inputs etc.
- (2) **Risk of fall in product price:** The output produced on the farm is generally expected to be sold at certain prices but the prices may decline at the time of sale. Since price is the result of supply and demand forces in the market, all the factors effecting the demand and supply are likely to cause risk of fall in price.
- (3) **Risk of fall in real return:** There are a number of enterprises in agriculture, the gestation period of which is very long such as fruit crops. The cost is incurred at present but the return is spread over such a long period. In case there is a fall in value of money, the real value of future return would fall. It will be a serious risk to the farmer.
- (4) **Risk of input non-availability:** The non-availability of factor inputs required for production in agriculture pose a number of risks. Non-availability of inputs would lead to high cost of production and thus profitability of farmers will decrease.

#### Types of Uncertainty

There are four major types of uncertainty which arises when the producer commits his resources to production in the present and then waits for the outcome till some time in the future. (This type of waiting is inherent in the nature of agriculture.) These are:

- i. **Yield Uncertainty:** The main reason for this type of uncertainty in agriculture lies in the biological nature of agricultural industry which makes the yield much more dependent on natural factors in comparison with the products of

non-farming industries. Floods, drought, epidemics, etc. affect agricultural yield suddenly without any warning and, at times, too severely. No doubt, livestock husbandry is less dependent on weather in comparison to crop farming but a hard winter or a dry summer can still have a marked influence on livestock production. Moreover, the possibility of live stock epidemics is always there.

**ii. Price Uncertainty:** In addition to yield or technical uncertainty, uncertainty also exists with regard to the prices of agricultural products. Price is more or less an uncontrolled or exogenous variable so far as the individual farmer is concerned. The farmer operates in a market structure which approximates to perfect competition and, therefore, the price he receives for a product of a given quality is altogether unaffected by any plan or courses of action that he might adopt. He is a price taker and not a price maker. The outside factors which affect prices are:

- (a) the behaviour of other farmers taken together;
- (b) weather-induced random fluctuations in output;
- (c) fluctuations in national income and prosperity; and
- (d) discontinuous production cycles of the cobweb type.

As stated earlier, product prices faced by the non-farm industries are also subject to fluctuations, but the degree of price uncertainty in these industries is much less than in agriculture. The main reason for this is that not only are the non-farm industries much less affected by weather generated price fluctuations but also that the monopolistic market structure in which they operate enables them to exercise greater control over prices of their products.

**iii. Tenurial Uncertainty:** Another type of uncertainty that is quite conspicuous in agriculture is the tenurial uncertainty. We know that land is generally leased out to tenants. The tenant, as a farmer, does not know for how long he will be able to retain the land in his possession. He will, therefore, hesitate to make long-term improvements in land as he is not sure about earning sufficient additional returns from such improvement during the period of tenancy.

**iv. Uncertainty with regard to Input Prices/Quality:** Yet another type of uncertainty is that which exists with regard to the prices and quality of inputs. This type of uncertainty is particularly important in the case of capital inputs which are generally costly and are subject to frequent qualitative improvements. The farmers generally react to this type of input price uncertainty by postponing the purchase of such inputs.

Some economists, in order to be more comprehensive, have suggested six 'Ps' indicating uncertainties. These are: Price uncertainty, Production uncertainty, Production technology uncertainty, Political uncertainty, Personal uncertainty and People's uncertainty. Some of these need further explanation. Political uncertainty refers to the uncertain political conditions in the country. Under normal circumstances,

this type of uncertainty may not be there. However, Government's vague policy about land reforms and other institutions may create some uncertainty which may be included under 'Political uncertainty'. Personal uncertainty refers to the uncertainty about the welfare of farmer's family. People's uncertainty refers to the relationships of the farmer with persons he deals with. These persons include labourers (both family & hired), bankers, landowners, neighbouring farmers from whom the farmer leases in land or to whom the farmer leases out his land or other resources.

#### Self check exercise

**Q4. Discuss the different types of risk.**

**Q5. What are the various types of uncertainty?**

#### 2.4.6 MEASURES TO DEAL WITH UNCERTAINTY

##### Measures at the Farm Level

Uncertainty in price and in yield has an important bearing on the decisions taken by farmers in regard to the conduct of the farm business. They take various steps which would help in mitigating uncertainty. The measures taken to mitigate uncertainty, however, always involve a cost—the cost which is mainly in the form of foregoing of higher profits which the farmer had earned if he had not incurred some expenses or made some unfavourable adjustments to lessen the impact of uncertainty. The chief measures adopted to overcome uncertainty are as follows :

- a. Diversification
  - b. Flexibility
  - c. Liquidity
  - d. Capital Rationing
  - e. Contract Farming.
- a. Diversification:** Diversification means that the farmer carries on several farm enterprises simultaneously in order to avoid the dangers of having all his eggs in one basket. This implies that even in a situation where the marginal rates of transformation and the expected price-ratios suggest production of only a few products, the farmer, as a precaution against uncertainty, does not do so and instead, diversifies his production by producing several products. By such diversification, the farmer hopes to reduce the variation in his aggregate income because yields or prices of all products may not vary in the same direction simultaneously. For example, if the return from one product is low, the return from another product might be high enough to compensate for the loss.
- b. Flexibility:** As an alternative or a supplement to diversification, the farmer may use the technique of flexibility for minimising the impact of uncertainty on his earnings. Flexibility means that the farming system is so arranged that the farmer can without much cost, move out from one enterprise into another if economic conditions make this shift desirable. With flexible techniques, it should be possible for the farmer to switch over resources, say, from beef enterprise to

milk enterprise. Flexibility, as Heady says, 'is the avoidance of rigid production methods'. And in case of a multi-product enterprise, it also means avoidance of a rigid production pattern.

