CHAPTER TWO

PRODUCTIVITY IN INDIAN AGRICULTURE - A REVIEW

Introduction

In this chapter an attempt has been made to examine the importance and behaviour of agricultural productivity (yield per unit of land) in India. The factors which cause instability in Indian agriculture are also briefly examined, keeping in view the past studies made by different authors. The concept of agricultural productivity is also another theme of this chapter.

2.1 Growing Importance of Productivity in Agriculture:

Agricultural output can be increased by (1) bringing more and more land under cultivation, (2) cultivating the already cultivated land more frequently and (3) by increasing the yield per acre. The possibility of the first alternative (the extension of arable land) in India is extremely limited even at an exhorbitant costs. About 25% of the world's land (about 3.4 billion hectares) is thought to be of agricultural potential, out of which 1.4 billion hectares, 40% is being cultivated, and therefore, 2 billion hectares remain to be utilized.¹ But the

case is different in India. The net area sown in the country increased from 118.75 million hectares in 1950-51 to 142.80 million hectares in 1977-78, showing an increase of 20% only during the entire period. This has strongly demonstrated that the scope for horizontal expansion of land in the country is very limited. Alagh and Bhalla have rightly pointed out that "the task of accelerating growth rates in agriculture is becoming more difficult, given the fact that the total cultivable area in the country is virtually exhausted and it is consequently no longer possible to increase output substantially by increasing area alone". The study group of ICSSR has also stated in their report that accretion to cropped area as a source of agricultural growth has been largely exhausted and the future growth is to come mainly from increase in the productivity of land and the productivity growth has to come primarily through high yielding technological progress. What is of greater importance is that the area sown more than once by and large, has remained stagnant despite new technological innovations and extension of irrigation facilities. The area


sown more than once increased from 25.01 million hectares to only 29.50 million hectares showing an increase of 18% between 1970-71 and 1978-79.\textsuperscript{5} This marginal increase of area sown more than once is quite insignificant as compared to increase of population.

Therefore, the limited availability of land in the face of increasing population is a matter of serious concern. Besides, the growing urbanization, industrialization and growing need for housing facilities for growing population will aggravate the situation further in the future. Hence, effective utilization of limited land with modern technology is inevitable for increasing the volume of production.

In a labour surplus economy like India, the basic precondition for industrial development is the continued increase in agricultural productivity. Rising agricultural productivity according to W.A. Lewis supports and sustains industrial development in several important ways. Firstly, it releases surplus manpower from farm sector to non-farm sector. Secondly, it raises agricultural incomes, thereby creating the rural purchasing power needed for expanding the market for industrial products. Finally, it provides raw materials and food-stuff to the industrial sector.\textsuperscript{6} According to R.P. Christensen,

\textsuperscript{5} Ministry of Agriculture, "Agricultural Situation in India", April 1980, New Delhi, Vol. XXXV No.1, p. 44.

agricultural productivity is essential for the following reasons:

(1) To supply an economic surplus that can be consumed or used for further production in agriculture or transferred out of agriculture to provide capital for industrial growth and to meet the expanding consumption needs of the urban population.

(2) To make possible the release of labour and other resources for use in non-agricultural sector.

(3) To increase the purchasing power of rural people, expand markets for industrial goods and help bring about needed changes in the national income organization.

Thus agricultural development is essential not only for the rural economic development, but also for industrial expansion. It generates income, expands industrial market and thereby increases the tempo of economic growth.

Self-sufficiency in foodgrains is to be achieved by increasing both production and productivity in the agricultural sector. Rising imports of food and raw materials create certain problems for the national economy. It creates pressure on already meagre foreign exchange resources of the country, affects domestic production adversely and hurts the national pride and prestige in the international market. India imported 2,402 thousand metric tonnes cereals in 1982 as against 20,365 thousand metric tonnes imported

This amount of import caused heavy drainage of foreign exchange which otherwise could have been utilized for other productive purposes.

Rising productivity will go a long way in arresting inflationary tendencies which are associated with our economy with all its attendant evils. Productivity does not mean mere increase of output alone. It is primarily concerned with how to utilize the material and human resources in the most efficient manner to reduce cost. Thus it has double ways to prevent inflation.
(a) Firstly, it increases production which has supply effect,
(b) Secondly, it has cost effect, thereby reducing the cost of production.

"Productivity" in agricultural sector is highly essential for contributing to consumer's welfare. It increases the saving capacity of the rural poor, which can be reinvested in farm operations, further leading to a multiplier effect on national welfare, thereby it will enable to eradicate the sub-marginal farm units in the agricultural sector.

