LABOUR PRODUCTIVITY AND WAGE RATE IN INDIAN AGRICULTURE-A STATEWISE STUDY

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PROMODITA

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CERTIFICATE

Certified that the dissertation entitled, "LABOUR PRODUCTIVITY AND WAGE RATE IN INDIAN AGRICULTURE" - A STATEWISE STUDY being submitted by Promodita in partial fulfilment for the award of the Degree of MASTER OF PHILOSOPHY (M.Phil.) in Jawaharlal Nehru University is to the best of my knowledge, a record of the student's own work, carried out by her under my supervision and guidance. It is hereby certified that this work has not been presented for the award of any other degree or diploma.

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CONTENTS

LIST OF TABLES

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CHAPTER - I

Introduction

Indian economy, since the launch of first five year plan, has attracted great interest of economists and policy makers, all over the world. Indian agriculture, even today after three decades of planning provides bulk of employment to Indian work force. One intriguing feature of Indian situation is the near constancy in the share of workers dependent upon agriculture. This is because of the failure of Indian industries to absorb the rapid growing labour force. This being so, the additional burden of employment fall on the shoulders of Indian agriculture. However, there is no guarantee that additional labour absorbed is productive even if agricultural production records a rapid rise. Moreover, even if we accept increasing productivity of labour over time, one has to find out whether this improvement, is the result of efficiency of labour or of other factors of production? Secondly, whether this improvement in efficiency is improving living conditions of workers or not? The answer to this could be provided only by investigating the link that exists between the productivity of labour and real wage rate.

Since independence various programmes have been launched in order to make the country self-sufficient and put her on the way to economic development. Technical

breakthrough in the form of "Green Revolution" was one of the important breakthrough in Indian agriculture that led to substantial increase in agricultural production. It was assumed that rapid increase in the output would result in the simultaneous increase in labour productivity. Further if productivity increases, it was assumed, then new seed-fertilizer technology would transform itself into an increased returns to factors and this would finally lead to an improvement in the condition of agricultural labourers. Moreover in order to nullify the labour saving effect of new technology various employment generating programmes were proposed to be taken up side by side in order to ensure certain minimum real wage rate and employment.

But India being a labour surplus economy, apart from technical change, both male-workers productivity and wage rates are influnced by numberous other factors. Therefore it is worthwhile to take other factors into account. Moreover diversity in Indian agricultural regions requires separate analysis for each region because factors which might be effective in determining wage rate and productivity in one region may not have any effect on other regions. This not withstanding, it appears that technology plays an important role in all the regions in influencing productivity of agricultural male workers and wage rates.

I (a) OBJECTIVES

Present study aims to undertake a detailed analysis of growth of labour productivity and real wage rates at the state level, prior to and after the advent of green revolution during the mid sixties. Therefore we seek to examine the following hypotheses:-

1. Increase in labour productivity in agricultural production leads to an improvement in living standards through increase in wage rates. The basic objective of this paper is to test the hypothesis whether an increase in productivity is accompanied by an increase in agricultural wage rates or not?
2. There exists a positive association between land productivity and labour productivity in Indian agriculture.
3. Socio-economic variables also play an important role in determining real wage rate and productivity.

where as the first two hypothesis will be tested by using statistical techniques only, theoretical description will be provided for examining the third one.

The study is divided into four chapters. Chapter I gives a brief introduction on the topic, reviews some of the important studies on this topic and provides

the scope, methodology and sources of data. Nature and extent of change in labour productivity and land yield prior to and after the advent of green revolution across different states during 1969/65 to 1984/87 are analysed in chapter II. An attempt is made to find various determinants of labour productivity by fitting a regression line. In particular it is an attempt to find how far labour productivity is determined by land productivity as also by various inputs that explain land productivity. Chapter III then explains the relationship between labour productivity and wage rate by fitting a regression model across states. The results for various years are analysed to see the changes that have taken place in this relationship over time. Finally summary and conclusions are given in Chapter IV.

I (b) Survey of Literature

A peep into the post independence development patterns in Indian economy indicates that the relationship between productivity of labour solely as an outcome of increased labour use and wage rate is more complex than is often assumed. Many studies have been done to investigate the relationship between productivity of workers and wage rate in Indian agriculture. However interrelationship between the two has remained unclear. Further there is a controversy even regarding the trend of real wage rates in Indian agriculture, that is, whether even over

time these have tended to increase or have remained stagnant.

One can discern two distinct strands of thought relating productivity of agricultural labourer to wage rates.

1. An increase in the agricultural production with the help of new technology would result in the increased demand for agricultural labourers and there by higher wages for agricultural labourers (Deepak Lal[1], Hardt and Baker[2])
2. There are however, number of other studies which highlight the opposite phenomenon. According to these studies, agricultural growth has not resulted in any improvement in the level of living or rural poor and instead has been accompanied by their immiserisation. The "new orthodoxy", hypothesis has been shared by various vriters. Pranab Bardhan,[3] Byres, Dandekar & Rath, Dantwala[6] Griffin[7], A.V. Jose[8] are some of them.

However before dealing with literature survey on these aspects, we would be highlighting the available studies done solely on the labour productivity prior to and after the green revolution.

Productivity takes into consideration both output that is produced in an economy as well as the resources

utilized to produce the same. Productivity thus defined is of interest in virtually every economic activity and is defined as the ratio of output to input. Higher productivity can be regarded as efficient use of the inputs in terms of layout, materials and capital and labour services. In agricultural sector also productivity could be increased by the efficient use of inputs i.e. land and labour besides capital. Bhalla and Alagh have pointed out the decline in the labour productivity in Indian agriculture"[9]. Their study is based on 281 districts of sixteen states and the time periods chosen are 1962-65 (before the green revolution) and 1970-73 (after green revolution). Data sources are area and production of 19 principal crops published by Ministry of Agriculture, Government of India, and Census reports for 1961 and 1971. According to them, technological breakthrough, no doubt, has led to an increase in the output of agriculture but this has been counter balanced by an equal increase in the labour force. Male agricultural workers have been taken as a proxy for labour force. As a result there is a decrease in land-man ratio. This being so, for a country as a whole, male worker' productivity has declined slightly. However classifying all the 281 districts under four groups viz high, big, moderate, slow and negative growth districts, they observed an increase in labour productivity inspite of suction of labour force in high growth districts

But because of rapid increase in labour force and consequent decrease in land-man ratio, labour productivity grew at a slower pace than the aggregate output even in high growth areas. As far as moderate districts, are concerned, increase in output has been eaten away by almost an equal increase in the labour force. As a result labour productivity remains constant. Slow growth districts have experienced a notable fall in the labour productivity as a result of interaction of two factors. Firstly output of these regions did not increase significantly & remained more or less constant. Secondly there was sharp increase in the labour force. Negative growth districts observed a sharp decline in output and increase in the labour force. The outcome of this is a drastic decline in the labour productivity in these areas. Aggregating all types of districts shows a marginal decline in the labour productivity for the period under study. High growth districts were characterised by the availability of high irrigation, high use of fertilizers and a favourable institutional set up. In general these experienced an increase in labour productivity but also experienced large influx of labour due to in migration. However most of the regions of the country remained agriculturally backward because of non availability of irrigation and lack of use of fertilizers, and other new technical inputs. These however experienced natural

increase in the agricultural labour force which often exceeded growth of output and thereby resulted in a decline in labour productivity .

Further, they have analysed the factors that are responsible for high or low urban productivity in various regions by fitting regression equations on groups of districts classified according to their growth of output.

Use of advanced appliances such as tubewell, tractors, high capital intenstity/worker explain much of variations in the labour productivity for high growth districts after the advent of green revolution. Moreover, cropped area per and fertilizers also help in explaining labour productivity. However when low and medium growth districts are taken into account, gross cropped area and fertilizer explain large variations in labour productivity. For the districts bearing negative growth trends, tractors explain labour productivity to a large extent than gross cropped area/worker and use of fertilizers. Aggregating all these districts into one single model, they have concluded that tractors account for large part of the variation in labour productivity. This relationship becomes weaker for medium and low and also to some extent for negative growth districts. This being so, variation in labour productivity in the negative and slow growth districts seem to be dependent on fluctuating

output determined by vagaries of monsoons rather than by fixed capital and variable capital.

Another study by G.S. Bhalla and D.S. Tyagi in the book[10] "Patterns in Indian Agricultural Development" a district level study shows a different trend. Although this is a study of 357 districts, only 288 unit districts of these are taken by combining few districts in order to make them comparable during the 60's, the 70's and the 80's. There are districts of seventeen major Indian States. The time periods chosen are 1962-65, 1970-73, 1980-83. This study brings out significant increase in the labour productivity during the period from 1970-73 to 1980-83 at all India level. This contrasts with near constancy of labour productivity for the period 1962-65 to 1970-73. This is, according to them, a net outcome of slow growth rate of agricultural labour force during the last decade. As a result, the share of agricultural labour force in the total male work force has declined making positive effect on the productivity of agricultural workers.

Further in contrast to an earlier study, which recorded high increase in absorption for high growth districts, this study points out declining labour absorption with respect to output even in high growth districts. The author thus

emphasize the role of other factors having become important in explaining labour productivity increase along with output increase. Therefore, though the labour productivity has increased because of large differences in the growth rates of output due to differential adoption of new technology, inter state variation in labour productivity have tended to rise quite sharply.

In a recent monograph on labour productivity, Indira Rajaraman,[11] has replied to the findings of Bhalla and Alagh of 281 districts of 15 states for time periods 1962-65 & 1970-73. After discussing about the growth rate of population, she points out that growth rate of rural male agricultural workforce is lower than that reported by the authors. Hence, assuming rate of growth of output, reported by Bhalla and Alagh studies, she noted an increase in labour productivity instead of a decline. Further, according to her, assuming the male work force did grow more rapidly in the high production growth district, second highest male workforce increase was recorded by group of negative growth districts. However, she emphasised the fact that an increase in work force apart from growth of output depends on number of other factors, such as spatial location and output growth rates in adjoining districts.

A third view that predominates in explaining labour productivity is that by S. Mahendra Dev.[12] His paper on labour productivity of agriculture deals with 56

agro-climatic regions for the period 1962-65 and 1975-78 at the all India level. Ninteen major crops have been considered for the study. As far as work force is concerned sum of total workers i.e. urban and rural has been taken together.

Work force data (total male and female) for early 1960s at region level have been built up from the district level data of 1961 census. 32nd round of NSS are used for late 1970's. District level data have been built up for Gross Cropped area and Net Sown area to obtain regional level data during 1962-65 and 1975-78 triennia. The sources for district level data are Indian Agricultural Statistics, Ministry of Agriculture and Season and Crop Reports. After making data of two time points comparable by doing various adjustments he has found an increase in male agricultural productivity at all India level during the period 1962-65 to 1975-78 though the increase was much slower than that of land productivity. He attributes this to new strategy of agricultural development. He finds out the decline in the share of work force in both high and negative growth districts. Thus his work is not comparable with that of Bhalla and Alagh which showed operation of suction mechanism. That there exists an inverse relationship between growth of productivity and growth of labour force is also clearly brought out by the authors.

Mahendra Dev points out that while on the one hand

co-efficient of variation for labour productivity has increased in both periods in the groups of high growth regions, however inter regional variations has declined in the groups of medium growth-regions. As far as negative and low growth districts are concerned, variations have increased during 1975-78. This he attributes to variations in net sown area/worker at the all India level which explains a major part of variations in labour productivity. Variation in cropping intensity and yield do not provide equally good explanations. But for some districts high growth in yield and multiple cropping explain increase in labour productivity. Further according to him land/worker has contributed negatively to the growth of labour productivity. High growth regions have observed an increase in labour productivity because of gross cropped area, output and net sown area. However, these regions do not show any increase in the growth of work force.

In groups of low and negative growth regions, gross cropped area, output and net sown area have declined, while the number of workers has increased thereby leading to low and negative growth in labour productivity. But the number of workers has failed to counter balance the positive growth of labour productivity in medium and high growth regions and this has led to slow but a positive increase in labour productivity at the all India level during 1962-65 to 1975-78.

Therefore, all of the latter studies have found an increase in the labour productivity during the late seventies and early eighties.

In a labour abundant country like India, increased labour productivity has no impact unless and untill it is accompanied by higher wage rates for workers so as to improve their standard of living. As mentioned earlier some scholars feel that inspite of an increase in labour productivity due to the advent of agricultural technological revolution, agricultural workers are not getting their due share, while some others opine an improvement in the living condition of workers. A number of authors have expressed themselves against the well known dictum of "new orthodoxy" which stresses on the rural immiserisation along with the agricultural development. They have pointed out that agricultural wages have risen after the advent of green revolution and this has resulted in an improvement in the living conditions of rural poor.

Dealing with NSS data for 1951-1971 of agricultural labourers and taking wholesale prices, Deepak Lal has tried to analyse the rural wage rate trend for the entire period 1956-57 to 1970-71. Accepting the reliability of NSS data, he argues that except for West Bengal for which study was not carried out because of non-availability of data, all the remaining 13 states experienced an increase in the real wages rate. Dividing the entire period into two viz., 1956-57 to 1964-65 and 1964-65 to 1970-71, he observed that real wage rates have

risen only in seven states whereas eight states recorded a decline in these during the first period. However, the latter period recorded an increase and this increase was sufficient to neutralise the decline of the early period. Nature of money wage rate to lag behind prices is the reason for a fall in the real wage rate. According to him "New orthodoxy" seems to be generalizing and concluding a decline in the real wage rate without taking the above reasons into account. Further he argues that on the basis of unreliable Agricultural Wages in India data one cannot generalize about the decline in the real wage rate and thereby to argue that agricultural growth leads to a decline in the rural real wage rate.

On the determination of real wage rate he argued that labour market being competitive in nature would respond to an increase in the demand for labour which occurs on account of effect of an increase in agricultural operations. He quotes K. Bardhan[13] and S.M. Pandey[14] to show an increase in real wage rate in different states. Lal also supports demand and supply hypothesis in labour market as contrasted with Griffin's[15] and Herdt and Baker's[16] studies on the determination of real wage rate in labour market According to the latter it is not the demand and supply but institutional factors that determine wage rate in rural India. Further using NSS data and taking real wage rate as a dependent variable and

increase in cereal output as independent variable, Lal comes to the conclusion that for the recent period, there seems to be a presumption that agricultural growth does lead to a rise in real wages in India. Further studies according to him which do not support the above line of argument, draw a hasty conclusion as green revolution had only taken root by 1965-67. This being so, new technology takes time to work through and thereby make a positive impact on the real wage rates because of higher rate of agricultural growth.