Flexibility in agriculture can be achieved in different ways. Some of these are as follows:

- i. To achieve flexibility, it is important that the farmer's capital investment on farm buildings and machines is not of too specialised nature. It should rather be adaptable for use in more than one enterprise. For instance, instead of having a building to be used specifically as a poultry house, it may be better to design a dual purpose building which can house poultry and if need be, can also serve as a hog house. Similarly, dual-purpose cows provide the farmer with more flexibility than specialised milk or beef cows. With the dual-purpose cows, output can be switched between beef and milk as price ratio changes.
  - ii. Flexibility in productive assets can be introduced, in term of time as well. The farmer may go in for short duration assets rather than for long duration ones. For example, he may use bamboos instead of steel for constructing a cattle or a poultry shed.
  - iii. Further, flexibility can be introduced not only in terms of assets but also in terms of crops produced. Production of annual crops will ensure greater flexibility than that ensured by fruit production. Similarly, production of short duration crops, instead of long duration crops, will ensure greater flexibility in production.
  - iv. Again, we can ensure greater flexibility in costs by having casually hired labour rather than labour on contract or by purchasing only the services of the permanent assets like tractors etc. rather than purchasing the tractors themselves.
- c. Liquidity:** Apart from compromises in the designs of farm buildings and equipment, a greater degree of flexibility can also be ensured if the farmer holds a reasonable proportion of his assets in liquid form. With liquid resources, the farmer can take advantage of the passing favourable opportunities such as a highly remunerative rise in the prices of his products, by purchasing additional resources for producing them. Another advantage of liquidity is the ability that it provides to the farmer to face unforeseen contingencies such as continued crop failures and market slumps. The farmer who has liquid reserves can withstand such contingencies better than his neighbour with less liquid resources.
- d. Capital Rationing:** Apart from diversification and flexibility, another way in which the farmer reacts to uncertainty is through self-imposed capital rationing. Capital rationing is a general term which means a restricted flow of capital to an enterprise even when the return to it is quite high. Capital rationing is quite

common in agriculture. Many empirical studies have confirmed such a rationing of capital in agriculture. It has often been observed that while the marginal return to labour in agriculture is below that in the rest of the economy, the marginal return to capital is relatively higher so that a more efficient allocation of resources would be achieved if labour were to move out of agriculture and capital to move into it until the marginal product of each factor became the same in each sector of the economy.

The main cause of capital rationing in agriculture is the existence of uncertainty, particularly yield and price uncertainty. Looking back at events, the farmer may easily be able to see that a particular investment would have been profitable but it may not be easy for him to see it in advance. The result is that not feeling sure of the outcome of investment, the farmer is reluctant to invest a sufficient amount of his own resources to ensure equality of the marginal returns to the amount invested with its marginal cost. This is called internal capital rationing. It differs from external capital rationing which means that private moneylenders and financial institutions are reluctant to advance loans to the farmers on account of uncertainty.

- e. **Contract Farming:** This is another device which can be adopted by the farmer to overcome uncertainty. It involves contractual agreements in money terms between the farmer, manufacturing firms and input suppliers. Such agreements guarantee the farmer a certain price for a given grade of a product at a given time. By this agreement, the farmer can not only mitigate the inherent price and income uncertainties of the traditional marketing system but also establishes useful links with manufacturing firms and input suppliers. The latter, often anxious to see that the farmer's technical efficiency improves, advance him funds at low interest rate and also provide the necessary technical expertise to enable him to use the modern technology. However, we must note one point with regard to this measure. No doubt, the farmer is able to protect himself fully against price uncertainty through this method. But, at the same time, he also foregoes the opportunity to earn additional profits, if the price of the concerned crop goes up beyond the agreed prices or if prices for agricultural inputs fall below the prices agreed upon.

Sometimes, contracts in kind are also helpful in meeting uncertainty. For example, an agreement on crop and cost sharing can reduce the impact of yield and price uncertainty for a tenant farmer.

#### **Other Methods**

Besides the above measures, Upton refers to a few other measures also which a farmer can adopt to minimise the impact of uncertainty. These are:

- i. **Choice of Reliable Enterprises:** Farmers know that yield from certain enterprises is more stable than from others. For example, yield variation of pigs and poultry,

is generally thought to be less than that of sheep and beef cattle. Again cereal yield is generally less variable than the yield from root crops.

- ii. Again uncertainty is avoided by the farmer by continuing to stick to the traditional crops rather than the crops involving new innovations even if these may be more remunerative. Innovations in the activities involving biological element have more uncertainty around them and are consequently slow to be adopted. In fact, one will not be wrong if one says that keenness to avoid uncertainty is one reason for the slow rate of technological progress in agriculture as compared with that in industry.
- iii. **Discounting for Risk:** In order to be on the safe side, the farmer discounts the expected yield of a crop for risk and uncertainty and then equates the discounted marginal value productivity of this crop with its cost of production, for reaching an equilibrium. This will obviously imply that the farmer will use less of inputs and produce less of output when compared with a situation when there was a complete certainty about the yield of this crop. Smaller production will reduce the losses if the situation turns out to be unfavourable.
- iv. **Maintaining Reserves:** This is another form of flexibility. Maintenance of extra multipurpose equipment and labour force larger than what is normally necessary, to meet some types of uncertainty, e.g., floods, etc. may be helpful. Maintenance of food reserves may also be helpful at times.