Realising the importance of agricultural productivity, Prof. Nicholls has emphasised that though the long term growth pattern of a country may be the development of industry, improvement of agricultural productivity should be used as the basis of

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Note: That was the second highest quantum of cereal import, first being China, among the low income economies. But in the case of food aid in cereal, India received the highest volume i.e. 416 thousand metric tonnes in 1982.
short-run economic planning in over-populated countries.9/

Substantial increase of agricultural products over domestic requirements is highly essential to yield export earnings for imports of essential equipment, technical know-how and industrial raw materials. "It is hardly a surprise that in the initial stages of growth of many presently developed countries", observes Simon Kuznets, "agriculture was a major source of exports and that the resulting command over the resources of the more developed countries played a strategic role in facilitating modern economic growth".10/

From the above, it is clear that in India, where a substantial number of population live below the poverty line with a high degree of inequalities of income, sustained and continued growth of productivity is a necessary condition for transforming the traditional sector to modernised sector, to sustain industrial sector and above all to increase the living standard of the rural poor.

2.2 Behaviour Pattern of Productivity in Indian Agriculture:

This section deals with the past studies on the nature and behaviour of agricultural productivity in India to find out the trends in productivity pertaining to certain major crops during

Several important studies have been made by different experts in this regard. Very old study is the one made by V.S. Menon during the period 1910-11 to 1956-57. He examined the long term trends in area and yields of selected crops including rice, wheat, jowar etc. by fitting smooth curves to the data with statistical techniques. From the study of the yield rates for the said period he did not find any clear evidence of decline in yield per acre of crops in India. Whatever downward trend was noticed in the case of one or two crops in some States, was mostly due to a large expansion of area under the crop without adequate increase in the percentage of area under irrigation and to some extent due to local conditions. {11}\ Prof. S.R. Sen studied the growth of Indian agriculture for undivided India for 48 years from 1900-01 to 1947-48 and for Indian Union for 30 years from 1936-37 to 1965-66. He found that during the first 24 years of the century food-grains production increased at a meagre annual rate of 0.3 per cent and in the next 24 years it actually showed a declining trend of 0.02 per cent per annum. During the first 15 years beginning with 1936-37, food production registered a declining trend at the average annual rate of 0.68% while in the next 15 years, it increased at the rate of 2.75% per annum. Agricultural growth was very slow during the first quarter of this century and it remained stagnant during the next quarter due

to complete lack of improvement in technology and investment in farm practices.  

After independence, particularly after launching economic planning, India has been making progress in agriculture in spite of several institutional and technological constraints. During the post independence period, particularly in recent years, studies of growth rates in agriculture have engaged the attention of many experts. The study made by Alagh and Sharma shows that the trend growth rate of food-grains production was higher (2.74%) during the period from 1969-70 to 1978-79 than the first period ranging from 1960-61 to 1969-70 (1.35%). They have also found that the growth rate for the longer time i.e., from 1960-61 to 1978-79 was still higher (2.77%) apparently indicating the impact of "Green Revolution" in recent years.  

Thus it seems that the agricultural sector as a constraint to the planning of higher growth rate of the Indian economy is now less of a problem. However, the study has noted that most of the growth rates estimated for the second period (1969-70 to 1978-79) are lower than those which are required for the medium term and perspective periods to permit the economy to achieve its desired objectives.

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Another study made by Daroga Singh has also shown that the progress of agriculture particularly in recent years has been quite impressive. The growth rate of agricultural production according to the study was at 2.31% per annum against the estimated growth rate of population a little over 2% for the period 1967-68 to 1978-79.\textsuperscript{14/} But viewed from the angle of progress in production of individual crops, pulses and oilseeds have not depicted satisfactory progress. Again, the study finds that the uneven growth rate of individual crops has led to the regional imbalances in the rural prosperity depending upon the crops which each region has been cultivating.