This view is also shared by Herdt and Baker in their article on agricultural wages, production and HYV.[17] Their data are taken from Agricultural Wages in India, Quarterly Bulletin of Statistics in India, the Statistical Abstract of the Government of Punjab. Wage deflator reported by Directorate of Economics and Statistics and Agricultural prices in India are also taken. Cereal grain prices have been chosen by them for determining real wage rates. Assuming a lag response of real wage rate to the demand of labour for the period 1954/55 to 1968/69, they observed that in a few states like Punjab, Kerala, Madhya Pradesh, real wages are not generally influenced by production. However for the period begining from 1966-67 to 1968-69, after the adoption of HYV leading to an increase in demand for labour, HYV wheat is very significnatly correlated with both money as well as real wage rate.

Analysing the trend of real wage rate they find

that in contrast to 1957-58 to 1965-66 during the post-HYV years the adoption of HYV has helped at least to prevent a decline in the real wages of agricultural workers.

There are, however, numerous other studies on Indian agriculture which on the basis of available empirical evidence seem to highlight the opposite phenomenon and dwell a theme of unequal sharing of benefits within the agricultural sector. Such studies, what Deepak Lal calls "new orthodoxy", take a totally opposite stand regarding income distribution in agriculture.

A.V. Jose[18] makes use of Consumer Prices Index collected from Agricultural Wages in India (AWI) annually Published by the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, Consumer Price Index Numbers for Agricultural Labourers (AGCPI) separately available for each state in India for undertaking his analysis. He argues that one should take (a) agricultural wage-rates, b) quantum of employment and c) price of wage good consumed by the numbers of the households in order to determine real wage rate. Depending on the indirect evidence on the possibility of a decline in the employment opportunities available to agricultural workers after 1964-65 and an increase in the rural unemployment and under employment in

India during the 60's[19] he brings out the possibility of decline in the real earnings of agricultural labourers. This is supported by his analysis of trend of real wage rate from period 1957/58 to 1963/64 and 1963/64 to 1971/72. He thereby brings out the decline in real wage income of the rural area. However, there has been an significant increase in real income in Uttar Pradesh, Punjab/Haryana[20]. Further on the rural wage determination, he emphasised, that apart from the increase in grain output , there are other crucial factors such as cropping pattern, cropping intensity, irrigation that also have an important influence on the demand side. However dealing with the real wage rate in a paper Published in the Review of Agriculture E.P.W March 1974, he found that Indian agriculture observed a declining trend in real wage rates from 1961-62 onwards which seems to have been arrested in the latter half of the 60's. There are some states where wages in fact declined during the earlier period from 1956-57 upto 1970/71. These are Assam, Karnataka, Madhya Pradesh, Orissa, and West Bengal out of 14 states under study. During 1965-66 and 1966-67 real wage rates reached rock bottom levels, however, from then onwards, the real wage rates improved in all other states except in Orissa.

Further in the Working Paper of Asian Employment Published in ARTEP, taking 1970-71 as the base year,

he observed an increase in wage rate between 1970-71 to 1984-85 in almost every state. Accroding to him, during the first half of the 1970s almost all the states taken for study observed a decline in the wage rate. Lowest level was recorded in 1974/75. However from 1974/75 onwards wages seem to have generally risen in all the states. But again for next two years, real wages reverted to the 1970/71 level in most of the states. According to him a consistent rise in real wages from 1974/75 onwards is found to be a rare phenomenon in the context of any state with the exception of two states viz Andhra Pradesh and Assam which recorded a consistent rise in real wage rate. The next problem analyzed by Jose is whether or not HYV has made an impact on the movement of real wage rates. He tried to link money wage rates directly with the absolute level of product/worker in agriculture of each state. Productivity levels are expressed in current prices and have been obtained by dividing the estimates of states domestic product from agriculture workers prepared by the C.S.O with the corresponding estimates of agricultural workers in each state. Work force figures have been obtained from the Census and work force has been defined as cultivators plus agricultural labourers.

In order to test the strength of the relationship, regression results are carried out keeping product/worker at current prices as the independent variable & money wage rate across states as the dependent variable . The exercises were done separately for both male and female workers pertaining to three selected years namely 1970/71, 1977/78 and 1984/85. High regression co-efficients as well as 't' values of co-efficients were found to exist between these two variables thus concluding that there exists a positive and significant relationship between money wages and labour productivity. Somewhat similar views have been expressed by Rohini Nayyer[21] in a note. Using data available from Quarterly Bulletin of statistics Published by Directorate of Economics and Statistics, Government of Uttar Pradesh, her finding stands totally in contrast to those of Deepak Lal. Data analysis up to 1973-74, shows that in one of the main green revolution region viz, western Uttar Pradesh real wages showed a tendency to rise over the period 1959-60 to 1973-74. Further after 1970-71, real wage rates declined steadily. She concludes that there is no simple causal relationship between the introduction of new high-yielding varieties technology, leading to increased agricultural output, and real wages. A set of complex factors in the realm of political economy, namely the bargaining power of agricultural labourers, the power of land owner, the

nature of contractual relation between the two, the availability of alternative employment and the pattern of land ownership, would also influence rural wage rates.

N. Krishnaji,[22] has also more or less dealt with similar kind of arguments. Using data published by the Directorate of Economics and Statistics to study the trend in agricultural wages since 1956 and Consumer Prices Index furnished by Labour Bureau of Agricultural Labourers taking 1956-57 as the base year, he concludes that in only six out of 14 states i.e. Assam, West Bengal, Madhya Pradesh, Punjab, Himachal Pradesh, and Uttar Pradesh real wages during 1964-65 were lower than that of their 1956-57 levels. However in Bihar, Mysore Gujarat, Madhya Pradesh wage rates have remained constant more or less at the same level. In Kerala, Orissa, and Andhra Pradesh real wages have risen during 1956 to 1964. For 1968-69, Krishnaji uses data collected from Agricultural Situation in India and compares it with his earlier data for 1964-65. He finds that both wage rates and prices have shown an increase and hence concludes that living conditions of agricultural labourers have probably continued to be the same as before. Further according to him, increase in demand of labour lifting the conditions of agricultural labour above poverty line through the increased agricultural activity would not result in increased wage

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rates. This is because of the in-migration from the neighbouring states. A.V. Jose also argues that in-migration and mechanisation of agriculture are responsible for the low rise in real wage rate that prevails in Punjab and Haryanan.

Shiela Bhalla [23] takes up the analysis for Punjab's real wages of agricultural labourers from 1960/61 to 1976/77. In most of the years, money wages in Punjab during 1960/61 - 1976/77, responded with a time lag, to price changes and hence real wage rate declined for most of the operations between 1965 and 1968 and again in 1974, 1975 and 1977. However, real wage rates which declined below 1961 level got counter balanced by rise in productivity by 1969.

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Punjab observed peak level in real wage rates during 1969 to 1973. However subsequent years 1974 and 1975 saw reversal of wage rates to below the 1960's level. However real wage rates recovered during 1976 and 1977 but were below these recorded during 1969 to 1973.

Regression results in her study show that between 25 percent to 43 percent of year to year variations in real wage rates is explained by numerous variables, demand for labour being the single

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most influencial factor affecting real wage rates. However prices do not show any effect on the real wage rates. Further regressions carried out for early 1960's and early 1970's show that labour productivity has acquired a greater explanatory power during the 1970's. But according to her, large parts of the variations in real wages remained unexplained. This means that there are large number of other factors besides demand for labour and supply of labour, which leads to slow response of money wage rate to changes in the consumer price index there by affecting real wage rates.

Dealing with agricultural wages in India Sarthi Achary[24] in Indian Journal of Agricultural Economics Number -2 April Jan - 1989, has made study on agricultural wage series in India for male & female worker separately, covering the period 1970 to 1985 for 58 agro-climatically homogenous regions of the country. The Agricultural Labour's Price Indices (ALPI) obtained from the various issues of RBI Bulletin have been employed for obtaining real wages series with 1970-71 as a base year.

His study shows that in the early 70's the north west regions of the country and north eastern parts of Rajasthan along with some coastal regions had comparatively high real wage rates. On the other hand hinterland, the Deccan Plateau, Madhya Pradesh, Eastern Uttar Pradesh, Bihar, Maharashtra, internal Andhra Pradesh, most of

the Karnataka recorded low wage rates. However during 1982-83 to 1984-85 all states recorded an increase in real wage rates. But at the same time he has concluded that real wage rates are sensitive to the general upwings and downwings of the agricultural economy. P. Bardhan in his article[25] has used Agricultural Wages in India data and Consumer Retail Price (general) number for agricultural labourers issued by the Labour Bureau of the GOI for observing wage rate trends in the north west region. It seems that between 1960-61 and 1967-68, average real wage rate for male agricultural labourer in this region does not seem to record an increase inspite of the fact that agricultural production grew by more than sixty percent during this period.

By taking National Sample Survey, Round 11,12, 19, data he observed that between 1956-57 and 1964-65 an increase in money wage rate had been counter balanced by an increase in Retail Consumer Price Index, leading to a decline in the real wage rate in Punjab (including Haryana, Delhi and Himachal Pradesh). Similarly, on the basis of the data on agricultural wage rate and consumer price index for agricultural labour published by the Economics and Statistics Directorate of Government of Uttar Pradesh in Quarterly Bulletins, he found that real wage rate has remained nearly constant in Uttar Pradesh during 1960-61 to 1967-68. Further he agrues that those regions where the government concentrated its efforts for agricultural modernisation, the real

wage rates of agricultural labour remained disappointing low. Majority of districts of the different states recorded a decline in real wage rate between 1962-63 and 1967-68. Further by using NSS data he argues that there was a significant fall in the real wage rates in Punjab (including Haryana, Delhi and Himachal Pradesh) on the one hand while on the other hand there has been a considerable rise in the real wage rates for male agricultural labourers in Kerala between 1956/57 and 1964/65. This could be due to relatively strong peasant organisations in Kerala than the rest of the states of the country. In Kerala the bargaining strength of agricultural labour is an important determinant of high real wage rates. But the green revolution has not helped in raising agricultural wage rate in real terms in north west India, in fact there seems to be some indication of a fall in the real wage rates in many areas of this region.

From the foregoing studies one can assume that the studies which deal with the Agricultural Wages in India data shows that most of the states experienced a declining trend in real wage rate during the 60's. However, Deepak Lal dealing with NSS data, observed an opposite trend and argues that the picture would have been different had scholars used the more reliable NSS wage data.

I (c)-Scope of the Present Study

Review of literature has given very extensive knowledge on the labour productivity and wage rate during the pre and post green revolution periods. It has been pointed out by various studies, as already discussed, that in general there took place an increase in labour productivity after the advent of green revolution. Some studies however show that agricultural output increased in the post green revolution compared with the pre green revolution period, however, the latter period does not show an increase in wage rates in agricultural labourers. On the other hand some scholars feel that it has increased over time. One important reason for this could be the different data sources and methodology used by various studies in analysing the trend over time and differences in the time period chosen by them. Further, importance given by them to various factors leads to different conclusions. Neverthless each study is of great importance in its own right.

The present study is another modest attempt in analysing the complex relationship between growth of labour and real wage rate in Indian agriculture.

An attempt is made to systematically study the growth of agriculture and its performance over the period chosen. In this context an endeavour is made to focuss attention

on the data - sources and the source - material that has been made use of. An attempt has also been made to highlight broadly the methodological approach that the undersigned purports to utilize for analysis. The introduction, the data source, scope and methodology are all discussed in chapter I.

Green Revolution has led to a significant increase in the agricultural production. This could be because of some output augmenting modern technology using biological inputs as well as capital inputs which resulted in an increase in the productivity of inputs. As a consequence of this growth of output increased at a faster rate in post green revolution period than in the corresponding pre green revolution phase. But at the same time one has to take into account various aspects of development which helped the country in achieving certain underlying and basic goals. One of the net outcome of various development programmes is the decline in the mortality rate resulting in high population growth. As a result of this labour force has been rising over time. This being so, one might expect that technological change would lead to an increase in the intensity of labour inputs in agriculture simultaneously with increased agricultural activities. And this would affect the labour productivity. This being so, its is important to analyse the extent to which there is a change in labour producti-

vity as well as in land productivity prior to and after the green revolution across the different states during 1960/61 to 1986/87 resulting in an increased value of output. Further, it is also important to analyse differences in the level and growth of labour productivity that occurred prior to and after the green revolution and factors responsible for the same. The relationship between labour productivity and land productivity across different states over the period 1960/61 to 1986/87 is analysed in Chapter II.

Generally it is assumed that labour productivity is associated with wage rate. This not only reflects standard of living of workers but also is a good reflector of economic progress. Numerous rural labour households have very little access or no access to land. Therefore they totally depend on wage labour for their existence. It is therefore important to analyse the trend in real wage rate and to see how far change in the productivity of labour has affected real wage rage there by affecting living condition of labourers. Further, wage rates, apart from the changes in labour productivity, depends on various other socio-economic and institutional factors. Neverthless, labour productivity has its unique importance even in a country like India. Chapter III deals with wage rate and at the same time

throws some light on the other factors determining real wage rates.

I (d)- Data Sources and Methodology

Choice of Year

Four points of time have been chosen for this study. The conditions prevailing in Indian agriculture before the advent of green revolution are sought to be captured by taking average agricultural production of 49 crops during the three years 1962-63, 1963-64 and 1964-65. Though 1972-73 was a drought year, by early 70's the technological change in Indian agriculture had made a visible impact in the north-western states of India. The impact of it could be seen in Punjab, Haryana, Western Uttar Pradesh. Therefore the period 1962-65 to 1970-73 is chosen to analyse the impact of green revolution. However, drought did affect southern states of India—Maharashtra, Karnataka and Andhra Pradesh. Hence one could not get the true picture of change as far as these states are concerned. Moreover early 80's show an extension of green revolution, the "so called second phase of green revolution", to the other states like Andhra Pradesh, Gujarat, which matures by the 80's. Therefore 1980-83 is chosen to reflect this change. Further, late 80's show the spread of new technology to the lagging crops and regions. The special programmes for rice and oilseeds, to dry farming and to less deve-

loped states have started yielding results As a result eastern and western regions showed better performance during late 80's than that of first decade of the green revolution, which the period 1984-87 tries to capture. Thus periods chosen under this study, 1962-65, 1970-73, 1980-83, and 1984-87 have their own importance as these try to give relative picture of agricultural development prior to and after the green revolution.