#### Self check exercise

**Q6. What can be different methods to deal with uncertainty?**

**Q7. Write a note on contract farming.**

**Q8. What are the ways by which flexibility can be achieved in agriculture?**

#### 2.4.7 Measures Taken by the Government to Deal with Uncertainty

Broadly speaking, these measures can be of three types:

- i. Guaranteed agricultural prices
  - ii. Buffer stock schemes
  - iii. Crop insurance.
- i. **Guaranteed Agricultural Prices:** This measure involves enactment of legislation giving the farmer more or less precise guarantee of the price level or the minimum price he may expect some time ahead, in the U.S.A.. for example, legislation provides a system of guaranteed price for a wide range of farm products such as maize, cotton, wheat, rice, tobacco, groundnuts, wool, honey, milk and butter fat. These prices generally lie within certain fixed percentages of the 'parity prices', i.e.. the prices ensuring some sort of harmony with the prices of the industrial products ; and their actual level varies with the estimated supply in the coming year.
  - ii. **Buffer Stock Scheme:** Like the guaranteed price scheme, the Buffer stock scheme is also aimed at removing price uncertainty. In this method, the buffer stock authority (which is ordinarily a government agency) purchases stocks of

agricultural commodities in years of bumper crops and unloads them into the market in years of crop shortages with a view to raising price in times of glut and lowering them in times of scarcity. Thus by neutralising year to year fluctuations in output, buffer stock operations can bring about greater regularity in the year to year availability of crops and at the same time, reduce price uncertainty.

An essential condition for the smooth and efficient functioning of the buffer stock scheme is that the buffer stock authority must be able to maintain a balance between its purchases and sales over a period. While continuous purchases, by the buffer stock operating agency, of a commodity due to its glut in the market for a very long period will put a great strain on the resources of the concerned agency, its continuous sale for a very long period will lead to a complete exhaustion of its stock, lying with the agency. Both ways, the operations of the buffer stock scheme will suffer. This, in turn, implies that the buffer stock schemes will be more successful if the price changes, needed to be controlled are not uni-directional only. These should contain both upward and downward movements.

**iii. Crop Insurance:** While buffer stock and guaranteed price schemes are both aimed at reducing price uncertainty, crop insurance deals with the other major form of uncertainty that is yield uncertainty. By means of crop the farmer can insure himself against certain occurrences such as loss due to poor weather, insect infestations and disease. The farmer incurs a small known cost, the insurance premium, and thereby transfers the risk of much larger losses to the crop insurance agency.

Crop insurance can be of several types. It can be:

- [a] Insurance for specific crops; or
- [b] Insurance for all crops taken together.

Again it can be:

- [c] Voluntary crop insurance; or
- [d] Compulsory crop insurance.

Further crop insurance can be based on the individual approach in which the assessment of the indemnity payable by the insurance agency is done separately for each individual farmer and is based on the actual crop output of the concerned farmer each year as compared with his normal output.

It can also be based on the area approach in which the assessment of indemnity is not done separately for each insured farmer but it is done together for all the farmers in a given area on the basis of the actual average crop production over the whole area as compared with the normal crop output of the area.

Of these different types of insurance, an insurance scheme for all crops taken together, preferably of the compulsory type, would be more feasible than crops wise insurance for the obvious reason that the variability of all crops taken together is generally much

lower than the yield variability of individual crops. Similarly, the area approach is more practicable than the individual approach as it does not require ascertaining the crop outputs of individual farmers for determining their losses. All that is needed is the estimate of average annual yield of the crops over the whole area which is agro-climatically homogeneous.

**Self check exercise**

**Q9. What are three measures taken by the Government to deal with uncertainty?**

**Q10. What are types of crop insurance?**

**Measures taken by Govt. in India:**

In advanced countries, crop insurance is made available to the farmers through both commercial and public agencies. But in the developing countries, very little progress has been made in this direction. In India till recently, crop insurance scheme has been in the form of ad hoc tax relief, water rate relief, and famine and flood relief measures, etc., in the event of widespread crop losses due to drought, floods etc. Quite some time back, Government of India had appointed an expert committee under the chairmanship of Dr. Dharam Narain to examine the desirability of introducing crop insurance in India. The committee came to the conclusion that, in view of the conditions obtaining in the country, it was not advisable to introduce crop insurance even on an experimental basis. Government again gave some more thought to this scheme and finally decided to introduce it in 1985. It was optional for the states to introduce the scheme. Till recently, the scheme was in operation in a large number of states/UTs and was called 'Comprehensive Crop Insurance Scheme'. Under this scheme, all farmers availing themselves of crop loans from Cooperative Societies, Regional Rural Banks and Commercial Banks for growing wheat, rice, millets, oil seeds and pulses could get their crops insured up to an amount of Rs. 10,000 by paying premium equal to 2% of the sum insured in case of wheat, paddy and millet and equal to 1% of the sum insured in case of oil seeds and pulses. The Central and State Governments met the claims for crop failure in the ratio of 2:1.

The scheme had been in operation since 1985. However, the experience was rather disappointing. The annual claims paid were more than the premia received. Claims filed in many cases were found to be fraudulent. There was no satisfactory criterion for assessment of loss. Payment of claims by the Government was considered by many as an unnecessary burden. A World Bank study on crop insurance in India dubbed the scheme as only a vote catching device.

Despite the unsatisfactory operation of the 'Comprehensive Crop Insurance Scheme', the Government extended the crop insurance scheme to cover non-loanee small and marginal farmers, on experimental basis, with effect from the rabi season of the year 1997-98. During the year, 1999, the Government replaced the 'Comprehensive Crop Insurance Scheme' by another scheme called 'National Agricultural Insurance Scheme'. This scheme covers all farmers—large or small, loanees or non-loanees and

also all food crops as well as horticultural and annual commercial crops and oil seeds. Among the annual commercial crops at present, seven crops namely, sugarcane, potato, cotton, ginger, onion, turmeric and chillies are being covered. Small and marginal farmers are entitled to a subsidy of 50% of the premium charged, to be shared equally between the Central and the State Government. The premium subsidy will be phased out over a period of five years.