Thus, it seems that agricultural production is increasing slightly at a higher rate than the population growth rate in recent years. But the performance of Indian agriculture is still not satisfactory. The growth of production is irregular and uneven due to erratic behaviour of monsoon. Several studies made by different authors have proved the destabilizing character of Indian agriculture. An ICSSR working group has observed that growth in agricultural income during the planning period has been associated with increasing instability in spite of the stabilizing effects of irrigation and intensive development strategy adopted in the early sixties.\textsuperscript{15/} Another study made by


Prof. C.H. Hanumantha Rao has also shown that the co-efficient of variation of agricultural output almost doubled from about 4 in the fifties to about 8 in the sixties. Similarly the fluctuations of yield per acre were greater (6.08) in the sixties than in the previous decade (2.85). The variability of the first decade was attributed to the inferior marginal lands that were added to the cropped area and the variability of the second decade was attributed to the application of modern inputs such as chemical fertilizers, pesticides and hybrid seeds under rainfed conditions. Dharam Narain studied productivity in Indian agriculture for a period of 20 years starting from 1952-53. He divided the whole period into two parts viz. 1952-53 to 1960-61 and 1961-62 to 1971-72 and estimated the compound growth rates of agricultural productivity for both the periods. Productivity growth rate (compound) during the first period increased at the rate of 1.58% per annum which was lower than the growth rate of 2.07% achieved during the second period. He had given separate explanations for the fluctuations of productivity growth rates between the two periods. In the former period productivity growth was mainly due to cropping pattern changes and locational shifts in area while in the latter period, it increased due to growth in crop yield which was the result of technological factors such as development of irrigation, rural electrification, hybrid seeds and fertilizer use.


Thus it is clear that productivity in Indian agriculture has increased in recent years, but it is associated with greater instability despite technological achievements. Now, we turn to examine the growth of production of certain major crops during the post-independence period. A crop-wise study made by George Blyn shows that except wheat and bajra, all food-grains crops had lower growth rates during 1960-61 to 1973-74 than the preceding decade 1949-50 to 1960-61. Pulses, the important source of protein, registered a negative growth rate. In the case of non-food grains, rate of growth of production of oilseeds, fibre and sugarcane fell below the population growth rate.\(^{18}\) V.S. Mahajan, after studying the growth rates of different crops, has come to the conclusion that except wheat, which has been registering an increasing trend in production from the late sixties and of rice in recent years, the growth rates of other crops leave much to be desired.\(^{19}\) Nilakantha Rath examined the performance of production in India for the period 1955-56 to 1977-78 and he found that during the decade ending 1964-65, the growth rate of production of non-food-grain crops was higher (3.46%) than that of food-grains (2.70%). In the post 1964-65 years, however, the position was reversed, food-grains as a group maintained or marginally improved the growth rate (2.8%) against the non-food grains which showed a declining growth rate.


(2.48%). Pulses, an item of food-grains showed no increasing trend in production. The major cereals rice, wheat, millets and maize registered 3% growth rate during the decade ending 1964-65. But in the post 1965 period only, improvements were noticed in the case of wheat and ragi from the cereal group. Rice, the principal stable food, did not show any evidence of accelerated growth rate. It is only "wheat" from the cereal group which has been showing a upward trend in production.20/ This has been amply demonstrated by T.N. Srinivasan that there is as yet no evidence for such a change in the growth of output or yield of rice on All India basis. The so called green revolution has not touched all the major crops, thereby India's green revolution can be termed as "wheat revolution".21/

S.P. Pant has also studied the growth rates of selected crops and crop-groups during pre and post-HYV periods, where he found that during the early fifteen year period before the emergence of the HYV technology, food-grain production increased at the rate of 3.53% per annum which declined considerably to 2.36% per annum during the post-HYV period i.e., 1967-68 to 1981-82. During the post-HYV period, he observes that growth was neither smooth nor was it even between crops and regions. It was 2.66% for cereals (as against 3.77% during pre HYV period) but was negative (-0.36%) for pulses against 2.18%

achieved during the first period. Wheat, which witnessed a growth rate of 4.26% during the earlier period, accelerated to 5.44% in the latter period. Recently, S.D. Sawant has made a detailed investigation on the production behaviour of Indian agriculture and found certain conclusive results. In general, she observes, that the growth rates in productivity of many food-grain crops excluding wheat, jowar and cotton were higher or almost the same in the pre-green revolution period in comparison with the post 1967-68 period. The period during 1967-68 and 1975-76 was a sluggish growth rate period for all the crops except wheat. But the situation improved after 1975-76. Further, it was also observed that relatively accelerated growth in food-grains production came from wheat followed by rice and jowar.

From the foregoing overview of literature, the following broad observations can be made on the trends in production and productivity of Indian agriculture.

(a) The 1950's were a period of moderate but fairly steady growth for a number of agricultural products.

(b) There has been a wide amplitude of yearly fluctuations in agricultural production.