Coverage of Study

States Covered

Fifteen states are covered under the present study. They are Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal.

Crops Covered

41 principal crops on which data re published by Directorate of Economics and Statistics, Ministry of agriculture have been selected for the study. These are the following:-

Food Grains:-

Cereals:- 1 Rice
2 Jowar
3 Bajra

4 Maize

5. Ragi

6. Small Millets

7. Wheat

8. Barley

9. Sugar Cane

10. Gvarseed

Pulses:- 11. Gram

12. Tur

13. Other Pulses

Oil sSeeds 14. Ground-nut

15. Sesamum

16. Rapeseed and Mustard

17. Linseed

18. Castor Seed

19. Sunflower

20. Niger Seed

21. Coconut

Fibres 22. Cotton (Lint)

23. Jute

24. Mesta

25. Sannhemp

26. Tobacco

Condiments and Spices

27. Black Pepper

28. Chillies

Fruits and Vegetables

34. Banana
35; Potato
36. Sweet Potato
37. Tapioca
38. Cashewnut
39. Ginger

Plantation Crops

40. Tea
41. Coffee
42. Rubber

Value of Output and Area:-

Data of production and area have been collected from various issues of "Area and Production of Crops in India". Further, to remove the fluctuations in agricultural production three years average have been taken for study. Prices - The production is weighted by constant all - India prices of these crops during the triennium ending 1981-82. These prices are average all - India prices for 1980-83 derived by the Directorate of Economics and Statistics, Ministry of Agriculture, for constructing the revised index number of agricultural output. Thus weights assigned to different crops are based on 1980 average all-India prices during triennium ending 1981-

82. Prices thus collected are multiplied with production to get the value of output. However, for a few states like Punjab and Haryana, district - wise data has been combined to arrive at the state level data for period 1962-65. This is because the Punjab was not divided into present Punjab and Haryana till 1976. Further to calculate cropping intensity, data on gross cropped and net sown area have been obtained from various issues of Statistical Abstract of India.

Agricultural Male Workers

Data for this variable are primarily collected from the General Economic Tables of 1961, 1971 and 1981 censuses. Agricultural male workers have been defined as rural male cultivators plus rural agricultural labourers. Exponential growth rates have been calculated for 1961 to 1971 and 1971 to 1981 to derive the data for male agricultural workers for 1962-65, 1970-73 and 1980-83 and 1984-87. Further, due to non-availability of data for Punjab and Haryana separately at the state level, Punjab Statistical Abstract and Haryana Statistical Abstract have been used to derive workers' figure for 1962-65. Moreover, in the case of one state, namely, Assam where census operations were not conducted in 1981, present study has assumed male agricultural workers' to grow at the all India level and thus all India growth rate has been multiplied with 1971 Assam census data to obtain 1981 agricultural

workers' figure for Assam.

Tractors and Fertilizers:

Data for tractors and fertilizers have been obtained from appendix of book by Bhalla and Tyagi "Patterns in Indian Agricultural Development" district level study for three time periods. that is 1962-65, 1970-73 and 1980-83. However, the data on this variable are not available for the fourth time period i.e. from 1984 to 1987.

Money Wage Rates

The principal source of data used in this study for wage rate are Agricultural Wages in India (AWI) annually published by the Directorate of Economics and Statistics Ministry of Agriculture, Government of India. wage data for all the 15 states have been used in the present study. However due to non-availability of data for Haryana and Rajasthan before 1966, Punjab's data have been used for Hanyana. Gujarat's figures have been assumed to prevail for Rajasthan. Wage rate data refer to wages for unskilled labourer that is field labourer and agricultural labourer. (Male).

However the present study confines itself only to male agricultural workers. In the case of male workers, average of different operations is taken at district

level. District-wise average rates for different months have been combined to obtain the yearly average wage rates. The yearly average estimates of money wages for male workers at district level have in turn been used to derive state level wage rates.

Wage rate data pertaining to two intervening years 1972-73 and 1981-82 are not published by the Ministry of Agriculture. Hence average wage rates of 1971-72 and 1973-74 have been taken to derive 1972-73 data. Similarly average of 1980-81 and 1982-83 have been taken for 1981-82 Statewise consumer price index numbers for agricultural labourer (ALCPI) furnished by the Labour Bureau, Chandigarh were converted into indices with base 1981-82. These are used to deflate the money wage rates for respective states to arrive at real wage rates of male agricultural workers in different states from 1960/61 onwards upto 1986/87.

Labour Productivity* and Land Productivity

Labour productivity has been calculated by dividing total value of output with total male rural agricultural workers. Similarly land productivity has been calculated on the basis of total value of output divided by net sown area for different time periods under study.

* (Ref. table 21 in appendix)

Cropping Intensity:

The has been obtained by dividing gross cropped area with net sown area for different time periods.

Growth Rates

Growth rates calculated are annual compound growth rates. There have been calculated on the basis of the three years average value of output and areas for different periods. Formula used is following:

$$Pt = Po\ (1+r)^{t}$$

Annucal compound growth rate for four time periods 1962-65 to 1970-73, 1970-/73 to 1980/83, 1980/83 to 1984/87 and 1962/65 to 1984/87 have been calculated growth rates for labour productivity, cropping intensity, real wage rates have been similary calculated. There is no doubt that new seed technology along with capital input led to increased output to a great extent. However, in a country like India climatic conditions do make an impact on the agricultural growth rates to a considerable extent. Further there are instances when country faced severe drought. Therefore to examine the changes over the entire period, growth rates for 1962/65 to 1984/87 have also been calculated and made use of . Thus period chosen would give growth performance at different time points of agriculturalperformance.

Real Wage Rate

Real wage rate has been calculated on the basis of consumer price index and money wage rates.

$$\text{Real Wage Rate} = \left(\frac{\text{Base year price index}}{\text{Current year price index}} \times \text{money wage rate}\right)$$

Consumer Price Index and Real Wage Rate Index

Following formula have been used to find out index of real wage rates and index of consumer price index:-

1) $$\text{Index of Real Wage Rate}_{(1981\text{-}82)} = \frac{\text{Current real wage rate}}{\text{Base year real wage rate}} \times 100$$

2) $$\text{Index of Consumer Price Index}_{(1981\text{-}82)} = \frac{\text{Current consumer price index}}{\text{Base year consumer price index}} \times 100$$

Thus index calculated on the basis of above formulas have been used to study the trend in the value of real wage rates and consumer price index.

Regression Models

Labour productivity, apart from other things can be assumed to a function of land productivity. There are various factors like irrigation, fertilizer, tubewell etc which affects land productivity. In turn these factors can be taken as a proxy for land productivity and can be assumed to affect labour productivity.

Therefore double log linear model would try to analyse the effect of factors like land productivity and its determinants like cropping intensity, fertilizer use, number of tractors etc on labour productivity.

1. $\text{Log PRD}_{1962-65} = \log a + b \log \text{PRDD}_{1962-65}$

   $\text{Log PRD}_{1970-73} = \log a + b \log \text{PRDD}_{1970-73}$

   $\text{Log PRD}_{1980-83} = \log a + b \log \text{PRDD}_{1980-83}$

   $\text{Log PRD}_{1984-87} = \log a + b \log \text{PRDD}_{1984-87}$

2. $\text{Log PRD}_{1962-65} = \log a + b \log F_{1962-65}$

   $\text{Log PRD}_{1970-73} = \log a + b \log F_{1970-73}$

   $\text{Log PRD}_{1980-83} = \log a + b \log F_{1980-83}$

3. $\text{Log PRD}_{1962-65} = \log a + b \log \text{C.I}_{1962-65}$

   $\text{Log PRD}_{1970-73} = \log a + b \log \text{C.I}_{1970-73}$

   $\text{Log PRD}_{1980-83} = \log a + b \log \text{C.I}_{1980-83}$

4. $\text{Log PRD}_{1962-65} = \log a + b \log T_{1962-65}$

   $\text{Log PRD}_{1970-73} = \log a + b \log T_{1970-73}$

   $\text{Log PRD}_{1980-83} = \log a + b \log T_{1980-83}$

   where PRD = Labour Productivity

   PRDD= Land Productivity

   F = Fertilizer

   T = Tractors

C.I. = Cropping Intensity

Increased labour productivity is a good indicator of economic growth in positive direction. But for overall economic development, it is essential that increased labour productivity should transfer itself into high returns to workers. To examine whether this actually occurred in the Indian economy, double log linear regression model for four time periods have been used

These are:

$$\text{Log } WR_{1962} = \log a + b \log PRD_{1962-65}$$

$$\text{Log } WR_{1970-73} = \log a + b \log PRD_{1970-73}$$

$$\text{Log } WR_{1980-83} = \log a + b \log PRD_{1980-83}$$

$$\text{Log } SR_{1984-87} = \log a + b \log PRD_{1984-87}$$

Where

WR = real wage rate

PRD= labour productivity.

I(e) Limitations

1. For the period 1962-65 data of area and production for Punjab and Haryana are not available separately at the state level, therefore different districts during early 60's were combined to obtained separate data for the two states. Agricultural data at the district level suffer from some limitations. In particular, district level data may be too small a sample to provide a good base for a reliable estimate of yield.

2. Again approximate wage rate data for Haryana and Rajasthan, are not available before 1966. It's assumed that the wage rates were same as in enighbouring states. Wage rate data for Rajasthan for period 1960/61-1965/66 is taken as equivalent to Gujarat's wage rate. Similarly Punjab wage rate is taken for Haryana for the same period. This, however, might not give a true picture of wage rate prevailing in the pre-green revolution period.

3. Agricultural male worker data for Assam are not available due to non-availability of 1981 census data. It is assumed that the growth rate of workers in Assam was the same as at the all India level. This being so, Assam data for 1980s are approximate

4. AWI data is subject to all kinds of biases such as investigator bias, respondent bias, location bias etc, etc, which might give biased result. But according to some scholars AWI data are regularly collected and are consistent. This is because over time the biases get evened out. These authors feel that AWI data on wages can be fruitfully used for analysing spatial variations and long term trends in the behaviour of wage rates.

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CHAPTER - II

Labour Productivity In Indian Agriculture

Indian agricultural sector, even today, retains its importance as it did some three decades ago. Being one of the major source of food and employment, this sector is, however, constrained by some glaring limitations. Scarcity of ploughable land and lack of much scope for diversification are important among these. This being so, growth of agriculture depends on productivity of land as well as that of labour.

Apart from the aforementioned two headings, growth of agriculture in India also bank upon other peculiar factors. Variations in certain factors, the control of which is beyond human parameter (for instance, weather leads to a fluctuation in agricultural output to a great extent) is also a significant feature of our indigenous economy. So too are some "controllable " factors such as material inputs of labour. All these factors are in one way or the other affect the productivity of land and labour, which in turn, the growth of agricultural output .

India, being predominantly agricultural economy, in order to reduce dependence on food import and to feed tremendous growing population paid considerable attention to the agricultural development in her subsequent plans

as well as like other countries adopted "new agricultural strategy". As a result its agricultural growth rate accelerated from 0.37 per cent per annum during the pre-independence days to about 2.7 per cent in the post independence.[1] However apart from the new strategy which resulted in growth of agriculture, according to C.H.H. Rao,[2] there are two major factors which helped in stimulating growth viz. growth of population and rise of agriculture classes to political power[3] However, this marked increase in the agricultural growth rate should not be taken as an indicator of absolute benefit as the country received after adoptation of a new strategy, rather it should be judged by keeping in view the relative need of the country.[4]

Modern technology was a major attributing factor for increased production. However production can increase as a result of increased coverage of the crops and increase in yield. This can also be accompanied by an increase in the productivity of labour. Therefore, it is very essential to examine closely the nature of agricultural growth prior to and after green revolution. For an evaluation of the relative performance of green revolution in India after the mid-sixties, the study is being conducted at state level of performance has been divided under four different phases. They are

1962-65, 1970-73, 1980-1983 and 1984-87.

Present chapter is divided into two broad sections. While section (I) shows the nature and extent of agricultural growth, section (II) mainly deals with labour productivity in Indian agriculture prior to and after the on set of green revolution

SECTION - I

This section is devoted to an empirical analysis of level and growth of agricultural output in terms of rupees, prior to and after green revolution at state levels. While analysing the level and growth of output, this section would also examine following queries:-

a) was there an increase in production or not? and if so, a close observation of the factors.

b). whether this increase was accompanied by an increase in productivity of land.

c) how far it would be correct to say that increased land productivity made possible on account of a favourable movement of both net sown area and cropping intensity.

New agricultural strategy has placed special emphasis on the development and widespread adoption of HYV. As a result of this the post 1966 period, in Indian economy, saw a substanstial increase in agricultural output. Where as in early stages of green revolution

(i.e. period till late 60's), saw a breakthrough in the form of green revolution, the latter period saw its extension to rice and cotton also. Output increased by 13.4 million tonnes during 1962-65 to 1970-73 and by 14.3 million tonnes during 1970-73 to 1980-83[5]. In case of rice, the period 1970-73 to 1980-83 witnessed a sharp increase of 9.5 millions tonnes [6] and one of main reasons for this increase could be extension of new technology to rice. Whereas the major contributor of wheat was Punjab, in case of rice Andhra Pradesh made a relatively big contribution than other states. Inspite of decrease in the area under cotton its output increased from 5.5 million bales to 7.4 million bales. On this account one could say that green revolution is basically wheat revolution. However, to analyse the overall performance of agricuture prior to and after green revolution it is necessary to take other food grains, non-foodgrains, fibres etc. rather than confining merely to wheat alone. This section therefore, without going into each individual crop would take the production (in terms of rupees) of 41 crops in the 15 major states.

II(a)-Growth in the Average Value of Output (at state level)

During mid 60's few regions witnessed an increase in the consumption of several seed, fertilizers, agro-inputs such as pesticides, growth regulating compounds etc.

