II. REVIEW OF LITERATURE
CHAPTER II

Review of Literature

2.1. Introduction: The aim of this study is to analyse the growth rates of agricultural output in the North-Eastern Region. Hence an attempt has been made in this chapter to review some of the existing literature on the growth rates of agricultural output in India as a whole as well as on the growth rates of agricultural output in different states. Literature in this field of agricultural economics is too vast and the subject areas are overlapping. Research into agricultural economics in the recent past is configured with techno-economic problems and more work has been done in the field effect of transition from simple means of agricultural production to more sophisticated means of production. These researches convincingly put forward new ideas to the farmers who have not yet received the message except in two states and a few pockets here and there.

The trend in growth of agricultural output cannot be attributed to a few factors. Land suitable for cultivation may not be increasing, technology is yet to reach the villages and population pressure
is increasing, so what can be said about the fluctuations or growth rate (positive) of agricultural production. It is the monsoon finally which controls agricultural growth in India and the need drives the farmers to multiple cropping to avoid total starvation.

We shall discuss a few of the recent works, although they may not be totally relevant, since this author is concerned only with the trend in growth, a time series type of analysis taking into consideration the spatial factor.

2.2. Trend or Technology: As said in the earlier section that technology has not gained importance in Indian agriculture. In the other sectors of economy, e.g., manufacturing, one can possibly single out technological progress as a factor of production through empirical analysis. But in agriculture with a few acres of irrigated land, with a few kilograms of fertilizers per acre and only one or two high yielding variety crops, no micro type analysis can be done from the time series data. A cross-sectional study in a specific area for a specific crop the effect of technology upon production can be discerned.

In a study with respect to nature and
causes of technological change in agriculture and the distribution of technological change (Rao, 1965) the author has stressed upon the following factors:

a) Change in output with respect to technological change.
b) factors determining the adoption of mechanised methods.
c) application of fertilizer and
d) issues involving distribution.

His findings can be summarised as follows:

(a) Despite technological change the rate of growth of foodgrains and of agricultural commodities as a whole decelerated in the decade ending 1970-71 compared to the preceding decade.
(b) The annual fluctuation in the output of foodgrains in the country increased during 1961-71 compared to the preceding decade.
(c) Inter-state disparities in regard to the supply of institutional credit per hectare and the percentage of net sown area irrigated has increased over the decade.
(d) Inter-state variability in respect of the use of fertilizers in per capita terms increased.
(e) Inter-state disparity in productivity per
hectare of major food crops experiencing technological change increased.

(f) While technological changes have led to a more even use of services of permanent farm workers during the year, the variability in the wages of casual hired labour has increased because of the rise in peak-season demand for such labour.

(g) While the absolute share of hired labour has risen, its relative share in output has declined in the areas experiencing the Green Revolution.

(h) Since the changes in Indian agriculture have been introduced on the base of 'an institutional structure featured by disparities in investible resources per acre', the growth of output has been much faster among the larger farms than among the smaller ones. As a result disparities in income have tended to widen.

(i) Under the impact of technological change the area under tenancy particularly sharecropping has declined and rents have risen - phenomena which are indicative of exclusive resumption of land on the part of landowners and also share-croppers having been forced to part with a larger share of output.

(j) Given the influence of producer interests in the fixation of higher procurement prices and in regulating inter-state movement of foodgrains, despite the technological breakthrough, farm prices in the
Punjab have increased relative to those in the deficit states.

In conclusion Rao said that the prospects of further growth in Indian agriculture hinge on technological change. It is likely to be limited in the short run in the investment in irrigation. According to him, "Where irrigation water can be made available economically, irrigated farming with H.Y.V. technology would be more profitable than the dry farming technology."

S.A. Shetty attempted to analyse the trends in agricultural production and to isolate the contribution of crop pattern from the effects of area and yield per acre (Shetty, 1970). The analysis relating to all India covered the period 1920-21 to 1964-65 and that relating to regions covered the period 1920-21 to 1954-55.