Note: The reason for the differentiated growth rates, he finds, is the conflict between the requirements of the new technology and the traditional resource distribution and management.

(c) The production of pulses and oilseeds has been more or less stagnant throughout the years.

(d) Although the productivity of wheat has been steadily high, yet its growth rate seems to have slowed down during the last few years. Except wheat, major technological breakthrough has not been achieved in other crops.

(e) The growth of agricultural production in general was more or less stable and consistent during the fifties. But it registered unstable and irregular fluctuations of production trends during the sixties and first part of the seventies.

(f) "Productivity" has to play a major role in augmenting agricultural output in the future.

(g) The growth of productivity has been irregular and uneven over crops, space and time.

2.3 Levels of Agricultural Productivity : India Vs. some Other Countries:

Now, it will be appropriate here to judge the levels of productivity of Indian agriculture as compared to some other countries of the world. The yield differences between India and some other countries is most striking. For instance, as against 2008 kgs per hectare in India, the yield of rice (Paddy) in 1978 in some other countries was as follows - Japan, 6205 kgs, U.S.A., 5049 kgs and U.S.S.R. 3621 kgs. In the case of wheat, as against the output of 1480 kgs per hectare in India in 1978, it was as
high as 5107 kgs in U.K., 5057 kgs in France and 3333 kgs in Egypt. In case of some of the commercial crops, the gap between our yields and those of other countries is strikingly wide. In sugarcane (in terms of cane) for example, the yield per hectare in India was 56,160 kgs in 1978, as compared to 80,510 kgs in U.S.A., 83,333 kgs in Indonesia, 83,463 kgs in Australia.\textsuperscript{24}

Again, taking all cereals, the average yield per hectare of harvested area in India was 1.34 tonnes during 1979-81 as against 5.27 tonnes in Japan, 1.94 tonnes in Thailand, 4.20 tonnes in U.S.A., 1.61 tonnes in Pakistan, 2.11 tonnes in Mexico, 1.96 tonnes in Bangladesh, 2.82 tonnes in Malaysia. Thus, the yield per hectare was lowest in India as compared to some other Asian countries.\textsuperscript{25}

Likewise, as regards the growth of agricultural production, India's position is not satisfactory even compared to some low income economies. For instance, the average annual growth rate of agricultural production in India was 1.8% as against 2.8% in China, 2.7% in Pakistan, 2.3% in Bangladesh, 5.0% in Burma, 4.1% in Kenya, 3.2% in Sri Lanka during 1970-82.\textsuperscript{26}

The foregoing analysis strongly demonstrates the poor performance of Indian agriculture and, therefore, the strategy for adoption of scientific agriculture has become extremely


Note: Harvested area covers all cropped area including tree crops.

\textsuperscript{26} Ibid., p. 220.
relevant in recent times.

2.4 Causes of Backwardness of Indian Agriculture:

Having discussed the trends and broad patterns of agricultural productivity, we now turn to make a summary of the causes of backwardness of Indian agriculture in view of the past studies.

The backwardness of Indian agriculture is primarily due to institutional, technological and organisational constraints and the intensity of each of the constraints varies from region to region depending on localities, geographical environment, fertility of soil, rainfall, climate and weather, rural infrastructure etc. Here we are summing up the problems as follows:

The fate of Indian agriculture, even in the later part of the 20th century by and large, has been conditioned by the fluctuating behaviour of monsoon. The monsoon being irregular and uneven over time cause disincentives and generates risks and uncertainties to the farming community. The production behaviour in India for the years 1970-71, 1972-73, 1974-75 and 1979-80, clearly shows that climatic variation, though not sufficient condition, has substantial impact on crop production. Rainfall appears to be the most important variable responsible for sharp fluctuations in production. Moreover, farmer's crops in the country are in constant danger of being devoured by insects and pests.

As we have already stated that paucity of land is another
limiting factor in Indian agriculture. For example, in India between 1953-54 and 1971-72, a 66% increase in the number of rural households was associated with only a 2% increase in the cultivated area.\footnote{27} The crucial point is not the extension of land, but the deterioration of productive capacity of soil. Dr. R.V. Tamhane, believes that the principal cause for low productivity in Indian agriculture is the deterioration of soil fertility due to erosion and other natural calamities, like, flood hazards in some areas and drought conditions in others.\footnote{28}

Dharam Narain has analysed that there are two types of explanatory variables contributing towards increase in productivity in Indian agriculture. To him it is the non-price factors, particularly, the growth of irrigation facilities and shift in production function through increased use of fertilizer and high-yielding varieties of seeds, which have contributed towards pure increase in the yields of individual crop in different States.\footnote{29} But irrigation potentialities in India have not been fully utilised by the farmers causing a substantial accumulation of unutilised capacity. There has been a wide gap between irrigation potential created and its utilization. Difficulties such as inadequate maintenance, non-delivery of water to farmers at the right time and in the right quantity,

lack of appropriate infrastructure and extension service etc. affect the existing irrigation system adversely. Irrigation and fertilizers as the chief motivating forces to usher in the whole complex of modern technology in Indian agriculture have yet to play their significant role.