Table 1. Statewise Levels of Average Value of Output During 1962-65, 1970-73, 1980-83 and 1984-87 (Constant Price:1981-82)

Sl.No.	State	Average Value of Output (000 Rupees)			
		1962 - 65	1970 - 73	1980 - 83	1984 - 87
1	2	3	4	5	6
1	Andhra Pradesh	21868879.24	23060329.63	33447415.70	30998081.41
2	Assam	9327854.41	10989035.43	14372693.86	15983633.85
3	Bihar	18441551.37	19979107.62	19388182.40	24089258.94
4	Gujarat	13899777.81	16442675.01	22058409.27	18743871.10
5	Haryana	6932551.12	10396829.44	14297624.65	12931370.07
8	Karnataka	14270339.07	17391367.07	21432947.44	27595418.14
9	Kerala	10026437.49	13878610.53	13273041.28	12443639.98
10	Madhya Pradesh	21196671.47	24730304.91	27186767.89	30022121.69
11	Maharashtra	21433272.77	16156947.23	30900189.51	27960121.41
12	Orissa	11605204.33	12350553.04	15461878.12	19006263.33
13	Panjab	9651693.76	16576380.96	26995431.49	33696153.70
14	Rajasthan	10650915.25	14863795.62	16836773.64	18865223.41
15	Tamil Nadu	20347577.26	25355718.07	24436437.91	29306129.63
16	Uttar Pradesh	41056643.06	51120149.73	66647065.32	74377027.49
17	West Bengal	17358691.98	20650287.92	22364593.81	26853574.10

Table 2. Statewise Growth of Average Value of Output During 1962-65, 1970-73, 1980-83 and 1984-87

Sl.No.	State	% Annual Compound Growth*			
		(A)	(B)	(C)	(D)
1	2	3	4	5	6
1	Andhra Pradesh	0.6653	3.7886	-1.8833	1.5984
2	Assam	2.0698	2.7207	2.6915	2.4782
3	Bihar	1.0060	-0.2998	5.5776	1.2218
4	Gujarat	2.1223	2.9817	-3.9889	1.3683
5	Haryana	5.1964	3.2372	-2.4797	2.8743
8	Karnataka	2.5032	2.1115	6.5219	3.0430
9	Kerala	4.1478	-0.4451	-1.6002	0.9866
10	Madhya Pradsh	1.9460	0.9515	2.5111	1.5948
11	Maharashtra	-3.4708	6.6990	-2.4686	1.2157
12	Orissa	0.7811	2.2722	5.2952	2.2677
13	Panjab	6.9943	4.9978	5.6994	5.8475
14	Rajasthan	4.2540	1.2542	2.8847	2.6326
15	Tamil Nadu	2.7887	-0.3686	4.6478	1.6722
16	Uttar Pradesh	2.7782	2.6878	2.7814	2.7377
17	West Bengal	2.1942	0.8007	4.6792	2.0030

* %age Annual Compound Growth Rate:
(A) 1970-73 over 1962-65;
(B) 1980-83 over 1970-73;
(C) 1984-87 over 1980-83; and
(D) 1984-87 over 1962-65.

Moreover, there was an increase in public investment in agriculture. Public investment being complementary in nature[7], saw an increase in private investment and with the result, there was a considerable rise in gross capital formation which in turn resulted in an unprecedented increase in gross irrigated area. Thus as a consequence to all these factors, post-mid 60's saw a considerable change in total farm production.

(Ref. Table 1 & 2)

North west states like Punjab, Haryana and Uttar Pradesh were the main beneficiaries of agricultural breakthrough. During 1962-65 the level of output of Haryana increased from Rs 6932.5 million to 10396.8 million in 1970-73. However there was only a slight increase, during 1980-83, in the value of output which resulted in the decline in the growth rate from 5.19%, during 1962-65 to 1970-73, to 3.25% during the period 1970-73 to 1980-83. Moreover during 1984-87, Haryana, further accounted a decrease in the output and as a result of which it observed a negative growth rate of -24.7% during period 1980-83 to 1984-87. However for the entire period it had a positive growth rate.

Punjab, apart from the slight decline in the growth rate during 1970-73 to 1980-83, recorded a relatively high growth rate than other states. Punjab experience a substantial increase in the level of output after green

mid 60's. Its value of output increased from Rs. 965.6 million, during 1962-65, to Rs. 3396.1 million during 1984-87. For the entire period it recorded growth rate as high as 5.84 per cent per annum.

Uttar Pradesh though a recorded low but a positive and constant increase in the growth rate of 2.7% per annum for entire period i.e 1962-65 to 1984-87 and like other states Punjab and Haryana which experienced a decline in their growth rates after early phase of green revolution, Uttar Pradesh did not experience any major, fall, in the growth rate of her output.

Coming to the central region of India, which comprises of Rajasthan, Madhya Pradesh, Maharashtra, and Gujarat, is highly dependent on rains. Agricultural performance is too much dependent on monsoon. And because of large weather fluctuations which this region recorded in the past it is very difficult to draw a consistent trend line which show either an increase or a decrease in the output performance. Some states like Gujarat recorded an increase in the level of output from Rs. 13899.7 million during 1962-65 to Rs. 22058.4 million till 1980-83. On the one hand while there are some states such as M.P and Rajasthan come out with quite different pictures. Madhya Pradesh recorded a low growth rate of 1.94% during 1962-65 to 1970-73 but decreased to 0.95%

during the 1970-73 to 1980-83. Rajasthan recorded a high growth rate of 4.25% during 1962-65 to 1970-73, which declined to 1.25% during 1970-73 to 1980-83. However during 1980-83 to 1984-87 both states Rajasthan and Madhya Pradesh recorded an improvement in their growth rates to 2.88% and 2.5% respectively.[8] But on the other hand Gujarat recorded a negative growth rate of (-)3.98% during the same period. However for entire period it recorded a positive growth rate of 1.36 per cent per annum.

As regards Maharashtra also monsoon has played a bigger role than technical revolution. Failure of monsoon depressed the level of output from Rs. 21432.2 million, during 1962-65, to Rs. 16156.9 million, during 1970-73. As a result of this Maharashtra accounted negative growth rates of (-) 3.47% during the period 1962-65 to 1970-73, while favourable monsoon during 1980-83 resulted an increase in growth rates to 6.09% during the period 1970-73 to 1980-82. But again during next period 1980-83 to 1984-87 growth rate declined to (-) 2.47% as a result of wide weather fluctuation. As a result for entire period Maharashtra recorded a quite low growth rate of 1.21[9] per cent per annum.

All four Southern States viz Andhra Pradesh, Karnataka, Kerala and Tamil Nadu experienced an improvement in their position during the early phase

of green revolution. But this position deteriorated during the later phase. However between 1980-83 and 1984-87, Karnataka recorded 3.04% followed by Tamil Nadu and Andhra Pradesh and Kerala which recorded growth rates of 1.67%, 1.5% and 0.98% of growth rate respectively.

In the eastern region, Assam maintained a constant increase of more than 2% per annum throughout the entire period. While Bihar and West Bengal saw decline in their growth rates from 1.00% and 2.19% to (-) 0.29% and 0.80% respectively from period 1962-65 - 1970-73 to 1970-73 to 1980-83. However during 1980-83 to 1984-87, these states recorded phenomenal increase in the growth rates of output. Bihar recorded a growth rate of 5.57% followed by Orissa, West Bengal and Assam which observed growth-rates of 5.29%, 4.67% and 2.69%, respectively.[10] But for entire period growth rates were low as compared to Nroth-west region.

In general 1st period i.e 1962-65 to 1970-73 recorded a positive growth rate except for Maharastra.[11] Punjab recorded growth rate as high as 6.99% followed by Haryana with the growth rate was of 5.19% occurred due to favourable conditions that these region experienced.

Maharashtra recorded a fairly high[12] growth rate of 6.89% during the period 1970-73 to 1980-83 followed by Andhra Pradesh[13] during the same period. However

during the same period Punjab, Haryana, and Uttar Pradesh recorded a decline.[14] Moreover Bihar , Kerala and Tamil Nadu recorded a negative growth-rates of (-) 0.29%, (-) 0.44% and (-) 0.36% respectively from a positive growth rates of early period of 1962-65 to 1970-73.

A notable feature which emerges during the 3rd period, 1980-83 to 1984-87 is considerable increase in the growth rates of eastern states. Apart from eastern states few southern states like Karnataka and Tamil Nadu also recorded a fairly high growth rates. There seems to be a general improvement in those states which did not stand to benefit in early phase of green revolution. It appeared that inter-crop imbalances which had occured during early phases of green revolution are getting narrowed down. This could be possible due to an increase in the growth rates of crops such as rice, pulses, oil seeds whose growth rate during early and late eighties[15] than those recorded in te pre-green revolution. Apart from an increase in the coverage of crops, the increased growth rates could be attributed to an extension of those crops to rainfed and unirrigated areas and states which has resulted in the better performance of states like Assam, Bihar, Orissa, Madhya Pradesh and West Bengal compared to those of the early green revolution period. This encouraging performance is basically attributable to the spread of new technology to the lagging crops and regions and because of special attention that is being given

to dry farming which has resulted in a better performance of eastern region which is nearer or even higher than all India average.

During the entire period, most of states registered positive growth rates. There are however, few states which were not able to maintain high growth rates that they had recorded during the early phase of green revolution. Haryana, Karnataka Rajasthan are few examples of them. On the other hand, there are states like Karnataka, West Bengal, Orissa and Bihar, which recorded an increase in growth rates during 80's, as a result of which their overall performance improved relatively to that of initial stages of green revolution. Punjab and Uttar Pradesh recorded a slight improvement during 80's than that of early 70's, however managed more or less constant increase in the rate of growth throughout the entire period.

Indian agriculture, therefore, saw an increase in growth rate of output at different phases for different states. This increase could be possible only if there was an increase in the use of inputs. However, it is believed that the growth in agricultural output is being achieved with increasing cost per unit of output, as the index of inputs at constant prices has been rising faster than output.[16] This is possible only at high rate

of substitution of capital for land and labour which was one of the major outcome of the new technology. But apart from the negative effect of increasing cost of replacing labour, it has a positive impact on productivity of factors of production. But without going into a detailed analysis of relative judgement of cost benefit analysis of technology, this paper is confining itself to a close analysis of productivity of labour and land as a outcome to technological change. A close examination of these factors would, however indicate the relative deterministic role played by each of them in agricultural performance.

II(b)- Level and Growth of Land Productivity at State Level

Land being one of the most crucial variable of agricultural prosperity is fixed in supply. Though technically it could be argued that the more waste land could be made cultivable the cost of output that this exercise would involve, would make the efforts less encouraging. Therefore in order to get rid of it one tries to maximise the returns from it and the only way to do so is to improve land productivity.

Mid 60's in Indian agriculture saw a considerable increase in the productivity of different states which

Table 3. Statewise Levels of Land Productivity During 1962-65, 1970-73, 1980-83 and 1984-87 (Constant Price:1981-82)

Sl.No.	State	Average Value of Land Productivity (in Rs/hectare)			
		1962-65	1970-73	1980-83	1984-87
1	2	3	4	5	6
1	Andhra Pradesh	1942.23	2029.90	3125.05	3003.69
2	Assam	4092.37	4844.55	5372.31	5914.02
3	Bihar	2206.72	2418.49	2398.04	3148.38
4	Gujarat	1453.50	1755.63	2299.19	1946.47
5	Haryana	1969.43	2918.55	3965.32	3575.49
6	Karnataka	1375.85	1716.99	2102.92	2648.82
8	Kerala	5043.48	6351.77	6084.84	5671.67
10	Madhya Pradsh	1293.77	1341.39	1436.65	1560.40
11	Maharashtra	1183.68	948.81	1696.32	1549.92
12	Orissa	1980.75	2074.56	2500.84	3020.38
13	Panjab	2439.40	4071.49	6439.24	8030.54
14	Rajastham	776.21	984.38	1099.32	1224.80
15	Tamil Nadu	3394.66	4035.61	4454.06	5164.69
16	Uttar Pradesh	2386.60	2959.77	3867.93	4313.88
17	West Bengal	3230.92	3656.21	4073.45	5027.82

Table 4. Statewise Growth of Land Productivity During 1962-65, 1970-73, 1980-83 and 1984-87

Sl.No.	State	% Annual Compound Growth*			
		(A)	(B)	(C)	(D)
1	2	3	4	5	6
1	Andhra Pradesh	0.55340	4.40907	-0.98533	2.00161
2	Assam	2.13153	1.03940	2.43077	1.68773
3	Bihar	1.15204	-0.08488	7.04285	1.62848
4	Gujarat	2.38875	2.73400	-4.07800	1.33632
5	Haryana	5.03966	3.11245	-2.55393	2.74779
8	Karnataka	2.80745	2.04824	5.93938	3.02224
9	Kerala	2.92492	-0.42841	-1.74256	0.53500
10	Madhya Pradsh	0.45285	0.68844	2.08719	0.85537
11	Maharashtra	-2.72682	5.98218	-2.23118	1.23288
12	Orissa	0.58010	1.88635	4.83201	1.93627
13	Panjab	6.61266	4.69070	5.67628	5.56525
14	Rajasthan	3.01440	1.11047	2.73898	2.09487
15	Tamil Nadu	2.18546	0.99147	3.77006	1.92577
16	Uttar Pradesh	2.72704	2.71221	2.76551	2.72729
17	West Bengal	1.55776	1.08649	5.40333	2.03043

* %age Annual Compound Growth Rate:
(A) 1970-73 over 1962-65;
(B) 1980-83 over 1970-73;
(C) 1984-87 over 1980-83; and
(D) 1984-87 over 1962-65.

resulted from technical change including mechanisation of different agricultural operation, use of chemical fertilizer, pesticides, improved varieties of seed etc.

(Ref. table 3 & 4)

In north west region, during 1962-65 to 1970-73, Punjab's land productivity recorded a high growth rate of 6.61% which was followed by Haryana and Uttar Pradesh which recording a high growth rates of 5.03%, 2.72% respectively. A decline in the land productivity was recorded in all these states of North-west region having 1970-73 to 1980-83. However except Haryana it was picked up byPunjab and Uttar Pradesh.