In order to ascertain the rate of growth of production, semi-log trend of \( Y = ab^t \) was fitted. In order to compare the movements in the production of foodgrains and non-food crops trends were fitted to each series separately. The main findings of his study are:-
(i) The long term trend in agricultural production has been a rising one during the period 1920-21 to 1964-65.

(ii) The trends in production of foodgrains and non food crops were also positive and significant, though the rate of growth of the latter was twice as high as that of the former.

(iii) While almost all the crops except barley have contributed in varying measures to the increase in foodgrain production, only a few crops notably groundnut and sugarcane and to some extent rapeseed and mustard contributed to the increase in the production of non-food crops.

The analysis of trends in agricultural production among the regions presents a mixed picture:

i) In four out of the eight regions studied, agricultural production has increased while in three regions it was stagnant and in the remaining one region it declined during the period 1920-21 to 1954-55.

ii) A geographical pattern of agricultural growth is discernible in the increase in output in the northern and eastern regions with the exception of Bihar, Orissa and stagnation in output in the southern and western regions.

iii) It also found that agricultural production
tended to increase in some regions even before the advent of planning in India. The most important source of growth of production at the all India level was acreage expansion, the contributions of area and crop pattern accounting for nearly 90 percent of the increase in agricultural production. The contribution of area was also significant in almost all the regions studied with the exception of the Punjab where nearly the entire increase in production was accounted for by improvement in yield per acre. The contribution of changes in crop pattern to the growth of production was negligible in all the regions except in the Uttar Pradesh. Thus, the increase in agricultural production during the period covered seems to have been realized mainly through the expansion of area rather than through improvement in productivity of land.

In another study into the growth rates of agricultural output the authors have taken into consideration the contributions of land, irrigation and fertilizer to the growth of crop output in India during the period 1951-52 to 1962-63. (Giri et al., 1966). The authors have experimented with a number of multiple regression equations and tried to estimate 4 to 5 parameters on the basis of 12 time
series observations. These estimated coefficients of the time series production function are made use of in deriving the relevant growth equations. Besides time, they have used three independent variables: $X_1$ - the gross area sown, $X_2$ - the proportion of gross irrigated area to gross area sown and $X_3$ - quantity of fertilizer (in terms of nitrogen) per unit of irrigated area, to explain the behaviour of total crop output $Y$. The authors have found that production of foodgrains increased during the period 1950-63 by 39 percent by extending the cropping area by 20 percent over the base year. It was also found that the growth of output was brought about more by expansion of area through the extension of cultivation than by the use of productivity raising factors. Among the foodcrops, wheat recorded highest growth of output and the major contribution to growth of production of wheat came from hand. In the case of barley and gram which are substitute crops for wheat not much effort has been made to increase their production. As a result of a decline in productivity of jute, its gross yield could not improve despite an expansion in the area under it.

2.3. Fluctuations according to Time and Space — S.R. Sen in his book 'Growth and Instability in
Indian agriculture has discussed a variety of Indian agricultural and demographic problems (Sen, 1971). On the basis of certain studies made by the Directorate of Economics and Statistics of the Ministry of Food, Cooperation and Agriculture, the author has shown that during the first 24 years of the period 1900-01 to 1947-48, while foodgrains production showed a rising trend, the instability was also on the increase. In the next 24 years of the same period Indian agriculture had become stagnant but unstable. In 1937-38 foodgrain production was fairly stable while the general trend was one of stagnation. On the other hand, during 1952-66 there was an unprecedented rate of growth but instability tended to increase with the rate of growth.

Marshalling statistical evidence Sen states "...... it is not enough for us merely to plan for increasing the rate of growth of food production...... It is equally important for us to plan for minimisation of the instability that often accompanies such growth."

Sen suggested that with the unprecedented facilities for analysis which modern electronic computers offer it is possible to subject all the
data regarding rainfall, run of dry days, crop conditions and crop output that are available for different regions and districts of the country, for the last 90 years or so to an imaginative programme of cooperative research by statisticians, meteorologists and agronomists which may throw light on this question and avoid or at least minimise the risk of uncertainty in agricultural production.