The scheme, at present, is being implemented by the General Insurance Company. Upto Kharif 2004, 58945844 farmers had been covered by the scheme. Upto the same period, crops worth Rs. 52762.9 crore had been insured. For Kharif 2004 proper, 12737279 farmers were insured, 271.3 lakh hectares of area were covered and crops were insured for a sum of Rs. 12464.6 crore. At present, (March 2005), the scheme is being implemented in 23 states and two union territories.

#### **Self check exercise**

**Q11. What are the measures adopted by Indian Government to deal with uncertainty?**

**Q12. What is comprehensive crop insurance scheme?**

#### **2.4.8 Suggestions to deal with uncertainty:**

The Government can also adopt some other measures to reduce uncertainty. Better irrigation facilities can be provided. This will reduce the uncertainty caused by uncertain rains. Encouragement of the use of insecticides, etc., can also ensure a more certain crop. Development of drought-and disease-resistant crops can be another step to reduce uncertainty.

Assurance of security of tenure to the tenants will reduce the tenurial uncertainty. If it is ensured by the Government that a reasonable compensation will be given by the landowner to the tenant if the latter is made to leave the land before the stipulated period (if such a period has been stipulated) without any justification, it will be more conducive to agricultural development. Further, an assurance that whenever, he leaves the land at the end of his stipulated tenure, he will be compensated for the permanent improvements in the land, made by him, will also encourage investment in land. Fixation of fair rent is also suggested as another measure to ensure stability with regard to tenurial arrangements.

If all the above measures are adopted, the resource allocation will improve. However, it may be noted that these measures will never be able to eliminate the uncertainty in agriculture completely. Only its impact will be considerably reduced.

#### **2.4.9 Summary**

In this lesson we have discussed the meaning of risk and uncertainty, types of risk and uncertainty. We talked about factors responsible for risk and uncertainty. There are so many ways by which these can be reduced, like insurance is one of the important measures. If prices are stable, there is full availability of resources then uncertainty can be reduced. In India the Government is adopting different measures to deal with

uncertainty. Farmers also try their level best to reduce there uncertainties at their own, only overnment alone can not solve this problem.

**2.4.10 Glossary**

- **Voluntary :** when it is upto a person whether he wants to do something or not.
- **Compulsory:** A person has to do something whether he wants to do something or not.
- **Yield:** Total production or output
- **Tenurial:** assigned time period

**2.4.11 Short answer type questions**

- a. Write a note on uncertainty
- b. What are the types of risk and uncertainty?
- c. Differentiate between risk and uncertainty?
- d. What are the types of crop insurance?

**2.4.12 Long answer type questions**

- a. Discuss the types of risk and uncertainty.
- b. What are the different measures to deal with uncertainty?
- c. What is the government doing to deal with uncertainty in India?

**2.4.13 Suggested Readings**

1. Leading issues in Agricultural Economics, R. N. Soni.
2. Agricultural Economics, R. K. Lekhi and Joginder Singh.
3. Indian Economics, Ruddar Dutt and Sundaram.

**INSTABILITY OF AGRICULTURE**

- 2.5.1 Introduction**
- 2.5.2 Objectives of the lesson**
- 2.5.3 Types of instability**
- 2.5.4 Causes of instability**
- 2.5.5 Measures to stabilise agricultural prices and income**
- 2.5.6 Summary**
- 2.5.7 Glossary**
- 2.5.8 Short answer type questions**
- 2.5.9 Long answer type questions**
- 2.5.10 Suggested Readings**

**2.5.1 Introduction**

Instability of agriculture is mainly a problem of the developed economies. This implies fluctuations in prices, income and output obtaining in the agricultural sector when viewed over a long period. It will be wrong to say that the industrial sector does not experience any instability in terms of these variables. Both the agricultural and the industrial sector of an economy, on many occasions, have been found to face the fluctuations in prices, income and output in the same direction simultaneously. However, the intensity of these fluctuations has been greater in the agricultural sector when compared with that in the industrial sector. Further, in many cases, these fluctuations have also occurred in the agricultural sector due to causes connected with the biological nature of agriculture. As a result, the governments of developed countries, have been paying special attention to the problem of instability in agriculture.

**2.5.2 Objectives of the lesson**

In this lesson we will discuss what are the types of instability, what are the reasons behind this instability and how instability can be removed.

**2.5.3 TYPES OF INSTABILITY IN AGRICULTURE**

Instability in agriculture is mainly of two types namely :

- (i) instability in prices
- (ii) instability in income.

There is in fact, a third variable, *i.e.*, output. No doubt, due to certain reasons, there may be fluctuations in output also over time but fluctuations in output in agriculture, in developed countries have been considerably less violent when compared with those in the non-agricultural sector. we may further note that though instability

in agricultural prices and instability in agricultural income are- being discussed separately these are not independent of each other. Generally, in agriculture, due to relative stability of agricultural production in physical terms, agricultural prices and agricultural incomes move in the same direction. Price fluctuations will lead to the fluctuations in the income in the same direction.

### 2.5.3.1 PRICE INSTABILITY

Before we explain why agricultural prices fluctuate more violently than the prices of industrial products, it is desirable to know how the farmers suffer because of price instability.

- (i) fluctuations in agricultural prices will not allow the farmer to have efficient crop planning. The crop pattern cannot be changed in mid season because of the biological nature of the crops. The *ex-ante* efficient crop plan may turn out to be most inefficient *ex-post* crop plan due to price fluctuations.
- (ii) Sometimes, in order to guard against price fluctuations in various crops, the farmers may resort to measures like diversification of crops, or flexibility in the productive process. All this will involve extra cost or reduce income.
- (iii) Further, fluctuations in agricultural prices will ultimately result in fluctuations in the income of the farmers. This will mean a fluctuation in the standard of living of the farmers from time to time.
- (iv) Moreover, the impact of price fluctuations in the agricultural sectors is not confined to the agriculturalists alone. Their effect can spill over into the non-agricultural sectors as well. Higher prices of agricultural products—both food and fibre—will, other things remaining the same, adversely affect the profits and therefore, the growth of the non-agricultural sector. If, on the other hand, prices of agricultural products fall, though the non-agriculturalists will gain, agriculturalists will suffer. This, in turn, will not only disturb the flow of products and inputs between the two sectors, but also their relative fortunes.