Central region did not see a consistent trend of increase in land productivity during the 1962-65 to 1970-73. After a noticeable increase in growth rate of Gujarat till 1970-73 to 1980-83, there was a significant decline in growth rates of both Gujarat and Maharashtra to negative level of (-) 4.07% and (-) 2.23% during 1980-83 to 1984-87 while other states like Rajasthan and Madhya Pradesh experienced a notable increase in it to 3.77% and 2.08%. For entire period from 1962-65 to 1984-87 highest growth in land productivity was recorded by Rajasthan of 1.92% which was then followed by Gujarat Maharashtra and Madhya Pradesh which recorded growth rate of 1.33%, 1.23% and 1.33%.

For entire period in southern region starting from

1962-65 to 1984-87, Karnataka recorded a very high growth rate of 3.02% which was then followed by Andhra Pradesh and Tamil Nadu where both of them recorded growth rates of more than 2%. Kerala, however, was not able to maintain its high growth rate of 2.32% as it recorded in the early green revolution phase. During the entire period it experienced low growth rate of 0.53%.

As far as eastern region is concerned the period between 1980-83 to 1984-87, recorded a remarkable increase in the growth rate of land productivity of all states relatively to the other two period i.e. period between 1962-65 to 1970-73 and 1970-73 to 1980-83. Bihar recorded a highest growth rate. However for the entire period West Bengal recorded highest growth rate of 2.03% followed by Orissa, Assam and Bihar with growth rate of 1.93%, 1.68% and 1.62 respectively.

Therefore in general we see that those states which recorded an increase in growth rates of output are also one which accounted for an increase in their land producitivty. Moreover, to further analyse this dictum it would be better to empirically judge the performance of net sown are and cropping intensity.

The relationship between net sown area and productivity is not as simple as it may apparently sound.

Table 5. Statewise Levels of Net Sown Area During 1962-65, 1970-73, 1980-83 and 1984-87

Sl.No.	State	Average Net Sown Area (000 hectare)			
		1962-65	1970-73	1980-83	1984-87
1	2	3	4	5	6
1	Andhra Pradesh	11259.67	11360.33	10703.00	10320.00
2	Assam	2279.33	2268.33	2675.33	2702.67
3	Bihar	8357.00	8261.00	8085.00	7651.33
4	Gujarat	9563.00	9365.67	9594.00	9629.67
5	Haryana	3520.08	3562.33	3605.67	3616.67
8	Karnataka	10372.00	10129.00	10192.00	10418.00
9	Kerala	1988.00	2185.00	2181.33	2194.00
10	Madhya Pradsh	16383.67	18436.33	18923.67	19240.00
11	Maharashtra	18107.33	17028.67	18216.00	18039.67
12	Orissa	5859.00	5953.33	6182.67	6292.67
13	Panjab	3956.58	4071.33	4192.33	4196.00
14	Rajasthan	13721.67	15099.67	15315.67	15402.67
15	Tamil Nadu	5994.00	6283.00	5486.33	5674.33
16	Uttar Pradesh	17203.00	17271.67	17230.67	17241.33
17	West Bengal	5372.67	5648.00	5490.33	5341.00

Table 6. Statewise Growth of Net Sown Area During 1962-65, 1970-73, 1980-83 and 1984-87

Sl.No.	State	% Annual Compound Growth*			
		(A)	(B)	(C)	(D)
1	2	3	4	5	6
1	Andhra Pradesh	0.1113	-0.5943	-0.9069	-0.3953
2	Assam	-0.0605	1.6640	0.2545	0.7774
3	Bihar	-0.1443	-0.2151	-1.3688	-0.4002
4	Gujarat	-0.2603	0.2412	0.0928	0.0316
5	Haryana	0.1493	0.1210	0.0762	0.1231
8	Karnataka	-0.2959	0.0620	0.5498	0.0201
9	Kerala	1.1881	-0.0168	0.1449	0.4492
10	Madhya Pradsh	1.4864	0.2612	0.4153	0.7332
11	Maharashtra	-0.7648	0.6763	-0.2429	-0.0170
12	Orissa	0.1998	0.3787	0.4419	0.3251
13	Panjab	0.3580	0.2933	0.0219	0.2674
14	Rajasthan	1.2034	0.1421	0.1417	0.5267
15	Tamil Nadu	0.5903	-1.3467	0.8459	-0.2488
16	Uttar Pradesh	0.0498	-0.0238	0.0155	0.0101
17	West Bengal	0.6267	-0.2827	-0.6870	-0.0269

* %age Annual Compound Growth Rate:
(A) 1970-73 over 1962-65;
(B) 1980-83 over 1970-73;
(C) 1984-87 over 1980-83; and
(D) 1984-87 over 1962-65.

Given a proportionate inter-relationship among land, output and productivity, the lesser the land and lesser the cost of production with no fall in actual production, productivity will be said to be on a rise. Ceteris paribus, if output increases at the same cost its net sown area would be said to be on a favourable patch. It therefore, may lead one to weigh the aforesaid dimesion of productivity of agriculture and to ascertian as to which of these made a favourable impact on the indigenous situation more after mid 60's.

(Ref. table 5 & 6)

Growth-rate in net sown area in north-western region, during all three period has declined considerably. A significant fall recorded by U.P. during period 1970-73 to 1980-83 from a level of though low but positive 0.04 percent per annum to (-) 0.032 percent per annum, however there was slight improvement in next period but it never exceeded earlier one.

Central region also evolves the same trend of decline in the growth-rate of net sown area, Maharashtra recorded a negative growth-rate of net sown area (-) 0.01 percent per annum over entire period 1962-65 - 1984-87. M.P. and Rajasthan also recorded a decline in their growth-rates.

Coming to the southern region, Tamil Nadu, Andhra Pradesh recorded a negative growth-rate of (-) 0.39 percent per annum and (-) 0.24 percent per annum

respectively, other two states observed positive but low growth rate over entire period.

As far as Eastern region is considered Bihar recorded a negative growth-rate of net sown area through out different periods which resulted in a negative growth-rate over entire period also. Similarly West Bengal except in period 1962-65 to 1970-73, experienced a negative trend in growth-rates. Therefore, for entire period West Bengal accounted a negative growth-rate. Assam and Orissa experienced a low but positive growth-rate.

II(c)- Growth in Cropping intensity at (State Level)

The intensity of cropping reflects the intensive use of land and is measured by gross copped area as a percent of net sown area. It is generally believed that an increase in the intensity of cropping transformsitself to high agricultural growth. However the -re are three factors on which its transformation would depend on, namely, availability of energy either human labour or mechanical energy, availability of water either in natural form or created form, i.e. irrigation and its distribution over crops, and natural fertility of land.

Moreover, apart from output being a function of cropping intensity its growth-rate also depends on a

Table 7. Statewise Levels of Cropping Intesity During 1962-65, 1970-73, 1980-83 and 1984-87

Sl.No.	State	Average Cropping Intensity*			
		1962-65	1970-73	1980-83	1984-87
1	2	3	4	5	6
1	Andhra Pradesh	1.085	1.081	1.137	1.072
2	Assam	1.152	1.230	1.243	1.327
3	Bihar	1.278	1.298	1.261	1.352
4	Gujarat	0.944	0.943	0.950	0.883
5	Haryana	1.191	1.293	1.405	1.473
8	Karnataka	0.993	0.947	1.001	0.960
9	Kerala	1.106	1.223	1.158	1.087
10	Madhya Pradsh	1.125	1.074	1.075	1.058
11	Maharashtra	0.991	0.969	1.051	1.061
12	Orissa	1.010	1.089	1.267	1.309
13	Panjab	1.034	1.212	1.441	1.509
14	Rajasthan	1.015	1.009	1.063	1.075
15	Tamil Nadu	1.153	1.149	1.116	1.171
16	Uttar Pradesh	1.370	1.442	1.495	1.400
17	West Bengal	1.193	1.237	1.286	1.270

* Gross cropped area/net sown area

Table 8. Statewise Growth of Cropping Intesity During 1962-65, 1970-73, 1980-83 and 1984-87

Sl.No.	State	% Annual Compound Growth*			
		(A)	(B)	(C)	(D)
1	2	3	4	5	6
1	Andhra Pradesh	-0.05	0.51	-1.46	-0.05
2	Assam	0.82	0.11	1.65	0.64
3	Bihar	0.19	-0.29	1.76	0.26
4	Gujarat	-0.01	0.07	-1.81	-0.30
5	Haryana	1.03	0.83	1.19	0.97
8	Karnataka	-0.59	0.56	-1.04	-0.15
9	Kerala	1.26	-0.54	-1.57	-0.08
10	Madhya Pradsh	-0.58	0.01	-0.40	-0.28
11	Maharashtra	-0.28	0.82	0.24	0.31
12	Orissa	0.95	1.53	0.82	1.19
13	Panjab	2.01	1.75	1.16	1.73
14	Rajasthan	-0.07	0.52	0.28	0.26
15	Tamil Nadu	-0.04	-0.29	1.21	0.07
16	Uttar Pradesh	0.64	0.36	-1.63	0.10
17	West Bengal	0.45	0.39	-0.31	0.28

* %age Annual Compound Growth Rate:
(A) 1970-73 over 1962-65;
(B) 1980-83 over 1970-73;
(C) 1984-87 over 1980-83; and
(D) 1984-87 over 1962-65.

number of other factors.[17] This being so, cropping intensity might not capture fully a variation in the level of agricultural output. Nevertheless one could still partially judge, (while taking it into account), performance of Indian agriculture after mid 60's. As mid 60's is characterized by the intensive use of modern agricultural inputs and ensured supply of water in some of the regions it is generally expected that cropping intesity in those regions would be relatively higher than other states or regions.

(Ref. table 7 & 8)

Punjab, Haryana and few patches of Uttar Pradesh, the favoured regions, recorded growth in cropping intensity relatively higher than other states. Punjab recorded 2.01 percent per annum while Haryana recorded 1.26 percent per annum during 1962-65 - 1970-73 - 1980-83.

Central region as well as Southern region except Kerala recorded negative growth-rate during the same period[19]. As for as Eastern region is concerned 1962-65 to 1970-73, recorded though low but a positive growth-rates for all four States.

As for as second period, 1970-73 to 1980-83, is concerned all three States of North Western region saw a decline in growth-rates. All regions of Central region recorded a positive growth-rates as compared to negative growth-

rates of first period.[21] Growth-rates of cropping intensity for some States had an effect on value of output during this period. This accounts for Southern and Eastern region, except Assam, also.

During the third period i.e. 1980-84 to 1984-87, cropping intensity was not able to explain the movement in growth-rates of output.

In general, technological revolution had a favourable effect on cropping intensity which transformed itself into high growth-rate of output during the period 1962-65 to 1970-73. Punjab, Uttar Pradesh and Haryana could be good examples of it.

Moreover late 70's and ealy 80's saw an extension of green revolution to Southern states as a result of which plus good monsoon helped in order to facilitate multiple cropping which resulted in high growth-rate of value of agricultural output as compared to earlier one. Similarly extension of cultivation to rainfall areas and unirrigated area during 1980-83 to 1984-87, had led to an improvement in cropping intensities of Eastern regions compared to early phase of green revolution.

Therefore both cropping intensity as well as net sown areas are responsible for a remarkable increase in the land productivity. However, there are other factors which play almost equal deterministic role in changing land productivity. Nevertheless cropping intensity and

net sown area are still being important in affecting land productivity. Section II would present the detailed analysis.

SECTION - II

II(d) Labour Productivity in Indian Agriculture: A Theoretical background

Besides attempting to bring out the level of output prior to and after the Green Revolution and its association with the land productivity, cropping intesity and, of course, of favourable movement of net sown area, section I also examines the reasons helping in the increase in the growth-rate of output due to the technical revolution. Increase in land productivity no doubt a necessary condition for getting increased output, is however partial unless accompanied by a favourable hike in the productivity of other factors. Labour, being the important input, apart from other requirements, requires an advanced productivity. Though not much work has been done highlighting this aspect, we would like to see whether the gain accompanied due to new seed, fertilizer, technology were sufficient for an increase in the labour productivity or not. Moreover, productivity of labour is also taken as an indicator of economic progress highlighting the performance of labour on one hand, and economic advancement on the other. Therefore, a study of this would help us in observing the relative conditions of agricultural labour prior to and after the Green Revolution. But before examining the empirical evidence,

theoretical base of labour productivity has also to be taken into account. After putting down the objectives of such theoretical aspects empirical evidences may be taken up for perusal.

Given the unique socio-economic-institutional complex of developing countries, population growth is largely determined by exogenous factors rather than by direct response of each individual households to the condition of food supply.[22] Agricultural sector, specially in these countries, as such doesn't require much trained or skilled labourer, therefore one of the net out-come of growth of population is an increase in the agricultural workforce.

Whatever the condition may be the net result is high workforce. However, this increase in the work force would result in either agricultural change or non-agricultural activities within the present sector or both.[23] This new trend, contrary to the often repeated Malthusian view, has emerged in developing countries[24] and India is no exception.

Therefore as long as growth of labour force doesn't overtake the growth of land, additional population can be fed with the resultant growth of output at a given level of technology through simultaneous increase in

stock which should complement labour. But once the emergent land exhausts, it is necessary to increase the growth of output by changing the agricultural techniques which not only increases output but is also accompanied by an increase in labour input with increased use of capital. This often constitutes a radical change and might even leads to switching up from traditional way of cultivation to highly modern method[25] which, in turn, leads to intensive use of limited land by new agricultural techniques.

Therefore, population by directly affecting the change in the labour force provides strong stimulus to increase the growth rate of output by forcing a change in agricultural technology. This in turn not only takes care of increased number of mouths and negative effects of decreasing land holding size, but also helps in increasing labour productivity. This will happen provided output growth consequent to technological change exceeds growth of labour force. However, this increase should not always result in an increase level of output.[26] As regards a developing economy, it is desirable that technological breakthrough ought to result in higher labour productivity. Inspite of an increasing supply of labour force in a developing country the output labour ratio should be prevented from falling by obtaining higher yield rate.

Moreover increased productivity of labour in agricultural sector is as important for other sectors as it is for agriculture sector. Low productivity in agriculture hampers the process of economic development in more than one way.[27] Low productivity of agricultural labour might lead to low purchasing power which in turn would put demand constraint for the product of other sectors, in turn, affecting the growth of national economy as a whole. Therefore productivity of labour should be increased to save economy from any kind of set back. An increased labour productivity, if mechanisation is partial and is followed by an increased cropping intensity and application of land - augmenting technology would result in higher yield. There would also be a demand for more labour. This would in turn, also lead to the betterment of labour position compared with those without any technical breakthrough

Indian agricultural sector is not an exception from the fellow developing countries. Being one of highly populous country, agricultural land of this country also faces pressure of resultant growth of agricultural labour. However, there are other factors which played an important role in changing agriculture sector. Increasing dependency on import for food, low agricultural growth than that of population growth., political pressure, pressure for self-sufficiency and need for

over all development resulted in the introduction of new technology in the basic sector of economy.

