UNIT II

AGRICULTURAL PRODUCTIVITY:

Agricultural productivity is measured as the ratio of agricultural outputs to agricultural inputs. While individual products are usually measured by weight, their varying densities make measuring overall agricultural output difficult. Therefore, output is usually measured as the market value of final output, which excludes intermediate products such as corn feed used in the meat industry. This output value may be compared to many different types of inputs such as labour and land (crop yield). These are called partial measures of productivity.

Agricultural productivity may also be measured by what is termed total factor productivity (TFP). This method of calculating agricultural productivity compares an index of agricultural inputs to an index of outputs. This measure of agricultural productivity was established to remedy the shortcomings of the partial measures of productivity; notably that it is often hard to identify the factors cause them to change. Changes in TFP are usually attributed to technological improvements.

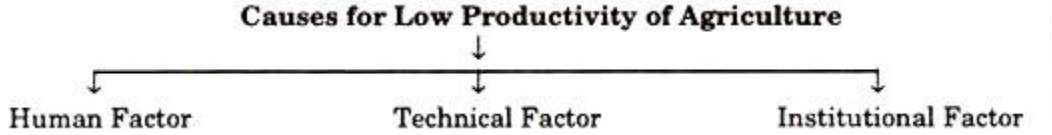
Agricultural productivity is an important component of food security. Increasing agricultural productivity, especially amongst small holder farms, is an important way to decreasing the amount of land needed for farming and slow environmental degradation through processes like deforestation. Since agriculture has such large impacts on climate change, Project Drawdown described "Sustainable Intensification for Smallholders" an important method for Climate change mitigation.

Causes of the Low Productivity of Agriculture

1. Human Factors:

Human favors are those which are related to training and efficiency of the farmers.

(i) Social atmosphere:



Social climate includes customs and traditions. Indian farmer is illiterate and has no knowledge for latest techniques of production. He believes in God and

fatalist in thought. He wastes money on customs and traditions. So social climate is not suitable for agriculture.

(ii) Pressure of population on land:
Heavy pressure of population is the main cause of low productivity of Indian agriculture. In 1901, 16.30 crore people were dependent on agriculture. The number has gone up to 58.80 crore. So per capita cultivable land had reduced from 0.43 hectare to 0.23 hectare. Heavy pressure has led to subdivision and fragmentation of land holdings.

2. Technical Factors:
Technical Factors include techniques and methods of production:

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2. Technical factors:Technical factors include techniques and methods of production:

(i) traditional methods of cultivation:

Traditional methods of cultivation like manual ploughing, two crop pattern and old system of irrigation are mainly responsible for low productivity of agriculture.

(ii) old implements:

Traditional equipment's like wooden ploughs, sickles and spades are commonly used. Tractors & combines are not so common in use. Due to the use of these old implements agriculture is backward.

(iii) insufficient irrigation facilities:

Indian agriculture is mainly dependent on rain. Even after 60 years of independence only 40% of the agricultural land has permanent irrigation facility. Due to improper irrigation facility, farmer can produce one crop only in a year.

(iv) problems of soil:

Indian soil has many problems like soil erosion, water logging, nitrogen deficiency and swamps. These are the reasons for low productivity of agriculture.

(v) problems of pests and diseases of crops:

Plant diseases like rust and smut and rats, insects and pests destroy large portion of crops.

(vi) feeble cattle:

Due to limited mechanisation of indian agriculture, cattle has significant place in agriculture. Cattle are generally weak. Farmer has to spent a lot on these cattle farming is more time consuming and expensive than tractor. So these also increase the cost of agriculture.

(vii) lack of credit facility:

Credit facilities are inadequate in rural areas. Farmers can not be able to raise credit from rural banks easily. They have to depend on ‘mahajans’ and ‘shahukars’. These money lenders charge heavy rate of interest. Farmers have to sell their produce at low price to these money lenders. So farmers have low income and thus low productivity.