T. Maitra and Bina Roy studied the regional variation in yield per acre of principal crops in India during the decade 1950-51 to 1959-60. In order to get rates of increase in the productivity over the decade they fitted a linear trend to the annual data. Agricultural development in different states was compared on that basis. The fitted trend also gave trend values. These were computed for the two end years. Variation in productivity in different states was examined on that basis. (Maitra et al., 1964).

The principal results of their study are quoted below:

1) Computed values of yield per acre of rice varied from 644 lbs in 1950-51 to 631 lbs in 1959-60, both estimates being free from annual fluctuation. In 1950-51 the yield of rice varied from 452 lbs in Bihar and 453 lbs in
Uttar Pradesh to 897 lbs in Andhra Pradesh and 910 lbs in West Bengal. Ten years later in 1959-60, the statewise yield varied from 489 lbs in Orissa and 604 lbs in Uttar Pradesh to 1,375 lbs in Madras and 1,204 lbs in Mysore. Thus, regional variation remained the same though the states changed places due to different increases achieved during the ten years.

ii) As for wheat the striking fact is the very small progress achieved in comparison with the progress achieved in rice. The all India average yield of wheat increased from 620 lbs in 1950-51 to 674 lbs in 1959-60. Almost all states in general retained their relative position except in case of Jammu and Kashmir, Uttar Pradesh and West Bengal recorded a decrease in yield per acre and Madhya Pradesh which showed a large increase.

iii) The authors offered similar analysis for other commodities which showed that disparities between states in yield per acre did not diminish to any appreciable extent.

In another study into the growth and imbalances in Indian agriculture the author has indicated explicitly the various constraints on agricultural growth in India and what is needed to
achieve higher rates in the future than in the past. (Dharm Narain, 1972) The possibilities for extension of net sown area have very largely exhausted themselves and therefore, the expansion of gross cropped area has to be achieved mainly through an increase in cropping intensity. Since the annual additions to the net irrigated area in recent years have averaged at nearly 2 million hectares (which is about as much as the additions realized over five year periods between 1950-51 and 1965-66) the scope for such increase in cropping intensity has of course greatly increased. Nevertheless, even at this rate of expansion of irrigation, it is unlikely that the gross cropped area will increase by more than about 12 percent over a decade. Therefore, according to the author, the growth in agricultural output will have to be achieved largely by increases in productivity per hectare. The high yielding varieties evolved so far offer hope of such increase in productivity in the case of only a few crops. The possibility of achieving much higher rates of growth in agriculture as a whole depends, therefore, to a considerable degree on whether or not technological advances of a similar nature can be secured in the case of all other crops and the increases in productivity per hectare which they make possible are in fact realized.
V.K.R.V. Rao studied the performance of the agricultural sector during the first two plan periods particularly in terms of productivity and by individual crops (Rao, 1962). Productivity was studied in terms of the relation between output and land, i.e., yield per acre. For estimating the change in agricultural productivity or yield per acre during this period, the author made use of the adjusted data as was done by the Ministry of Agriculture - "By adopting the ingenious device of linking up each year's production estimate for a crop with the preceding year's estimate through a second estimate strictly comparable with the latter and by using the chain method, constructing a time series of adjusted production estimates comparable with one another over the entire series".

The author has shown that while agricultural production as a whole increased by 36.4 percent during this period, the increase in the average yield per acre was only 18.6 percent, the rest of the increase in production being accounted for by increase in the area under cultivation. The percentage increase in the yield per acre, cropwise, ranged from +29.5 to -7.3, for the 25 crops considered in his analysis. The largest increases in yield per acre took place in the case of foodgrains.

Rao admitted in his analysis that the yield
per acre would be different for different crops and on the basis of physical output only inter-crop comparability could not be made. Still in India, according to him, "it is a matter of deep concern," as "its farmers have a crop pattern that favours crops with a low yield per acre without a compensating high value per unit." The author has opined that an immediate and intensive examination must be made in this regard.