Introduction of new technology, however not only took care of food problem that country faced but nature of new technology[28] was such that, depending upon relative factor prices and technological composition, it utilised factor inputs to a satisfactory level. As a result of the favourable impact of technological break through one might observe a substantial increase in land productivity. Increased land productivity comes on account of increased use of fertilizers, increased numbers of tractors, increased intensity of cropping. All these, in turn, might get channelised into an increased labour productivity. This could be due to nature of new technology which could be land augmenting, labour displacing or both. Land augmenting technology, in a labour surplus country like India, along with an increasing effect on agricultural production, might be accompanied by the progressive rise in labour input area ratio.

This fact could be supported by the study of Bhalla and Alagh at district level for Indian agriculture.[29] They have found an increased demand for agricultural labourer in districts with high rates of growth of output. However, at advanced stage of technological development, according

to Ishikawa,[30] the influence of labour saving technological change becomes more important which eventually leads to a decline in the labour intensity. This, nevertheless, implies that labour productivity could increase with a corresponding increase in capital lending to an increase in the growth of output.

But a serious outcome of this, in a populous country like India, could be an increase in number of unemployed personnel, increase in the income disparities, deterioration in the living conditions of agricultural population, increase in the involuntary unemployment in the absence of outside opportunities and like. As a consequence of all those, economy might get set back unless and until other sectors are rising fast enough to counter balance the negative outcome of agricultural sector.

This section while dealing with levels and growth of agricultural workers, separately for cultivators and agricultural labourer would also analyse the effect of technological breakthrough on male agricultural labourer productivity. Moreover in this section we would also like to see whether the regions which recorded change in growth of output prior to and after green revolution have also recorded change in labour productivity.

As a result of very limited scope for extension of cultivated area, agricultural sector of Inda has been utilizing the already cultivated area more intensively due to positive impact of new technology. There are three ways of making intensive use of the available land by reducing the extent to which lands are kept fallow. Fistly by increasing intensity of cultivation . Secondly, intensive cultivation of land/crop through greater application of labour input. Thirdly, through cultivating more labour intensive and high productive crops. It is assumed that increase in the cropping intensity through above mentioned methods would lead to, apart from intensive utilization of land, an increase in labour intensity. This would have favourable impact on labour productivity. Therefore, in this section we would deal with the effects of the growth in cropping intensity.

There are various studies which empahsize that green revolution has led to an increased use of high yield varities seeds, fertilizers, irrigation etc. and thus resulted in an increase in the land productivity. Again some others stress on the mechanization of agriculture as a outcome of green revolution. This, though on one hand replaced labour, on the other hand has a favourable impact on labour productivity.

This being so, this section would try to test the rationale behind labour productivity being a function

of land productivity. It is to be noted that in this study we take cropping intensity, use of fertilizer and number of tractors as a proxy for land productivity and thus try to analyse their effect on the variation on labour productivity.

II (e) Levels and Growth of Male Agricultural Workers*

Male agriculture workers in present study has been taken as sum of male cultivators and male agricultral labourers. Number of agricultural labourers has been increasing for the last three decades. For some states growth rates of male agricutural worker during 1962-65 to 1970-73 were more than 2 percent per annum. Table (9 & 10) brings out the growth of workers at state level. During 1962-65 to 1970-73 highest growth rate was recorded by West Bengal of followed by Kerala and Bihar. But this rate declined during 1970-73 to 1980-83. Moreover, for the entire period 1962-65 to 1984-87, except for Haryana and Karnataka, all other states recorded low growth rates of agricultural labourer compared to 1962-65 to 1970-73.* (calculated on the basis of table 21)

At disaggregated level, rate of growth of male agricultural labourer were higher than that of cultivators during 1962-65 to 1970-73. During 1970-73 to 1980-83, a relative increase in the growth rate of cultivator

Table 9. Statewise Numbers of Male Agricultural Workers During 1962-65, 1970-73, 1980-83 and 1984-87

Sl.No.	State	Numbers of Male Agricultural Workers			
		1962 - 65	1970 - 73	1980 - 83	1984 - 87
1	2	3	4	5	6
1	Andhra Pradesh	7208384.6800	8166128.6500	9559248.5000	10180913.9100
2	Assam	2425075.0500	2690474.4100	3090901.5200	3267290.0500
3	Bihar	10042227.6200	12013188.0400	13473437.9200	14106084.6600
4	Gujarat	3615631.0700	4309917.0000	5037908.9800	5362445.3800
5	Haryana	1462844.6700	1641956.6900	1984176.2700	2140265.6100
8	Karnataka	4586596.8900	5116026.7400	6026662.6100	6434791.9300
9	Kerala	1561991.7900	2119661.8400	1896198.0900	1813554.2700
10	Madhya Pradesh	7585193.9900	8697512.0800	10128232.3600	10764382.0300
11	Maharashtra	6869817.6000	7601478.1500	8610403.3300	9050522.9200
12	Orissa	4153319.3100	4737778.0600	5280450.0500	5514541.7500
13	Panjab	2088798.2700	2373459.7900	2688047.9000	2825264.1200
14	Rajasthan	4513772.4400	5025609.1800	5793784.8100	6132983.8400
15	Tamil Nadu	5711684.1700	6524056.2300	7184676.9100	7467290.7700
16	Uttar Pradesh	16781255.1000	18630068.4900	21270486.2300	22426822.6500
17	West Bengal	4756113.9000	6636292.0900	7582411.0100	7997606.9000

Table 10. Statewise Growth of Male Agicultural Workers During 1962-65, 1970-73, 1980-83 and 1984-87

Sl.No.	State	% Annual Compound Growth*			
		(A)	(B)	(C)	(D)
1	2	3	4	5	6
1	Andhra Pradesh	1.5716	1.5876	1.5876	1.5818
2	Assam	1.3067	1.3971	1.3971	1.3642
3	Bihar	2.2654	1.1538	1.1538	1.5566
4	Gujarat	2.2199	1.5730	1.5730	1.8078
5	Haryana	1.4543	1.9112	1.9112	1.7448
8	Karnataka	1.3749	1.6516	1.6516	1.5509
9	Kerala	3.8899	-1.1079	-1.1079	0.6811
10	Madhya Pradsh	1.7252	1.5346	1.5346	1.6038
11	Maharashtra	1.2731	1.2541	1.2541	1.2610
12	Orissa	1.6594	1.0903	1.0903	1.2969
13	Panjab	1.6098	1.2524	1.2524	1.3823
14	Rajasthan	1.3517	1.4326	1.4326	1.4032
15	Tamil Nadu	1.6762	0.9692	0.9692	1.2257
16	Uttar Pradesh	1.3150	1.3343	1.3343	1.3273
17	West Bengal	4.2519	1.3417	1.3417	2.3904

* (A) 1970-73 over 1962-65;
(B) 1980-83 over 1970-73;
(C) 1984-87 over 1980-83; and
(D)1984-87 over 1962-65

and a relative decrease in the growth rate of agricultural labourer is observed when compared to earlier period. But for the entire period 1962-65 to 1984-87, rate of growth in male agricultural labourer was much higher than that of cultivators. For the entire period 1962-65 to 1984-87 it is noted that except for Punjab, Uttar Pradesh and Maharashtra ; which recorded growth-rate of 1.55 percent 1.5 percent, 1.98 percent respectively in male agricultural labourer). All other states recorded rate of growth more than 2 per cent per annum. (Ref. table 19 & 20)

II(f). Growth and Level of Labour Productivity*

As discussed earlier, technological change in agriculture takes place as a result of several factors. Perhaps, one of the important among these is the excessive population pressure and need to feed it under given land used. Mid 60's saw a change in agricultural techniques and the resultant change in land productivity. However, it is not necessary that areas with high growth rate of labour should be the one blessed with rapid technological change leading to higher labour productivity. Besides labour growth, there are many other factors which affect technological change and thereby influence labour productivity. However, growth of labour do effect labour productivity positively up to a certain level of development.[31] But without going to the extent of development,

*(Ref. Table 21)

present paper confines itself only to growth of labour productivity.

Table (11 &12) gives the levels and growth of labour productivity in India at state level. As far as the north-west region is concerned, among all three states, Punjab recorded highest growth in labour productivity of 5.29 percent per annum during 1962-65 to 1970-73 followed by Haryana and Uttar Pradesh with growth-rates of 3.68 percent per annum and 1.44 percent per annum respectively. During the second period, 1976-73 to 1980-83, all states of north west region observed deterrioration in growth rates in labour productivity. However, the third period i.e., 1980-83 to 1984-87, saw an improvement in labour productivity in this region. For the entire period, 1962-65 to 1984-87, Punjab recorded the highest growth rate in labour productivity of 4.4 percent per annum among all the states of north west region.

In southern region, low growth rates of labour productivity were observed during 1962-65 to 1970-73. A negative growth rate of -0.89 percent was observed by Andhra Pradesh during this period. However it increased to 2.1 percent per annum during 1970-73 to 1980-83 and this was the highest growth rate recorded among all the states of southern region. During the period

Table 11. Statewise Levels of Labour Productivity* During 1962-65, 1970-73, 1980-83 and 1984-87 (Constant Price:1981-82)

Sl.No.	State	Levels of Labour Productivity (000 rupees)			
		1962-65	1970-73	1980-83	1984-87
1	2	3	4	5	6
1	Andhra Pradesh	3033.81	2823.90	3498.96	3044.72
2	Assam	3846.42	4084.42	4650.00	4892.02
3	Bihar	1836.40	1663.10	1438.99	1707.72
4	Gujarat	3844.36	3815.08	4378.49	3495.40
5	Haryana	4739.09	6331.98	7205.82	6041.95
8	Karnataka	3111.31	3399.39	3556.35	4288.47
9	Kerala	6419.01	6547.56	6999.82	6861.47
10	Madhya Pradsh	2794.48	2843.38	2684.26	2789.02
11	Maharashtra	3119.92	2125.50	3588.70	3089.34
12	Orissa	2794.20	2606.82	2928.14	3446.57
13	Panjab	4620.69	6984.06	10042.76	11926.73
14	Rajasthan	2359.65	2957.61	2906.01	3076.03
15	Tamil Nadu	3562.45	3886.50	3401.19	3924.60
16	Uttar Pradesh	2446.58	2743.96	3133.31	3316.17
17	West Bengal	3649.76	3111.72	2949.54	3357.70

* Labour productivity refers to productivity of male agricultural workers

Table 12. Statewise Growth of Labour Productivity During 1962-65, 1970-73, 1980-83 and 1984-87

Sl.No.	State	% Annual Compound Growth*			
		(A)	(B)	(C)	(D)
1	2	3	4	5	6
1	Andhra Pradesh	-0.8922	2.1666	-3.4167	0.0163
2	Assam	0.7533	1.3053	1.2765	1.0990
3	Bihar	-1.2314	-1.4370	4.3734	-0.3297
4	Gujarat	-0.0955	1.3870	-5.4758	-0.4316
5	Haryana	3.6885	1.3012	-4.3085	1.1101
8	Karnataka	1.1131	0.4524	4.7911	1.4693
9	Kerala	0.2482	0.6702	-0.4978	0.3034
10	Madhya Pradsh	0.2171	-0.5742	0.9617	-0.0089
11	Maharashtra	-4.6842	5.3774	-3.6765	-0.0448
12	Orissa	-0.8639	1.1691	4.1595	0.9584
13	Panjab	5.2992	3.6990	4.3920	4.4044
14	Rajasthan	2.8636	-0.1759	1.4316	1.2124
15	Tamil Nadu	1.0942	-1.3250	3.6433	0.4410
16	Uttar Pradesh	1.4442	1.3357	1.4281	1.3920
17	West Bengal	-1.9738	-0.5338	3.2932	-0.3784

* %age Annual Compound Growth Rate:
(A) 1970-73 over 1962-65;
(B) 1980-83 over 1970-73;
(C) 1984-87 over 1980-83; and

1980-83 to 1984-87, Maharashtra and Tamil Nadu recorded a high growth rates in labour productivity of 4.79 percent per annum and 3.64 percent per annum respectively. However, Kerala, during this period, recorded a negative growth rate of -0.49 percentage per annum. For the entire period, Karnataka observed highest growth rate of labour productivity among all states of region. Central region, being wheather prone area, does not show any consistent rise or decrease in the labour productivity during the period of 1962-65 to 1970-73 except Rajasthan all these states recorded low and negative growth of labour productivity. Second period, that is, 1970-73 to 1980-83, saw a significant increase in the labour productivity in Maharashtra of 5.37 percent per annum where as Rajasthan during the same period recorded a negative growth of -1.32 percent per annum. Unlike, other states of India, growth rates of labour productivity of states of central region remained at a very low level during 1980-83 to 1984-87. For the entire period only Rajasthan recorded a positive growth rate of 1.21 percent per annum in labour productivity while other states maintained negative growth rates.

The most populous region of India, that is the eastern region recorded an improvement in labour productivity during third period, that is during 1980-83 to 1984-87 when compared to 1962-65 to 1970-73 and 1970-73 to

1980-83. Thus for the entire period though states of these regions have recorded very low growth rates, the growth rates have improved than those of early decades of green revolution.

In general, there was decline in the growth rates of male agricultural labourers during 1970-73 to 1980-83 as compared to that during 1962-65 to 1970-73. But between 1962-65 and 1970-73, regions of main beneficiary of technological improvement experienced high growth in agricultural labour. Moreover, during the same period high growth in labour productivity was recorded by the states experiencing favourable impact of technological change. However, the mechanism cannot be generalized for all other states in explaining in increase in labour productivity.