Prices of agricultural products are more unstable than those of the Industrial Products. An important point to note with regard to price instability in agriculture is that the same forces, other things remaining the same; cause more violent fluctuations in agricultural prices than in the prices of non-agricultural products.

The reason for relatively greater price fluctuations in case of agricultural products lies in the nature of their supply and demand. The supply as well as the demand for most of the agricultural products is relatively less price elastic. Therefore it is necessary to know the reasons why supply and demand for agricultural products is relatively less price elastic.

**(a) Demand for Agricultural Products:** The agricultural crops can be divided into two categories for analysing their demand, namely, the food crops and the fibre crops. So far as food crops are concerned, it is obvious that people can not extensively vary their demand for such crops. Their intake is biologically determined. If people in a

country have sufficient income and are already-consuming the food crops, in their basic form, as per biological requirements, any fall in their prices will not further increase their consumption. Similarly, people in such a country will continue to consume almost the same amount of these crops (in their basic form) when their prices rise simply because with their high level of income, they can easily pay higher prices for these crops. The price elasticity of demand for food crops, will be thus, quite low, especially in a high income country. And we should note here that the problem under discussion pertains mainly to well developed, high income countries.

Demand for fibre crops, no doubt, is more elastic than that for food crops. But still, price elasticity for most of these crops is less than unity in most of the developed countries. The reason is that most of the fibre crops are meant to meet the basic necessities of life and the demand for such products, at the given point of time cannot be very price elastic.

**(b) Supply of Agricultural Products**

There are many reasons for the low price elasticity of supply of agricultural products. Most important among these are:

- (i) Peculiar nature of costs:** This is one of the major reasons for inelastic supply of agricultural products and is, in fact, valid even for the supply of individual crops (though our focus in this analysis is on the aggregate supply). In the short run, production costs can be divided into two parts namely fixed costs and variable costs. The production continues, as we know, so long as the price, even if falling, covers the average variable costs. Now, in agriculture in developed countries, portion of its variable costs is quite small when compared with the fixed costs and therefore, the price of a crop even after a fall, may still cover its variable costs and the production of the crop may continue. In fact, we should consider another important point regarding variable costs in agriculture and this is true for agriculture in both developed and under-developed countries. Production of a crop is spread over a span of time. As time passes, variable costs turn into fixed costs.
- (ii) Biological nature of the production process:** Whereas the distinction between fixed costs and the variable costs explains why no attempt is made to reduce the supply of a crop after it has been once sown when its price falls, the biological nature of the crop explains why its production cannot be increased when its price rises, especially during a season. If, once the crop has been sown and prices start rising, it may not be possible to bring more area under cultivation during that season simply because the climate suitable for the sowing of that crop is no longer there.
- (iii) The Market Structure:** Market structure obtaining in agriculture also

makes the supply of individual crops or of all crops taken together, inelastic, for one season or a period covering more than one season. There is a large number of agricultural producers, these producers are not in touch with each other and there are no, as Schultz says, marketing organisations of the farmers. The result is that any change in demand for a crop fails to bring about a co-ordinated response so far as changes in its supply are concerned. Prices of a crop, therefore, fall (or rise) significantly, if the demand for it falls (or rises). In Industry, due to oligopolistic market structure and the existence of producers' organisations, supply responds more effectively to changes in demand. The prices, therefore, do not change much.

- (iv) ***Inflexibility in the total area under cultivation:*** There is yet another reason for the inelastic supply of agricultural products as a whole, especially when all the agricultural prices rise simultaneously. If we look at the production of one single crop beyond a season, its production will, no doubt, rise when its price continues to rise. The increase in its production will take place through a diversion of land to this crop, from other crops. However when prices of all crops rise simultaneously, aggregate agricultural production will not rise significantly even though some inter-crop diversion of land and, therefore, a change in the composition of crop-mix may take place. The aggregate agricultural production will almost remain unchanged simply because the supply of land which is the basic source of all agricultural production in a country is fixed.
- (v) ***Immobility of labour, especially during depression in the industrial sector:*** land under cultivation (and therefore the supply of agricultural crops) generally does not increase when the prices of all crops increase simultaneously. As a matter of fact, land under cultivation neither increases nor decreases. It does not increase simply because additional land is not available for cultivation. But the question still to be answered is: what prevents it from going out of cultivation when the prices of all crops fall simultaneously?

Before we answer this question, we should note that such a simultaneous fall in the prices of agricultural products, in a developed economy, normally occurs only when the industrial sector passes through a phase of depression. During depression, low level of production in the industrial sector, reduces the demand for fibres and the increase in unemployment also reduces the demand for foodgrains.

### **2.5.3.2 INCOME INSTABILITY**

On the face of it, it may appear that a change (rise or fall) in agricultural prices may also result in a change (rise or fall) in income of the farmer or in other words, one may say that price instability may also result in income instability. For example, if the demand for agricultural products, in general, rises (or falls), but the supply conditions remain unchanged, prices will rise (or fall) and the total income will also rise (or fall). Similarly, if

the supply of agricultural products increases due to some reasons but the demand conditions remain unchanged, prices will fall and if the demand for agricultural products is inelastic (as we have assumed so far), fall in prices will result in fall in income also. Even if this is generally the case, there are situations in agriculture when income may change, without there being a simultaneous change in prices. Or, in other words, agricultural sector may experience an income instability, without price instability. For example, a situation can arise where both demand and supply for agricultural products fall or rise simultaneously, and also by the same amount. The prices in such cases may remain unchanged but total income of the farmers will fall or rise. This can happen, for example, when at the time, the economy is passing through a phase of depression, resulting in a fall in demand for agricultural products, there is a drought and a resultant decline in the agricultural production. Similarly, one can visualise a condition of general boom accompanied by an unexpected kindness of the weather gods.