Low level of technology with inadequate extension service is another serious bottleneck in Indian agriculture. Most of the farmers are using the traditional inputs available within the farm at a reasonable cost. The new technology makes them dependent on the market for the supply of new seeds, chemical fertilizers, pesticides, hired labour and hire agricultural machinery, N.C. Joshi places more emphasis on technological, institutional and economic factors for raising productivity in agriculture. Creation of technical conditions and provision for adequate infrastructure— in the form of better communication system, power, rural industries, irrigation facilities, fertilizers, and pesticides, are necessary conditions for maximising productivity. Application of mechanisation in agriculture in consonance with the suitability of natural and technical conditions is another requirement for agricultural growth.\(^{30/}\) For bridging the institutional gap, he suggests liberal credit, extension services and provision for crop insurance.

Dr. V.S. Mahajan has studied the productivity of agriculture cropwise and found the following causes responsible for

the poor performance of agriculture.\textsuperscript{31}

(a) The growth of the crops, like bajra, maize and jowar, are highly dependent on the vagaries of nature, as these are grown under rainfed conditions. Besides, the high-yielding varieties in the form of hybrid bajra, maize and jowar have not been extensively used by the farmer's because of its susceptible character to pests and diseases.

(b) As regards rice, he believes, that no significant breakthrough in the productivity of rice has been achieved because the new high-yielding varieties introduced in recent years are less resistant to pests and diseases and these are unsuitable under water-logged conditions.

(c) Lack of suitable seeds, prevalence of high prices for other grains, insufficient irrigation facilities and lack of technological breakthrough and price support policy are some of the causes for the virtual stagnation of production of pulses during the sixties and seventies.

In brief, excepting wheat, he finds that in recent years, the growth rate of other crops is unsatisfactory. The slow progress made in evolving suitable high-yielding varieties of seeds, excessive dependence on monsoon, the lack of suitable infrastructural framework and the poor development of farm extension facilities are some of the possible causes behind the scene.

The Economic Survey 1980-81 has also made a frank confession that the high-yielding variety of seeds has so far been limited only to wheat and rice to a limited extent. There has been no significant technological advance in coarse grains, pulses and oilseeds.\textsuperscript{32/}

J. Veeraraghavan finds that the major structural defect in Indian agriculture is the preponderance of labour in relation to capital, land and enterprise. Lack of enterprise rather than capital and land is the major inhibiting factor in agriculture. He asserts that defeatism and pessimism which dominate the most of the Indian farmers must be replaced by self-reliance, optimism and the capacity to undertake risks.\textsuperscript{33/}

From the analysis of past studies, it is revealed that the problem of Indian agriculture is multidimensional. Poor research infrastructure, lack of field-tested technical innovations and lack of absorptive capacity of majority of farmers, further stand in the way of progressive agriculture leading to self-sufficiency. From the financial side, majority of farmers are living in abject poverty having tiny pieces of land-holdings and, therefore, they are absolutely dependent on the market for the supply of required inputs for agriculture. Another aspect of the problem is the pricing and marketing of agricultural products. The productive efforts of the farmers get thwarted at


the doorsteps of market. Likewise, dissemination of technical knowledge at field level through the network of extension and farmers training services is an imperative necessity for achieving rapid agricultural growth. A comprehensive and dynamic agricultural policy covering all these aspects including soil and crop management, risk-reducing innovations, like better pest, weather resistant crops, conducive to agricultural environment, rural infrastructure and harvesting and management-technology will go a long way to push up the agricultural productivity in the country. The World Development Report has rightly put it as "To avoid a fall in agricultural output, per worker, land scarce countries, will require new technologies, fertilizers, improved inputs and different farming techniques supported by pricing policies to encourage production". \(^{34/}\)

2.5 The Concept of Agricultural Productivity:

It is a difficult task to define productivity. In recent years considerable amount of literature has been made available on this issue and various attempts have been made by different authors to define the concept of productivity at different times to suit different needs.