(viii) lack of high yielding variety (hyv) seeds:

Hyv seeds are not commonly used. Farmers do not understand their significance. They cannot afford to buy them and also these seeds are not easily available.

(ix) improper marketing:

Improper marketing is a significant factor for low productivity of agriculture. Farmers fail to get suitable price for their produce. Inadequate means of transport forces the farmers to sell their produce to local money lenders at low prices. Due to lack of warehousing facilities, farmers can not able to store their produce when prices are low. So these attribute a lot for low productivity of agriculture.

3. Institutional factors:

Institutional factors include land holdings and land system.

(i) small size of farms:

Land holdings in india are of very small size. Average size of holding is 2.3 hectare and 70% of the holdings are even less than 2 hectares. These holdings are fragmented. Due to these small holdings, mechanised cultivation is difficult. Implements and irrigation facilities are not properly utilized. It affects indian agriculture .

(ii) defective land tenure system:

Zamindari system has been an important factor responsible for the low productivity of indian agriculture. In this system cultivator is not owner of land. Zamindar is the owner of land and he can evict the tenant any time. So

the cultivator does not take interest in the development of land and zaminder does not take interest in the development of cultivation. Though zamindari system was abolished after independence yet the position of cultivator has not improved.

Measures for developing the Agricultural sector in India

Since the dawn of independence, several steps have been taken to develop the agricultural sector of the country. The major break through has been achieved in food grains production.

The production of food grains which was 550 lakh tonnes in 1950 substantially moved to 1991 lakh tonnes in 1995. However, the various measures employed from time to time can be discussed as: The various technical measures employed to develop agriculture are as under:

1. Multiple Cropping:

Multiple cropping aims at maximizing production per unit of land and per unit of time by taking three or four crops in a year. By adopting multiple cropping, there are two advantages as of getting increased returns and economy of the farm resources.

2. Expansion of Irrigation Facilities:

Irrigation facilities have increased manifold over time. Several, minor, medium and major irrigation projects have been launched in the country. At the inception of First Five Year Plan, India had only 18% of total irrigated area which at present increased to about 33.9 percent.

Moreover, dry farming has also been introduced in those areas where means of permanent irrigation cannot be installed. In 1994-95 the country witnessed total irrigated area of 876 lakh hectares.

3. Use of HYV Seeds:

HYV seeds have absolutely revolutionized Indian agriculture by increasing yield per acre. Among these, mention may be made of dwarf varieties of wheat PU-18, Kalyan Sona 227, Sona Lika, Hybrid maize, Vijay, Rice I R-8, Jhona 351, Padma and Jaya etc.

4. Plant Protection:

Considerable efforts have been made to protect the crops from the insects and pests. For this purpose, 14 Central Plant Protection Centres have been set up by the Govt.

5. Scientific Methods of Cultivation:

In the planning period, stress has been laid on the scientific methods of cultivation. It has been emphasized to adopt superior agricultural technology in respect of crop rotation, selection of quality seeds, use of proper manure, treatment of soil, selection of crops etc.

In this regard, Govt has initiated Intensive Agricultural Area Programme. Moreover, several Agricultural research centers and universities have also been established.

In this regard, Haryana Agricultural University Hissar, Punjab Agricultural University Ludhiana, Himachal Agricultural University Palampur, ICAR, Delhi is playing a pioneer role to develop agriculture.

6. Use of Mechanization:

Mechanization is another noteworthy step employed to develop agriculture. Small farmers are assisted with cheap credit facilities through co-operative societies, community development blocks to purchase machinery and other modern equipments.

7. More Use of Chemical Fertilizers:

Use of chemical fertilizers has also contributed significantly to the growth of agricultural output. Several steps have been taken to encourage the use of cow-dung as manure rather than as fuel.

In 1950-51, 0.13 million tonnes of chemical fertilizers was used which in 1980-81 increased to 5.52 million tonnes and further to 12.54 million tonnes in 1990-91. In 1995-96, the use of chemical fertilizers was recorded to the tune of 15.7 million tonnes.