There is yet another reason for referring to the instability of income separately because while some measures taken to stabilise income, also help in stabilising prices, some others, like direct income transfer measures, are not expected to affect the prices at all. Again, when a particular measure affects both prices as well as income, its adoption for ensuring complete price stability may not always lead to complete income stability and vice versa. Its impact on fluctuations in prices and income can differ in extent and sometimes even in direction.

The difference in the impact of changes in market forces on prices and on income and also the difference in the impact of any regulatory measure on the fluctuations in prices and income, as referred to above, make it necessary for the policy makers to treat income stability and price stability as two separate objectives. As in case of price fluctuations, the income fluctuations too, have been wider in the agricultural sector than in the non-agricultural sector. Table 1 given by Schultz clearly illustrates this.

TABLE 1

Net income Per Head of Agricultural Population		Net Income Per Head of Non-Agricultural Population	
Period	Percentage change from the first to the last year of the period	Period	Percentage change from the first to the last year of the period
1911-19	+ 160	1911-20	+ 88
1919-21	-62	1920-22	-18
1921-29	+ 87	1922-29	+ 22
1929-32	-67	1929-33	-52
1932-37	+ 153	1933-37	+ 59
1937-38	- 19	1937-38	-7
1938-43	+ 213	1938-43	+ 101

**Self check exercise****Q1. What are the types of instability?****Q2. Explain income instability in agriculture.****2.5.4 Causes of Instability**

We will discuss the causes of price instability or income instability in agriculture. And we can consider both of them together as the factors responsible for these are the same (though the impact of these factors is not the same for prices and income).

Factors responsible for fluctuations in agricultural prices and incomes are many and varied.

**(i) Long Term Movements :** Long term movements in prices or income are caused by factors which continue to operate for a considerable period after they appear. These factors bring about a basic change in supply or demand conditions. These factors include change in population in the country, opening of new markets, development of new technology, etc. The changes caused by these factors are generally of a permanent nature and generally no attempt should be made to suppress their impact on prices or incomes. However, attempts should be made to dilute their impact if the changes caused by them are sudden.

**(ii) Cyclic Fluctuations :** Though a trend (long term fluctuations) does not show sudden and sharp turns, the cyclic fluctuations do reveal some sort-of regular up and down movements around the trend. Most of these fluctuations in the agricultural sector are in fact, a spill over of the fluctuations in the industrial sector, caused by trade cycles. It is felt that due to some changes inherent in the capitalistic system of production, these changes occur, in the first instance, mainly in the industrial sector. One cycle of these fluctuations generally covered a period of 6 to 9 years before 1939. However, in the post-war period, due to various fiscal and monetary measures, their intensity has been reduced and their duration has been cut short.

As the industrial sector depends upon the agricultural sector for the supply of raw material and wage goods, any fluctuation in production in the industrial sector will affect the demand for agricultural products in the same direction. As the supply of agricultural products is rather inelastic, change in their demand conditions will bring about still greater fluctuations in the prices and incomes of the farmers.

It will, however, be a mistake to say that no fluctuations of cyclic nature ever emanate in the agricultural sector itself. We often come across changes of a cyclic nature in live stock production, particularly pigs and poultry, and a cycle of production in case of some vegetables, fruits etc. The length of a cycle in production is governed by the biological characteristics of the product.

**(iii) Seasonal Fluctuations :** The seasonal fluctuations too, affect the ultimate fluctuations in income and prices as these appear in the agricultural sector.

Agriculture is a seasonal industry in the sense that a crop is sown only in a particular season of the year and one has to wait for a year to have a similar crop again. This interval obviously means that conditions of supply of a crop are not uniform throughout the year. There may be excessive supply of the crop immediately after harvesting and it may taper off as the time passes. As demand conditions for quite a number of crops, *e.g.*, the food crops are likely to remain stable throughout the year (other things remaining the same), the changed supply conditions will obviously affect the prices and the income of the farmers during the course of the year.

- (iv) **Annual Fluctuations** : Annual fluctuations refer to the variations in production (and the consequent changes in prices) of certain agricultural products which take place rather in a regular manner. Such fluctuations are generally experienced in case of tree products. It is for common knowledge that, other things remaining the same, power of a tree to bear fruit in a particular year is determined by the size of production in the preceding year. We may note here that generally price fluctuations in this case, run counter to fluctuations in production.
- (v) **Irregular Fluctuations**: These fluctuations have no system about them. These appear in the agricultural sector because, of irregular changes in the supply or demand, for the agricultural products. The factors responsible for such fluctuations are, *e.g.*, drought, floods, pests and diseases, speculation in agricultural products.
- (vi) **Fluctuations due to the operation of cobweb theorem** : Operation of cobweb theorem, in fact, explains an other type of cyclical fluctuations in prices and output of certain products in agriculture. According to this theorem, some cycles are caused by the tendency of producers to base tomorrow's production plans on the profits of current or recently past operations. For example, if poultry production is relatively low and poultry prices high in period I, people in the poultry business will look at their favourable earnings in the past and plan a larger production. But the intended expansion will take some time, so in period 2, after the appropriate time-lag, the increased production will come on to the market and may cause the prices to fall due to the increase in supply. The low prices in turn cause producers to plan reduced production, but this again takes time. Thus, in period 3, supply shrinks and prices rise and the cycle starts all over again.