During the second period, the states which experienced a positive impact of the so-called second phase of green revolution and experienced an increase in the agricultural production are also those observing an improvement in labour productivity. Highest growth rates of 5.37 percent per annum in labour productivity during this period was recorded by Maharashtra. Andhra Pradesh also recorded growth rate of 2.16 percent per annum during 1870-73 to 1980-83 as compared to -0.89 percent per annum during 1962-65 to 1970-73. A remarkable feature emerges out during 1980-83 to 1984-87. All states of eastern regions observed a significant increase in labour

productivity during this period. Except Assam, all other states of this region experienced a growth rate of more than 3 percent per annum in labour productivity.[32]

However, on one hand states like Haryana, Andhra Pradesh, Gujarat, Maharashtra experienced negative growth rate in labour productivity during 1980-83 to 1984-87 and on the other hand states like Tamil Nadu, Rajasthan, Madhya Pradesh, Karnataka recorded positive growth rates during the same period.

For the entire period, from 1962-65 to 1984-87, except few states like Madhya Pradesh, Rajasthan, Uttar Pradesh Punjab and Haryana all other states observed an improvement in labour productivity as compared to those of 1962-65 to 1970-73. As far as Uttar Pradesh and Punjab are concerned, these states recorded a slight decline in the labour productivity. Haryana observed a significant decline growth rate from 3.68 percent per annum to 1.11 percent per annum. This could be explained by the fact that the initial tempo of growth in agricultural production, as it was observed during early decade of green revolution, was not maintained in the case of Haryana. Although for the entire period under study not even a single state, recorded a consistent increase in labour productivity, growth in labour productivity seems to be strongly correlated with growth in agricultural production. During the first period 1962-65

to 1970-73, states with high growth[33] of output are the ones that recorded high growth in labour productivity. Andhra Pradesh, Gujarat, Maharashtra observed favourable impact of so called second phase of green revolution and extension of it to rice cultivation during early 70's. These states experiencing good monsoon had seen not only the better performance on agricultural front but also observed high growth rates of labour productivity. Similarly extension of green revolution to eastern region as well as backward and under developed regions recorded an increase not only in agricultural output but also in the labour productivity.

II(g)- Relationship between Growth of Cropping Intensity and Growth of Labour Productivity

Cropping intensity could affect labour intensive use of labour up to a certain time period. By observing table (12) and (8) one finds that for few states cropping intensity has increased while for some other states it has decreased. This being so, no clear cut picture of cause and effect between labour productivity and cropping intensity emerges prior to and after green revolution. Neverthless during the period under study, weak but positive relation emerges between these two in Indian agriculture. This could be due to the fact that besides cropping intensity, a good part of growth in labour productivity is traceable to other factors

also. Moreover, intensity of cropping has not increased in the high density area. This, in turn, imply that labour was not used intensively during post green revolution period. Therefore one could say that cropping intensity is not a strong variable in explaining labour productivity in Indian agriculture. However, latter section of this chapter would be taking detail analysis at state level, during different time periods.

II(h)- Interrelationship of Labour Productivity, Land Productvity, Cropping Intensity, use of Fertilizer and Numbers of Tractors

Our main hypothesis is that technological change provide a positive contribution in increasing product/ area. This being so, labour productivity can be assumed to be a function of land productivity. Land productivity, no doubt, is a function of numerous variables like, irrigation, number of tractors, fertilizer use, tubewell use, increasing intensity of cultivation. These factors are to a large extent responsible for an increased land productivity during the post-green revolution period. There is no doubt that at certain level of agricultural development these factors might affect labour productivity in turn but in a labour abundant country like India increasing intensity of cropping, increased use of fertilizer and number of tractors affect labour productivity to a limited extent. And there are other factors, apart from the above metnioned ones which affect labour

Regression Model Results

Dependent Variable (Labour Productivity)			Independent Variable (Land Productivity)	
1. $LPRD_{1962-65}$	= 2.43889	+	.3265 $LPRDD_{1962-65}$ (2.234)	$\bar{R}^2$=.22178
2. $LPRD_{1970-73}$	= 2.07203	+	.43251 $LPRDD_{1970-73}$ (2.703)	$\bar{R}^2$= .31059
3. $LPRD_{1980-85}$	= 1.73572	+	.53001 $LPRDD_{1980-83}$ (2.691)	$\bar{R}^2$=.30827
4. $LPRD_{1984-87}$	= 1.86193	+	.49262 $LPRD_{1984-87}$ (2.749)	$\bar{R}^2$=.31899

Labour Productivity			(Fertilizer)	
1. $LPRD_{1962-65}$	= 3.47414	+	.10167 $LF_{1962-65}$ (1.464)	$\bar{R}^2$=.07545
2. $LPRD_{1970-73}$	= 3.27675	+	.21961 $LF_{1970-73}$ (1.855)	$\bar{R}^2$=.14855
3. $LPRD_{1980-83}$	= 3.26527	+	.20480 $LF_{1980-83}$ (1.713)	$\bar{R}^2$=.12146

(Labour Productivity)			(Cropping Intensity)	
1. $LPRD_{1962-65}$	= 3.54863	+	-0.63900 $LCI_{1962-65}$ (-0.784)	$\bar{R}^2$=-.02829
2. $LPRD_{1970-73}$	= 3.50283	+	.60017 L C.I (.690) 1970-73	$\bar{R}^2$=-0.03892
3. $LPRD_{1980-83}$	= 3.51764	+	.82001 $L C.I_{1980-83}$	$\bar{R}^2$=-0.01715
4. $LPRD_{1984-87}$	= 3.52868	+	.85071 L C.I (1.143) 1984-87	$\bar{R}^2$= .02149

Labour Productivity			(Tractor)	
1. $LPRD_{1962-65}$	= 3.57383	+	.10594 $LT_{1962-65}$ (1.138)	$\bar{R}^2$= .02061
2. $LPRD_{1970-73}$	= 3.57651	+	.09362 $LT_{1970-73}$ (0.790)	$\bar{R}^2$=-.02759
3. $LPRD_{1980-83}$	= 3.57084	+	.17817 LT (1.978) 1980-83	$\bar{R}^2$= .17224

Where LPRD = labour productivity
LPRDD= labour productivity
LF = fertilizer
LCI = cropping intensity
LT = tractor

productivity in an equally important way.

The results of double log regression exercise are presented in page 88 . From those following results can be drawn

1. A fairly significant variation in labour productivity is explained by land productivity. Correlation co-efficient increased from 22 percent during 1962-65 to 31 percent during 1984-87. Another interesting feature which comes up is an increasing value of regression co-efficient. During post green revolution elasticity of labour productivity with respect to land productivity increased from .32 during 1962-65 to .53 during 1980-83 and is .49 during 1984-87.

2. As far as the use of fertilizers are concerned a very low but positive correlation co-efficient is obtained during the period under study. Around 8 percent variation in labour productivity during 1962-65 was explained by use of fertilizer which increased to 12 percent during 1980-83. Moreover regression co-efficient is quite low in this case. It remained stagnant to .21 during 1970-73 and .20 during 1980-83.

3. Increased intensity of cropping is generally assumed to have a positive impact on labour productivity. Regression co-efficient in this

case has increased to a significant extent. It had a negative sign of -0.63 during 1962-65 which increased to as high as .85 during 1984-87. However all these coefficients are insignificant and correlation co-efficient explain very low level of variations throughout the period under study.

4. It is assumed that mechanical change would explain large variation in the labour productivity once cetain level of agricultural development is reached. Regression model carried out by taking labour productivity as dependent and number of tractors as independent variable shows very low variations. Similarly regression co-efficient stands to be low and stastistically insignificant. However, both correlation coefficient and regression coefficient increased during post green revolution period of 1980-83, relative to the pregreen revolution period.

Few interesting results emerge out of the above model. Increase in land productivity to a large extent has transformed itself into an increase in labour productivity. However, cropping intensity, use of fertilizers and number of tractors, taken as a proxy for land productivity are not able to explain variation in labour productivity to the same extent as land productivity

by itself. Neverthless each of these factors has become slightly more important in explaining variations in early and late eighties than early decades of green revolution. However in most cases the regression coefficients are statistically insignificant. Further low correlation co-efficient once more emphasises the role of other factors, apart from above mentioned ones in explaining variations in labour productivity.

II (i)- CONCLUSION

Indian agriculture, witnessed an increase in the growth of output at varying rates in different states in the post independence period. The growth rates accelerated after the mid sixties in some of states. A large part of this increase is attributed to the momentum created by new agricultural strategy which laid special emphasis on the development and widespread adoption of high yielding variety seeds. As a result of this, the post-1966 period, the Indian economy, saw a substantial increase in agricultural output. North west region of India as a result of wide spread use of new technology recorded a tremendous increase in wheat production during late sixties. Later period, however saw its extension to rice and cotton output and to new areas. As a result, Andhra Pradesh and Gujarat recorded a significant increase in their agricultural output. Further early and late eighties saw the extension of new technology

to lagging crops and to backward and rain-fed areas. A remarkable improvement in the agricultural front was noticed by eastern region, Madhya Pradesh, Tamil Nadu and Karnataka, where a phenomenal increase took place in the growth rates of output during the eighties compared with earlier period.

Modern technology is a major attributing factor for such an increase in agricultural production in all the regions. One of the important contribution of technological change is an increased productivity of inputs. In particular land and labour, the two important primary inputs being the crucial inputs recorded an increase in their respective productivities. During the mid sixties, there was considerable increase in land productivity. States which recorded an increase in the growth rates of output are also the ones which accounted for rise in their land productivity. Land productivity measured in terms of output per unit of net sown area increased not only as a result of higher yields, but also because increasing intensity of cultivation made possible due to irrigation and introduction led to increase in net sown area also.

Numerous factors influenced the growth of labour productivity during the post green revolution period in particular after 1970-73. A deceleration in the growth

rates of agricultural labour during 1970/73 to 1980/83 as compared to that of 1962/65 to 1970/73 period could be taken as one of the factors for the increased labour productivity.

During the first period, 1962/65 to 1970/73 it was Punjab, Haryana and Uttar Pradesh, which recorded a significant increase in labour productivity because output growth rate was very high and exceeded workforce growth rate by a large margin. This happened despite an unprecedented growth in labour force in these areas. During the so called second period of green revolution 1970/73 to 1980/83, states such as Maharashtra and Andhra Pradesh experienced a remarkable increase in labour productivity. Further during the eighties, eastern region and a few backward states recorded a considerable increase in the labour productivity. During the post seventy period a deceleration in growth rate of labour force facilitated growth in labour productivity.

Although for the entire period, not many states recorded a steady increase in labour productivity, there seems to be a positive interrelation between growth of agricultural output, growth of land productivity and labour productivity.

No doubt, the advent of green revolution contri-

buted significantly in the rise of land productivity. Obviously growth of labour productivity depends not only on the growth of output but also on growth of labour force. Growth of output in tern is dependent on rise in land productivity. In this sense one would expect that given more or less equal growth in labour force, labour productivity would depend on land productivity. Labour productivity in all the periods studied by us is related to land productivity. The relationship is significant and is getting strengthened over time and is stronger in the post green revolution than during pre and early decades of green revolution.

However, cropping intensity, use of fertilizers and increased use of tractor, which transformed land productivity to a significant extent, when taken as a proxy for land productivity, affect labour productivity to a very limited extent. Nevertheless each of these factors has become slightly more important in explaining variations in early and late eighties than in the early decades of the advent of green revolution. This foregoing analysis, therefore, highlights the significance of other related factors, especially so in a labour abundant and populous country like India towards labour productivity. explaining the levels and growth of labour productivity.

Notes and References

1. G.S. Bhalla & D.S. Tyagi - Patterns in Indian Agricultural Development - A district level study

2. C.H.H. Rao - Technical Change in Indian Agriculture Emerging Trends of Perspective.

According to this version, the population growth has meant an increasing agricultural labour force, that is younger & healthier, which would lead to a better exploitation of land through intensive cultivation, involving the greater use of labour for augmenting irrigation & for multiple cropping.

3. However, the positive effect of population growth, which leads to increase in workforce, depends on the other existing condition of economy.

4 & As mentioned earlier, were need of Indian economy to be tried from imports and to feed an increasing population

5 & 6 Bhalla & Tyagi, op. cit.,

7. C.H.H. Rao, op. cit.,

8. Which could be due to extension of . : to rainfed and unirrigated area.

9. Taking both positive and negative effect of monsoon into account.

10. Extension of rice oilseed, pulses to these area and try farmicy resulted in high growth rate.

11. Monsoon hampered the growth rate during this period

12. However good monsoon resulted in high growth rate during 1970-73 to 1980-83

13. Due to extension of rice cultivation to Andhra Pradesh

14. Reason could be as mentioned by Bhalla & Tyagi
    - that initial tempo of growth could not sustained during later phase of green revolution

15. C.H.H. Rao, op. cit.,

16. C.H.H. Rao, op. cit.,

17. Fertilizer per hecter, labour per hecter,, capital -stock & technology

18. If other factors accompany it favourably

19. Whether prone region given these states are highly

20. Given these states are highly populous it could be due to intensive use of workforce during the period concerned.

21. Large whether fluctuation could have resulted in scarcity in water supply.

22. Because of lack of knowledge

23. Agricultural change however would be outcome of change in agricultural techniques in order to raise output and counter balance the effect of population growth.

24. According to Malthusian view at a subsistence level population grows in response to an increase in food supply

25. Which could be characterised by both mechanical and biological change in inputs.

26. In developed economics, labour has been substituted by capital which automatically leads to an increasing productivity.

27. Wage good constraint by agricultural sector.

28. Nature of new technology could be either land augmented or labour displacing or both. Innd augmenting technology would lead to an increase in labour input/area while labour displacing would lead to decrease it.

29. Bhalla & Alagh, op. cit.

30. Ishikawa, Shigeru, "Labour Absorption in Asian Agriculture", ILO ARTEP - Asian employment programme.

31. As long as consequent growth in output, occurred on account of technological change exceeds growth in labour force and technological change uses intensity labour input.

32. These were the states which experienced extensions of green revolution to lagging crops and rainfed areas.

33. Refer to table showing growth rate of value of output and growth of labour productivity.

CHAPTER III

WAGE RATE IN INDIAN AGRICULTURE

Beside dealing with the changes in output prior to and after Green revolution chapter (1) also examined the changes in the labour productivity caused as a result of the change in techniques of production over time. Some scholars have indicated that an increase in labour productivity along with other factors is an outcome of increase in land productivity, which as a result of changed techniques, may channalise itself into an increase in yield, increase in intensity of cropping.