8. Development of Agricultural Land:

Efforts have been made to develop agricultural land during the five year plans. Major success has been achieved in the leveling of land, terracing of fields and contour building. Land surveys are also being conducted.

9. Animal Husbandry:

Animal husbandry has assumed a much broader role in the overall agricultural development. Presently, this sector accounts for 25% of gross value of agricultural output. India's vast livestock population offers tremendous potential for meeting domestic demand for milk, egg, meat, wool, etc.

10. Land Reforms:

In a bid to increase agricultural productivity, land reforms are of immense use. Since the dawn of independence, Govt, of India has undertaken several land reform measures. For instance, Abolition of zamidari system, Fixation of ceilings on Land Holdings, Consolidation of Land Holdings, co-operative farming etc.

Relationship between Farm Size and Productivity

The most important explanation advanced in this regard, is in terms of the low opportunity cost of family labour and the resultant variations in the amount of labour input used on different size classes of farms.

It is based on the argument that the smaller farms, characterized by peasant family cultivation, extend the input of labour right upto the point where the marginal product of labour is zero (i.e., point P in the accompanying diagram) or at least much below the ruling market wage rate. On the larger farms, the use of hired labour stops at the level (OC in the diagram) where its marginal product equals the market wage. Hence the smaller farms have higher.

Marginal Value Productivity and Labour Units

This argument (put forth by Sen) based on the low opportunity cost of family labour on small farms is not sufficient to explain the inverse relationship on the following grounds:-

(i) If the peasant family farming and capitalist farming (hiring bulk of its labour) co-exist, one can argue that the opportunity cost of peasant family labour is the wage that is determined in the market through the employment of labour by various capitalist farmers and that the peasant family will try to equalize its opportunity cost of work in self-employment and wage earnings. In other words, a small farmer will not consider his labour as available at zero price it the capitalist farms also exist in the region.

(ii) Peasant family farmers even at the bottom of the scale, hire labour at the margin and even derive income from employment of family labour in alternative occupations.

(iii) Inverse relationship holds even when the larger farms (i.e., the farms using mainly hired labour) alone are ranked.

(iv) There also exists strong empirical evidence that the opportunity cost of labour on the smaller farms is not significantly different from market wage rate.

Thus, the arguments based on the opportunity cost of labour is not sufficient to explain existence of inverse relationship.

Despite the fact that Sen's arguments suffer from certain lacunae, there is no denying the fact that the amount of labour used per acre on small farm is greater than that used on large farm. This has been empirically confirmed. Some economists like Prannov Roy, try to explain this inverse relation between farm size and productivity of by saying that this extra labour on small farms is used for increasing the cropping intensity of the small farms.

That is, more of the area of small farms is used for multiple cropping than that of large farms due to availability of more labour. Prannov Roy, infect, points out that if we look out that the yield per acre of a given crop on small and large farm, we find no difference in it on these farms.

But when we look at the gross value of output of an acre of small farm as well as that on a large farm, we find that an acre of small farm gives greater value of output because off higher cropping intensity (due to multiple cropping).

2. Khusro (1964) advanced the hypothesis that the productivity differences are due to differences in the fertility of soil. In order to prove his point he went a bit further. He pointed out that when land was "standardized" on the basis of land revenue ratings, decline in productivity per acre on large farms, was reduced significantly.

We may, however, point out that though his assertion about differences fertility may be acceptable, his process of standardization of land with the help of land revenue rates in order to substantiate his point, is open to question. Land revenue is a poor index of soil fertility because of man-made improvements in land after the land revenue had been fixed and also because of the non-economic considerations that go into its fixation.

3. It has also been proposed that larger farms may consist of land acquired through "distress sales"— the assumption being that the land so offered for sale is marginal land and hence of poor quality.