In order to show inter-state variation in agricultural production the author has taken only those states which had 4 percent or more of the all India acreage under each crop. In terms of yield per acre the highest place was occupied by Madras for 5 crops out of the 7 and Punjab occupied the highest place for 4 out of the 7 crops considered in his analysis. Taking foodgrains as a whole states like Madras, Kerala, Bengal and Assam stood above the national average; U.P., Andhra, Bihar and Orissa were about the national average and Madhya Pradesh, Maharashtra, Gujrat, Mysore and Rajasthan stood below the national average. An interesting finding of his analysis is that the the states with the highest agricultural productivity (Viz., Madras, Punjab and Kerala) accounted
between them for only 11.4 percent of the total area under cultivation while states with the low agricultural productivity (viz., Maharashtra, Gujrat, Madhya Pradesh etc.) were having the largest area under cultivation.

According to Rao, "All these differences in inter-state productivity cannot be explained merely in terms of natural factors. Capital, labour, and agricultural practices must have something to do with these differences.....". Therefore, maximum attempt should be made to raise the yield per acre in all these states in order to raise their contribution to increasing the national average as well as to minimize inter-state differences in the levels of agricultural productivity.

V.G. Panse made some statistical analysis of the trend in the yield of rice and wheat. (Panse, 1959). He examined the data for yield per acre from large scale crop cutting surveys on these two most important food crops for ten years 1946-47 to 1955-56. The yield data analysed extended over 65 percent of the area under those crops in the country. The main aim of his analysis was the comparison of average yield during
the First Five Year Plan period, 1951-52 to 1955-56, with the average for the immediately preceding five years treated as a control. In order to determine how large the difference between the average yields in the two periods was in each state as compared to difference brought about by uncontrollable causes like weather, partitioning of the variation observed was done with the help of analysis of variance.6

Results of his analysis showed that the average yield per acre was higher by 5.4 percent for rice and 11.8 percent for wheat in the Plan period than in the pre-Plan period. The increase in rice yield was contributed by three states, Madras, Andhra Pradesh and West Bengal, and that in wheat by all the five states, viz., Punjab, Uttar Pradesh, Bihar, Madhya Pradesh and Bombay, although the increase in Bihar was not statistically significant.

Though the author admitted that it would be an extremely difficult task to make a rigorous allowance for the multitude of weather factors on crop yields, still an attempt was made to adjust the yields of both rice and wheat for inequalities of rainfall over the series of years under study.
by using regression analysis. The results of all regression analysis for wheat, however, proved negative, in the sense that the rainfall as examined did not show any considerable influence on the annual variation in wheat yields. But the results of the regression analyses on rainfall for rice were more positive. The adjusted rice yields showed an overall increase of 8.0 percent during the plan period as compared to the pre-plan period. The conclusion derived from this analysis was that irrigation should be "introduced in some rice areas as a positive measure for increasing yield by supplementing the normal rainfall of the area and not merely as a protection against the vagaries of rainfall."

So far as statewise study on growth rates of agricultural output is concerned, Raj Krishna studied the growth of aggregate agricultural output in Punjab (Raj Krishna, 1964). Using the production function of Cobb-Douglas type, an attempt was made to separate the contributions of irrigated area, unirrigated area and rainfall on the growth of crop output in Punjab during the two periods, viz., 1913-14 to 1945-46 and 1939-40 to 1955-56. His study revealed that the crop output increased at
an annual rate of 1.1 percent in the first period and 4.2 percent in the second period. Whatever slow growth in crop output was achieved in the first period, was ascribed almost entirely to expansion of irrigation, but only about one-third of the faster growth in crop output in the second period was attributed to increase in irrigation and the rest to other productivity-raising factors.

C.H.H. Rao has investigated into the impact of total inputs and rainfall on crop output in Punjab during the decade 1952-62 (Rao, 1965). Using the production function of Cobb-Douglas type he showed that in those districts of Punjab where agriculture was more dependent on rainfall, the coefficient of total inputs was insignificant. Whereas in other districts where agriculture was less dependent on rainfall, the crop output responded significantly to increase in the value of total inputs. Among the factors studied, land, labour input and bullock and tractor power, the coefficients of the first two factors were found to be not significant for Punjab as a whole; but in the selected 10 districts which had recorded large increases in cropped area and immigration of agricultural workers leading to intensive use of labour
and capital inputs, the coefficients for labour and capital were found significant.