In order to have a clear idea on this connotation, we attempt, in this section, to review some of the important definitions put forward by different experts.

By far, the most common approach, productivity is defined as the output per unit of input. In technical literature "it is an art of securing an increase in output from the same input or of getting the same output from a smaller input". Pandit further suggests that, increase in productivity, whether in industry or agriculture, is generally the result of a more efficient use of some or of all the factors of production, viz., land, labour and capital. Thus productivity implies the efficiency of resource use in the process of production.

Dr. V.K. R.V. Rao defines that "productivity is a physical rather than a value concept and describes the changing relation between output and one of the major inputs like land, labour and capital".

"The term productivity", according to J.W. Kendrick, "is generally used rather broadly to denote the ratio of output to any or all associated inputs in real terms".

There was a good deal of discussion on the definition of "agricultural productivity" among agricultural economists at the 23rd Annual Conference of the Indian society of Agricultural Economics. Some economists suggested, that, the yield per acre

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should be considered to indicate agricultural productivity. A number of objections were raised against this view, because it considered only land which is just one factor of production while other factors like human labour and other inputs which are equally responsible, and that, therefore, it was arbitrary to attribute productivity entirely to land and express it as per acre of land. Another suggestion was to consider the returns per unit of the scarce resource to represent agricultural productivity. It was further argued that the average returns per unit of scarce resources does not depict the true picture, therefore, instead of it, the marginal returns per unit of the scarce resources should be considered. This definition appears to be more meaningful than others, but it gives rise to a lot of practical difficulties. Again it was suggested, that productivity could also be measured in terms of per unit of labour.

After a full and thorough discussion, it was generally agreed that yield per acre may be considered to represent the agricultural productivity in a particular region, and that other factors of production be considered as possible causes for their variation in different regions.38/

Productivity is different from fertility. The latter refers to original productive capacity of soil, while productivity refers to fertility plus added factors or improvement. Besides productivity must be different from production or outturn

Productivity is a relative concept. Production of any commodity or service, on the other hand, is the volume of output, irrespective of the quantity or quality of resources deployed to achieve that level of output. "Productivity" is a concept which is used to mean the efficiency with which resources are deployed. This has been stated by D.H. Butani.\(^{39/}\)

Again, productivity is not a synonym of profitability. It is expected that higher productivity leads to higher profitability, but there is no causal relationship between the two. E.A. Saxon believes that productivity is a physical concept where profitability is involved, in addition to the notion of price.\(^{40/}\)

Broadly, agricultural productivity can be considered in relation to land, labour and capital. It can also be considered in terms of overall resources employed in agriculture.\(^{41/}\) In the former case, it is known as partial productivity and in the latter one it is termed as gross productivity.

Among the three, productivity per unit of land is gaining importance in recent years, particularly, in those countries

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where density of population is high. Land is the most fixed and permanent factor among the three conventional categories of inputs (land, labour and capital). Hence reliance has to be made on improving the productivity of land. It means output per unit of land must be increased and that can only be achieved with the best and efficient utilization of other inputs like labour, water, fertilizer, etc. applied to land. The key to agricultural productivity, therefore, lies in optimum utilization of the various inputs.

Raising the productivity of land, however, does not mean only raising the yields of individual crops. It encompasses, according to Mohammad Shafi, the whole output of a farm or country in relation to the total area of farm land, or that can be raised also by changing the pattern of production toward more intensive system of cultivation or towards higher value of crops. He further states, that productivity of land may be increased by raising multiple crops in a year on the same land as the farmers of Japan, China (Taiwan) are doing, or by progressively changing crop-pattern from low-value crops to high value crops.

Productivity can also be expressed in terms of money value of crops or calories intake. But as the prices of crops are changing due to variation of supply and demand factors, it is better to quantitify productivity in terms of quantity or

or calories intake.

Though narrow and simple "agricultural productivity" thus stands for yield per acre of different crops "which is said to be more meaningful." Further, Dr. R. Balakrishna says, that measurement of physical output should be preferred to value data, as the latter does not correctly measure changes in quantity owing to variations in the value of money.

For the purpose of the present study, agricultural productivity is taken to mean yield per hectare of land. Although it is narrow, it would be serviceable for our purpose of studying growth trends of major crops over a period of time. This is supported by Mac Namara, according to whom "It is of course, output per hectare which is the relevant measure of agricultural productivity in land-scarce, labour-surplus economies, not output per worker." 

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