4. It has also been suggested that larger farmers may be treading off marginal profitability against leisure.

5. Larger farms may have more leased in land. If there are tenurial disincentives, productivity may be adversely affected. Soni's study also confirms this. He found that whereas the productivity on owner cultivated farms increased as their size increased, it decreased on tenant cultivated farms when their size increased.

6. Larger farms may have a smaller proportion of irrigated areas.

7. C.H. Hanumantha Roy and A.K. Sen have also advanced another reason for the higher productivity per acre on small farms. This is based upon the need of small farmers. The small farmer with a relatively smaller piece of land will try his best to get the maximum out of his land. Psychologically, he will be keen to put his best so as to meet as much of the requirements of his family as possible from his small farm.

Green Revolution And the Inverse Relationship:

The inverse relationship between farm size and productivity was claimed by many to be a confirmed phenomenon in traditional agriculture during 1950's.

Under the impact of the new technology which is essentially capital-based (compared with the labour based technology of the traditional agriculture), the productivity advantage hitherto enjoyed by the small farmers with relative abundance of family labour started moving in favour of the large farms which have relative abundance of land also a more easy access to capital.

There is strong evidence that after green revolution in India, the inverse relationship started yielding place to at least a 'constant' relationship if not a positive relationship between farm size and productivity.

Hanumantha Rao for example reached such a conclusion in 1975. He showed the weakening and even disappearance of the inverse relationship between farm size and output per acre by comparing the relationship under traditional technology during the fifties with that under new technology in the late sixties

in some districts of U.P., Punjab and Andhra Pradesh. Studies by Bhattacharya and Saini, Chadha and by Kapur and Kahlon, based on the data collected in the post green revolution era also showed that the inverse relationship was disappearing.

Sen and Rudra also reviewed this controversy in 1980 and they found that the inverse relationship got weakened or even disappeared in areas using new technology. Their conclusion was, "The negative relation may hold in certain parts of the country at certain time but not everywhere and not yet all times."

They also felt that even were the inverse relationship between size of the farm and the productivity was found to exist, it existed only in certain ranges. According to them, no conclusion that was based upon the data for one region should be considered as valid for the whole of the country.

Recently (1986) Madhusudan Ghosh has also confirmed that the inverse size-productivity relation is found to be reversed in areas undergoing technological change.

We may here refer to another study of Patiala District (Punjab) by Bagai and Soni. This study also confirms the above assertion. The authors found that green revolution had taken place only in one part of the District. Agriculture in the other region was still traditional in character.

They found that whereas productivity per acre increased as the size of the farm increased in the region where green revolution had taken place, it declined with increase in the size of the farm in the region where agriculture was still traditional.

They further discovered that relatively higher productivity per acre on large farms in the region where agriculture had been transformed was accompanied by a relatively greater use, per acre, of modern inputs namely fertilizers, other bio-chemical inputs and machinery.

Similarly it was found that in the region with traditional agriculture, the amount spent per acre on the modern inputs was smaller on large farms than on small farms.

In other words, according to the authors the common experience in both the regions was that it was the relative position of the modern inputs in the over-all input structure on the farms which determined whether the output per acre could increase or decrease as the size of the farm increased.

Returns to Scale and the Inverse Relationship:

Size-productivity relationship is essentially a relationship between output, on the one hand, and a single input i.e., land, on the other. From this relationship, some economists tried to draw inferences about the nature of returns to scale in India agriculture.

This however, is erroneous for, the returns to scale are indicated by sum of regission coefficients of all inputs (as in a Cobb-Douglas production function) and not by the returns to one single input, say, land. This is the reason why the conclusions based upon the analysis of the Farm Management data that the scene of Indian agriculture is ruled by declining returns to a single input (acreage) are perfectly consistent with the fact that constant returns to scale are found in Indian agriculture. These assertions have been confirmed by Khusro and Saini.

Policy Implications:

The controversy regarding the inverse relationship between farm-size and productivity is not simply an academic discussion but is of fundamental significance from the point of view of economic policy. The farm-size and productivity raise many issues.