Diagrammatic expression of the fluctuations in Agriculture, Fig. 3. shows some of the fluctuations described above. (The diagram shows fluctuations in prices only).

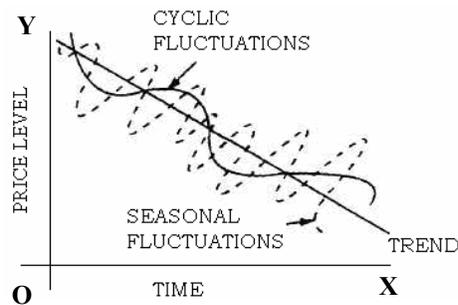


Fig. 1. Different types of fluctuations in agriculture.

In the diagram, only three types of fluctuations have been shown, namely the long term movements, cyclic fluctuations and seasonal fluctuations. With regard to cyclic fluctuations, we may note that one cycle generally covers a much smaller period than a long term fluctuation. A seasonal fluctuation is a regular fluctuation like a cyclic fluctuation but occurs many times within a period covered by a full cycle.

#### Self check exercise

- Q3. What are the reasons of instability of agriculture?**  
**Q4. Write a note on annual fluctuations.**

### 2.5.5 MEASURES FOR STABILISING AGRICULTURAL INCOMES AND PRICES

The measures that can be adopted to overcome instability in agriculture can be broadly grouped under two categories namely:

- (1) State or National level measures.
- (2) Farm Level Measures.

#### 2.5.5.1 State or National level measures.

There is a long list of measures which can be undertaken by the government of a country to deal with instability in agriculture.

**(a) Buffer Stock Scheme:** Buffer stocks are those stocks which do not form the direct sources of supply of the commodity in question, for normal trade channels. These are kept, on the other hand, in reserve by an organisation, generally the government, and are operated with a view to influencing not only the supply of but also the demand for the commodity in question. If for example, the government feels, due to some reasons, that the supply of a commodity in the market is less than what it should be, it may sell a part of its buffer stocks to make good that shortage. If, at an other time, it feels that the supply of the commodity emanating from the private sources is more than what should actually go to the consumers, it will itself purchase a part of the produce supplied by the producers, thereby adding to the demand for the commodity. The buffer stocks, will thus be fluctuating in amount from time to time, sometimes increasing and on other occasions, decreasing.

In actual practice, buffer stock scheme has certain limitations. For example, the scheme is meant to deal with the prices of individual commodities. If the general

price level is changing due to depression or boom, it will be a mistake to depend upon this scheme. Such a dependence will not only be quite costly but also be administratively unmanageable and in fact will not at all deal with the basic causes of the problem. Further, some sort of a monopoly procurement scheme and a limit on the stocks to be held by the producers as well as the traders and even the consumers is essential if the buffer stock scheme is to be successful. If these limits are not imposed, these people can freely sell or buy the commodity in the market and can easily neutralise the impact of action taken by the buffer stock authorities on prices/income.

**(b) The Price Insurance Scheme**

Such a scheme was introduced in Holland in connection with the price stabilisation programme for vegetables. Under this scheme, a minimum price of the vegetable is set. In case, on any day, the prevailing price tends to fall below this (minimum) price due to excess supply, the surplus produce at this price is withdrawn from sale and is either sent to schools or if necessary, destroyed. For the surplus so withdrawn, the producers concerned are paid at the minimum price. To finance this payment, a small levy is imposed on the whole produce that is sold. The scheme is thus self-financing. As the scheme is to be self-financing, if it is found that the levy imposed cannot compensate the producers at the minimum price, the minimum level of the price itself is lowered. Even if, at times, it is felt that such a minimum level does not cover the whole cost of production, it can still instil confidence among the producers and encourage them to invest more in agriculture.

**(c) The Deficiency Payment Scheme**

Under this scheme, the government determines the average price of a crop received by the farmers and pays each farmer the difference between this average price and the minimum guaranteed price if the former is less than the latter. This, in other words, implies a price stabilisation only from the point of view of the farmers. So far as the general consumers are concerned, they pay according to the prices determined by the market forces. In the market, the prices are allowed to fluctuate.

**(d) Forward Prices**

These have been used as another method to ensure price stability. Under this scheme, the farmers are told in advance, the price that they would receive for a particular crop at the hands of the Government authorities if they sell the crop to it. In other words, this becomes the minimum price which the farmers must receive. If the prices in the market happen to be higher than the forward prices, the benefit will go to the farmers. This scheme has been in force in most of the developed countries like U.S.A., U.K., Canada etc.

**(e) Crop Insurance Scheme**

Such a scheme aims at stabilising the income of the farmers in case of crop failure. The details of the scheme can vary but one common principle is that in lieu of a certain premium by the farmers, the farmers will be compensated, in case of crop

failure, at a predetermined price. The scheme has not been a success in any country so far. The main objection against this scheme is that this may favour the inefficient farmers more than the efficient ones. Administratively too, such a scheme may be unmanageable.

**(f) Direct Income Transfer Schemes**

Some economists like Schultz and Swerling are of the view that if income stabilisation is the goal and an attempt is made to achieve this goal by actions affecting market prices, it will result in distortions, inefficiencies and probably in failure to improve significantly, the lot of the farm people. The main functions of price mechanism are allocation of resources, channelising of products into various uses and distributing the income over various factors of production. Stabilising of income through price mechanism is simply to overburden the price mechanism. Price mechanism is not meant for stabilising income.