In another study into the agricultural development, the author has taken into consideration regional variation in agricultural development in India and of the state of Karnataka in particular having the basic objective that regional development is a nucleus of accelerated economic growth of Indian economy (Desai, 1976).

In first part of his analysis the author has shown that various states of India show disparity in regard to their total state income, per capita income, growth rates in agriculture, growth rates of foodgrains, average yield of principal crops, population, irrigation, fertilizer use etc. This disparity among the states is of high order which stand in the way of balanced development of the country as a whole. The regional variations in agricultural development according to the author are attributable to the irrigation facilities, soil fertility, agro-climatic environment etc.

In second part of his analysis, the author has discussed the various aspects of agriculture in the state of Karnataka. Agriculture predominates
more in the state of Karnataka when compared to India both in regard to the dependence of population on agriculture and agriculture's contribution to state income. The utilisation of strategic inputs such as irrigation, fertilizer, improved seed, the role of institutional set up have been examined. The crux of discussion is that vast potentialities exist for the growth of the economy of the state in general and in agricultural sector in particular. What is required is that the farmer should be provided with incentive both in the availability of strategic inputs and organisational assistance to raise his production. It has rightly been recommended that for formulating a plan for a village or a group of villages the planning team should consist of the banker, the agricultural expert, progressive farmers and local economists and only local resources - natural as well as human - should form the basis of the plan. The long term issues which require changes for improving agriculture are the tenancy system, fragmented holdings, uneven distribution of land etc. All these come under land reform which require a change in the social structure.

Saha has shown empirically the pattern or growth rate in agriculture, particularly in food
production in the seven plain districts of Assam (Saha, 1966). The author has used simple linear trend analysis of data on area and production of rice and total foodgrains for the period 1951-52 to 1961-62. The author has found "...quite a dismal picture in the growth rates of agriculture." While population grew at a rate of more than three percent, the growth of food production was only 1 percent. Moreover, the growth rates of different districts were not uniform "even though physical conditions and development efforts are by and large similar." In concluding section, the author has opined that attempt should be made to identify the causes of such disparity in growth rates of district as this will help in taking appropriate remedial measures.

Indian Council of Agricultural Research took pain taking exercises in finding alternative to shifting cultivation which is yet to be materialized. The shifting cultivation, jhuming endangers ecological balance and effective utilization of land resources in the hill regions (Agarwal, 1992).

2.4. Summary :- In summarising the opinions held by different authors in the existing literatures on growth rates of agricultural output in India and different states, it is concluded that the present
issue reveals that agricultural development in India varies from one region to another depending upon the quality of soil, availability of water and new strategy. There exists a wide disparity in agricultural development and productivity in the country as well as in a state itself. There is a frustrating gap between the best and the average in agricultural performance in the country and sometimes even within a state.

There is no doubt about the fact that during the period of a century and a half prior to independence Indian agriculture was in a stand still position. It is only after the launching of the Five-Year Plans the stagnant waters of our agriculture began to move. But it is to be admitted that in comparison with other developing countries the income derived from agricultural products of our country still falls far behind the performance of some other developing countries, e.g., Argentina. As regards agricultural productivity there is no denying the fact that it depends on natural factors to some extent. Still by using modern technology and agricultural inputs productivity can be increased to a considerable extent inspite of natural handicaps. Different authors mentioned in this chapter have outlined the causes of low productivity in agriculture
and have suggested also their own remedies in their studies. Improvement in agriculture therefore, necessitates radical change in our methods and institutions that have been built up over many generations as well as in the attitudes of millions of farmers. The sooner this is achieved the better it will be for the national economy. Swiftness to this effect is also supported by the opinion cited here: "If you are late in doing one thing in agriculture, you are late in all things". (Cato, 2nd Century, B.C.)