The choice occurs between:

(i) small family- based “peasant farms”;

(ii) large-hired labour-based “capitalist farms” and

(iii) large farms with cooperative type of organizations.

Thus, policy implications will differ depending on whether we treat the inverse relationship as an indication of higher efficiency of small farms or regard it as reflecting conditions of distress of small farms.

If we accept the former position, then we would advocate that land should be transferred from larger and middle farmers to small farmers either through sales or tenancy as recommended by C.H. Hanumantha Rao or, one could argue like V.M. Dandekar that capitalist form of wage-labour organization will lead to inefficient aggregate output and peasant family system based on family labour is more suitable.

By and large it may be accepted that small farms of economic size are more efficient that large size farms. Promoting large farms would make small size farms weak in their competition against large farms and may create distress among them and may even lead to the disposal of small holdings in distress. This certainly swell the already large army of landless labourers in this country.

The debate on farms size and productivity is of immense importance for policy measures such as:

1. Ceilings of land holdings, redistribution of land and consolidation of holdings.

2. Subsidizing farm inputs for economically weaker sections of farmers.

3. Price policy formulation such that it provides incentives to increase the productivity.

4. Land tenancy, loosening and tightening of land lease market purchase and sale of land etc.

The impact of all these policies should be to encourage or discourage the size holdings on the basis of their relative productivities.

The Role of Modern Technological Inputs on Agricultural Development in India:

Over 50 years since its independence, India has made immense progress towards food security. Indian population has tripled, but food-grain production more than quadrupled: there has thus been substantial increase in available food-grain per capita.

Agricultural Development

Prior to the mid-1960s, India relied on imports and food aid to meet domestic requirements. However, two years of severe drought in 1965 and 1966 convinced India to reform its agricultural policy, and that India could not rely on foreign aid and foreign imports for food security.

India adopted significant policy reforms focused on the goal of food grain self-sufficiency. This ushered in India's Green Revolution. It began with the decision to adopt superior yielding, disease resistant wheat varieties in combination with better farming knowledge to improve productivity. The

Indian state of Punjab led India's green revolution and earned itself the distinction of being the country's bread basket.

The initial increase in production was centred on the irrigated areas of the Indian states of Punjab, Haryana and Western Uttar Pradesh. With both the farmers and the government officials focusing on farm productivity and knowledge transfer, India's total food grains production soared.

A hectare of Indian wheat farms that produced an average of 0.8 tons in 1948, produced 4.7 tons of wheat in 1975 from the same land. Such rapid growths in farm productivity enabled India to become self-sufficient by the 1970s. It also empowered the smallholder farmers to seek further means to increase food staples produced per hectare. By 2000, Indian farms were adopting wheat varieties capable of yielding 6 tons of wheat per hectare.

With agricultural policy success in wheat, India's Green Revolution technology spread to rice. However, since irrigation infrastructure was very poor, Indian farmer innovated with tube-wells, to harvest ground water.

When gains from the new technology reached their limits in the states of initial adoption, the technology spread in the 1970s and 1980s to the states of eastern India — Bihar, Orissa and West Bengal. The lasting benefits of the improved seeds and new technology extended principally to the irrigated areas which account for about one-third of the harvested crop area.

In the 1980s, Indian agriculture policy shifted to "evolution of a production pattern in line with the demand pattern" leading to a shift in emphasis to other agricultural commodities like oilseed, fruit and vegetables. Farmers began adopting improved methods and technologies in dairying, fisheries and livestock, and meeting the diversified food needs of India's growing population.

As with Rice, the lasting benefits of improved seeds and improved farming technologies now largely depend on whether India develops infrastructure such as irrigation network, flood control systems, reliable electricity production capacity, all season rural and urban highways, cold storage to prevent food spoilage, modern retail, and competitive buyers of produce from the Indian farmer. This is increasingly the focus of Indian agriculture policy.