**(g) Control of the General Fluctuations**

Much of the instability in agriculture in developed economies is caused by the operation of trade cycle which generally originate in the developed industrial sector of these economies. Fiscal and monetary measures undertaken to iron out the fluctuations in the industrial sector will considerably reduce the fluctuations in the demand for agricultural products. A more stable demand for these products from the industrial sector will obviously reduce the fluctuations in their prices as well as in the income of the farm sector.

**(h) Other measures**

Other measures at the national level, suggested for stabilising prices or income include regulation of agricultural production as well as of imports and/or exports of agricultural products. Yet a few other measures can be taken at the national level for reducing erratic fluctuations in production. These include provision of irrigation facilities to the farmers, use of soil moisture conservation practices in water stressed areas, afforestation and plantation of perennial grass etc.

**2.5.2 Farm Level Measures**

The measures that have been described above are to be undertaken by the state or the society. However, the farmer too, can take up some measures for stabilising production and through that can control, at least, those fluctuations in the prices of the products and his income which emanate from the changes in production of agricultural crops. Following are some of such measures :

- (1) Stabilisation of output through the raising of drought and disease resistant crops, use of dry farming techniques and through better irrigation facilities like tube wells and other minor irrigation projects, use of pesticides and herbicides etc.
- (2) Use of machinery, especially tractors, to keep the area under a crop at a constant level when bullock labour cannot be used for sowing the crop due to wet season.
- (3) Diversification of crop production. Proper and well thought out diversification will definitely reduce instability of income because failure of one crop after diversification

will affect only a part of the total income. However, there is one drawback in this step. The total income itself, even under normal conditions (after diversification) may settle at a lower level when compared with the pre-diversification situation due to the introduction of relatively less remunerative crops.

- (4) Flexibility in cost and output etc. can be another measure that can be adopted in connection with instability. However, we should note that this measure is not meant to stabilise production. Rather, it provides a mechanism for adjustment in production and/or costs for minimising the impact of fluctuations in prices or income, in case, these take place.

#### **Self check exercise**

**Q5. What are the limitations of buffer stock system?**

**Q6. Explain farm level measures.**

#### **2.5.6 Summary**

In this lesson we have discussed the factors which are responsible for instability in agriculture, types of instability and the measures by which it can be checked. The above measures, if adopted judiciously, will create more stable conditions for the agricultural sector. However, these measures will only iron out short term fluctuations (both regular as well as irregular) in prices and incomes. These cannot be used for increasing the incomes of the farmers over time. Their effect, if any in this direction, will only be indirect.

#### **2.5.7 Glossary**

Fluctuations	:	when something keeps on changing
Immobility of labour	:	When people do not shift from one place to another
Cycle	:	In economics there are four parts of a cycle namely boom, recession, depression and recovery.

#### **2.5.8 Short answer type questions**

- What are seasonal fluctuations?
- Write a short note on long term movements.
- Write down the name the types of instability.
- Write down two causes of instability.

#### **2.5.9 Long answer type questions**

- What are the reasons of instability of agriculture?
- Which type of measures can be adopted to check the instability in agriculture?

#### **2.5.10 Suggested Readings**

Leading issues in Agricultural Economics, R. N. Soni.  
 Agricultural Economics, R. K. Lekhi and Joginder Singh.  
 Indian Economics, Ruddar Dutt and Sundaram.

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**Essay Type Questions**

1. Discuss the nature and scope of Agricultural Economics.
2. "Agricultural Economics is an applied phase of the social science of economics in which attention is given to all aspects of problems related to agriculture". Discuss.
3. What do you know about the role of Technological and Institutional factors in the development of Agriculture?
4. Write short notes on:
  - (a) Role of Irrigation in agricultural development.
  - (b) Role of Marketing in agricultural development.
  - (c) Role of Government in the development of agriculture.
5. What do you know about the interdependence of agriculture and industry?
6. Industrial development in an economy depends on the development of agriculture. Discuss.
7. For the development of industries, we should first develop agriculture. Do you agree? Give arguments in support of your answer.

8. What do you know about agricultural economics?  
Distinguish between agriculture and industry. Write an essay on the nature of agricultural economics.
9. Explain the nature of input-input relationship in agricultural production and show how farmers choose optimal combination of inputs.
10. What is production function? How are the TPP, APP and MPP related? Discuss with suitable diagrams.
11. Explain clearly the various facets of production decision problem e.g. Choice of Technique, Choice of Product, etc.
12. What are the different measures to deal with uncertainty.

**Short Answer Type Questions**

- (a) Define agricultural economics.
- (b) Distinguish between agriculture and agricultural economics.
- (c) Distinguish between agriculture and industry.
- (d) Define backward agriculture.
- (e) Write a note on poverty and agricultural development.
- (f) Write a note on Education (literacy) and agricultural development.
- (g) Price stability also provides stability in agriculture. How?
- (h) Write down Kuznet's categories of contributions of agriculture in economic development.
- (i) What are cyclical fluctuations?
- (j) What are the types of risk and uncertainty?

**Short Notes on:**

- (i) Sources of capital to industrial sector from agricultural sector.
  - (ii) Disguised unemployment as a source of capital formation in industry.
  - (iii) Agriculture and industry are markets for each other.
  - (iv) Contribution of agriculture in international trade in developing economy.
  - (v) How are higher living standard of farmers and supply of consumer goods by the industrial sector interrelated?
  - (vi) What is production function? State the Cobb-Douglas Production Function.
  - (vii) What are increasing and decreasing returns to scale.
  - (viii) Define the slope of iso-product curve and explain its economic meaning.
  - (ix) Show the nature of iso-product curves, when two inputs are perfect substitutes and perfect complements.
  - (x) Distinguish between production and productivity.
  - (xi) Distinguish between factor substitution and production transformation.
  - (xii) What are the concepts of MRTS and MRPT?
  - (xiii) Uncertainty
  - (xiv) Types of Crop Insurance.
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