Improvement in the living condition can be brought by three important factors (1) increase in per capita availability of agricultural production implying an increase in productivity, (2) favourable increase in employment, (3) improvement in the wage rate.[3]

Technological change, as we have discussed earlier, apart from population pressure depends on complex interaction of a large number of factors such as political, institutional, psychological and economic variables, plays major role in determining or improving labour productivity. Similarly an improvement in the wage rate requires a favourable movement of demand for labour

relative to supply, agricultural wage rate relative to prices of wage good consumed by household.

It is assumed that there is one to one relationship between labour productivity and standard of living of labour. This can happen provided given increased labour producitivity transforms itself into higher wages. This arises on an account of following facts (a) wages contribute high proportion of income of agricultural labour, (b) as already discussed, an increase in labour force would tend to decrease land holding, therefore unless and until it is accompanied by an increase in the returns to labour, poverty is going to spread in the rural sector assuming no change in supply of labour. Further an increase in productivity by stimulating demand for labour leading to positive effect on wage rate as an outcome of economic progress would set the economy on the path of economic development.

Under certain conditions increased labour productivity in economy would not always be accompanied by simultaneous increase in the demand for labour. Further there is no guarantee of increased productivity accompaning increased wage rate. Much would depend on the nature of technological change and its impact on relative prices of various factors of production.

It is generally argued that in a labour surplus

agriculturally predominate country like India 'green revolution has led to unequal benefit among agriculturist class. And despite marked increase in output as a result of new technology, it has not resulted in the benefit of poor labour. This is because, beside leading to unequal share, it has also increased disparities in income between different regions and classes of farmers.

Therefore impact of green revolution on wage rate along with the labour productivity is essential to analyse the condition of agricultural labour across the states prior to and after green revolution. Further it would provide a study of economic progress as well as economic development over time since independence.

Present chapter is divided into two sections. Section (I) takes trend of money wage rate, Consumer Price Index, and real wage rate into account, Section (II) deals mainly with change in real wage rate along with change in labour productivity.

SECTION I

Since independence, we have been facing an increase in the prices of commodities. Moreover money wage is also responding well to it. This Section (I) is divided into two parts. Part (a) of this section would examine the following :-

1. Trend of average level of money wage rate over

entire period starting from 1960/61 to 1988/89 with base year as 1981/82 at state level.

2. Whether in all states under study have been experiencing equal increase in absolute level of average money wage rate or not ?

3. Further apart from the money wage rate, this section would also analyse whether real wage rate is responding to both price and money wage rate or not? Part (b) - of the section (I) would provide the theoritical framework of labour market and would try to justify between various theories for Indian economy leading to change in the wage rate in labour market.

III (a)=TREND IN MONEY WAGE RATE & CONSUMER PRICE INDEX

This section would deal mainly with agricultural money wage rate for twenty seven years starting from 1960/61 to 1986/87. Against the background of the agricultural output as noted in earlier chapter this would help in analysing the standard of living of male agricultural worker in India during post independence period including both pre green revolution and post green revolution. For this both agricultural output and money wage rate will be deflated at constant 1981-82 prices.

Table 15A : Statewise Money Wage Rates of Male Agricultural Workers from 1960/61 to 1986/87 (in Rs/day)

States Year	Andhra	Assam	Bihar	Gujarat	Haryana	Karna-taka	Kerala	M.P
1960/61	1.26	2.29	1.34	1.91	2.45	1.53	1.70	1.23
1961/62	1.44	2.30	1.32	1.99	2.52	1.65	2.09	1.29
1962/63	1.30	2.27	1.25	1.99	2.02	1.63	2.28	1.34
1963/64	1.55	2.49	1.42	1.81	2.89	1.79	2.33	1.38
1964/65	1.65	2.75	1.73	2.25	2.24	1.94	2.60	1.49
1965/66	1.79	3.09	2.11	2.35	3.18	2.04	2.97	1.70
1966/67	2.04	3.60	2.59	2.51	3.78	2.01	3.45	1.80
1967/68	2.26	2.89	2.62	2.79	4.74	2.04	4.22	2.00
1968/69	2.38	3.55	2.57	2.84	5.44	2.12	4.47	2.02
1969/70	2.45	3.88	2.59	2.91	6.15	2.56	4.64	2.11
1970/71	2.63	4.02	2.69	3.29	6.66	2.61	4.87	2.17
1971/72	2.70	3.79	2.75	3.66	6.99	2.86	5.11	2.28
1972/73	2.86	4.12	2.92	3.52	7.09	2.92	5.15	2.56
1973/74	3.06	4.63	3.85	3.87	7.10	3.31	5.75	2.84
1974/75	3.37	5.10	4.16	3.91	8.16	3.58	6.70	3.32
1975/76	4.02	5.00	4.68	5.07	8.53	4.30	7.25	3.98
1976/77	4.56	5.59	5.01	5.99	8.99	4.92	7.02	4.25
1977/78	4.76	5.90	5.12	8.33	10.01	5.20	7.05	4.24
1978/79	4.97	6.27	5.31	6.45	11.07	5.10	7.49	4.30
1979/80	5.49	6.77	5.40	6.87	11.97	5.55	9.14	4.46
1980/81	5.96	7.26	5.83	7.28	12.55	6.02	10.98	4.76
1981/82	6.80	8.40	7.21	7.86	14.48	6.55	12.91	5.36
1982/83	7.95	9.52	7.93	10.73	16.23	6.64	14.55	6.87
1983/84	9.20	11.16	8.84	12.39	18.46	6.93	15.31	8.16
1984/85	10.26	12.37	9.57	13.56	19.83	7.21	17.90	9.00
1985/86	11.09	14.03	10.60	14.13	20.73	9.55	19.93	9.75
1986/87	12.21	15.00	12.13	14.71	22.59	22.88	19.09	10.64

Table 15B : Statewise Money Wage Rates of Male Agricultural Workers from 1960/61 to 1986/87 (in Rs/day)

Year \ States	Maharashtra	Orissa	Punjab	Rajas-than	Tamilnadu	U.P.	W.B.
1960/61	1.42	1.18	2.45	1.91	1.43	1.17	1.81
1961/62	1.48	1.27	2.52	1.99	1.60	1.25	1.89
1962/63	1.56	1.32	2.82	1.99	1.64	1.34	1.85
1963/64	1.64	1.45	2.89	1.99	1.52	1.17	2.01
1964/65	1.91	1.51	3.24	2.25	1.87	1.78	2.27
1965/66	2.20	1.87	3.18	2.35	1.96	1.53	2.50
1966/67	2.47	2.13	3.53	2.51	2.20	2.04	2.81
1967/68	2.52	2.21	4.35	2.83	2.37	2.28	3.17
1968/69	2.63	2.20	6.09	3.08	2.54	2.47	2.96
1969/70	2.87	2.13	6.45	3.03	2.66	2.73	2.96
1970/71	2.94	2.16	6.51	3.48	2.73	2.78	3.05
1971/72	2.90	2.26	6.69	3.57	2.70	3.98	3.41
1972/73	2.93	2.34	7.14	3.94	2.96	3.31	3.56
1973/74	3.28	2.60	7.46	4.27	3.35	3.93	4.01
1974/75	3.60	3.12	8.61	4.56	4.78	4.81	4.20
1975/76	3.74	3.56	8.64	5.68	4.87	4.85	4.54
1976/77	3.81	4.11	9.09	7.16	4.10	5.27	5.48
1977/78	3.95	4.15	9.86	6.52	4.43	5.63	5.90
1978/79	4.20	4.32	10.32	7.21	4.81	5.64	6.13
1979/80	5.10	4.50	10.85	7.00	5.19	6.07	6.74
1980/81	5.22	4.77	11.74	8.58	5.62	6.66	6.97
1981/82	5.79	5.30	12.32	10.32	6.61	8.12	7.43
1982/83	6.52	6.09	13.58	13.61	6.74	8.52	7.87
1983/84	7.81	7.09	15.71	14.15	8.06	9.38	8.40
1984/85	10.66	8.07	18.64	10.95	8.62	10.39	10.00
1985/86	11.36	8.32	19.97	14.50	9.22	11.72	14.12
1986/87	10.97	9.02	21.43	16.72	9.92	12.75	18.25

Table (15A & 15B) gives money wage rates for different states from period 1960/61 to 1986/87.

In the north-western region out of three states Punjab recorded relatively high average level of money wage rate from 1960-61 till late 70's. However Haryana took the lead after 1982/83. Uttar Pradesh maintained low level of money wage rate throughout the period.

Kerala in the Southern state as well as among all states recorded a high average money wage rate through out the period 1960-61 to 1986-87. The wage rate also showed an increase over most of the period. However relatively low levels of money wage rate was recorded by Tamil Nadu.

As far as Eastern regions and Central region is concerned all states recorded low level of average money wage rate during 1960-61 to 1986-87.

Consumer price Index generally represent average change over time paid by the ultimate consumer of specified basket of goods and services. Consumer price Index for agricultural labour has been increasing through out the period under study starting from period 1960/61 to 1986/87 which in turn implies increase in the price level leading to decline in the purchasing power of agricultural labour.

From the table we can make out that the money

Table 16A : Statewise Index Numbers of Consumer Price Index from 1960/61 to 1986/87 - 1981-82 = 100

States Year	Andhra	Assam	Bihar	Gujarat	Haryana	Karna-taka	Kerala	M.P
1960/61	24.93	21.77	21.27	25.44	21.55	20.43	23.86	20.65
1961/62	24.69	23.18	21.91	25.69	22.41	21.50	25.29	22.39
1962/63	24.93	24.82	23.40	26.19	23.49	22.58	26.96	23.26
1963/64	25.42	26.69	25.10	26.70	24.56	23.65	28.50	24.13
1964/65	30.56	30.67	31.91	33.50	29.95	28.38	33.17	32.86
1965/66	33.49	33.95	38.08	34.25	29.74	36.98	35.79	33.91
1966/67	38.38	44.49	48.72	38.53	37.50	34.62	48.21	38.04
1967/68	39.36	51.28	53.19	40.30	41.59	40.21	41.05	47.60
1968/69	40.83	48.71	39.78	40.30	41.59	39.13	46.53	42.39
1969/70	43.03	43.55	42.97	42.82	42.26	37.84	48.21	45.00
1970/71	41.80	47.54	43.82	43.57	41.81	40.43	51.07	43.04
1971/72	44.74	49.64	44.04	46.09	44.18	41.29	50.35	45.21
1972/73	50.12	50.35	51.06	56.67	49.13	46.88	52.74	52.17
1973/74	59.16	60.88	71.70	61.96	51.07	59.13	65.87	80.21
1974/75	78.72	80.09	83.40	80.35	51.07	73.97	91.40	90.21
1975/76	71.14	70.49	65.10	73.04	66.37	69.03	77.80	75.21
1976/77	68.70	68.85	63.61	67.00	65.73	66.45	75.65	69.34
1977/78	72.61	73.77	72.55	71.78	71.55	66.23	77.32	75.00
1978/79	68.94	77.75	70.63	72.29	72.41	63.01	82.33	73.04
1979/80	75.55	89.22	79.36	80.85	80.60	72.04	88.30	83.69
1980/81	86.30	94.61	91.06	89.67	94.18	85.59	90.45	94.13
1981/82	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1982/83	101.71	97.42	112.12	102.51	103.44	97.84	114.08	105.86
1983/84	106.60	102.10	120.00	113.60	110.77	112.90	139.61	114.24
1984/85	106.35	101.87	112.55	117.88	121.76	116.24	142.00	118.04
1985/86	113.69	132.08	118.93	130.47	130.17	118.27	143.43	128.91
1986/87	118.58	141.92	126.38	133.50	131.46	119.78	147.49	127.17

Table 16B : Statewise Index Numbers of Consumer Price Index from 1960/61 to 1986/87 - 1981-82 = 100

Year \ States	Maharashtra	Orissa	Punjab	Rajas-than	Tamilnadu	U.P.	W.B.
1960/61	20.48	18.96	21.55	19.56	20.30	23.04	21.15
1961/62	21.58	20.35	22.41	20.43	26.15	22.37	23.38
1962/63	22.90	23.35	23.49	21.52	24.07	21.92	26.28
1963/64	24.00	26.34	24.56	22.39	28.00	36.46	29.17
1964/65	32.15	28.54	29.95	28.69	30.94	36.68	30.28
1965/66	35.02	32.33	29.74	30.43	33.10	36.91	37.86
1966/67	39.42	38.12	37.50	36.30	40.50	47.20	43.87
1967/68	40.30	41.71	41.59	37.60	39.81	52.79	53.67
1968/69	38.98	43.51	41.59	39.56	40.97	40.04	44.54
1969/70	40.30	42.51	42.24	42.60	43.98	44.07	44.09
1970/71	42.29	42.31	41.81	37.60	40.27	40.93	45.87
1971/72	45.59	44.51	44.18	38.26	40.28	42.95	46.77
1972/73	53.74	49.50	49.13	49.56	44.44	52.34	48.32
1973/74	60.79	56.28	58.82	61.73	56.01	57.78	61.46
1974/75	80.17	79.24	72.62	79.13	93.75	84.56	75.27
1975/76	76.65	76.84	66.37	63.47	77.54	64.42	67.92
1976/77	68.28	68.66	65.73	60.43	66.98	62.19	72.82
1977/78	70.48	70.05	71.55	70.86	71.52	75.16	71.49
1978/79	69.60	69.86	72.41	68.91	68.75	73.15	73.49
1979/80	79.73	83.23	80.60	78.47	77.21	83.89	83.74
1980/81	89.20	88.02	94.18	92.39	90.50	102.23	89.08
1981/82	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1982/83	100.44	121.75	103.44	97.17	108.10	109.39	111.13
1983/84	112.11	121.75	110.77	102.60	122.22	117.44	116.92
1984/85	114.75	112.77	121.76	114.13	118.51	120.80	115.81
1985/86	119.60	120.55	130.17	129.78	124.30	132.66	125.38
1986/87	127.97	122.95	131.46	122.82	133.10	132.66	135.18

wage rate has been responding well to increase the Consumer Price Index. (Ref. Table 16A & 16B)

There are four states namely Orissa, West Bengal, Andhra Pradesh, Maharashtra which recorded less than 55 percent increase in the Index of Consumer Price Index of agricultural labourer during 1960-61 to 1986-87. On the other hand there are four states Karnataka, Kerala, Uttar Pradesh, Assam, which recorded more than 70 percent increase in prices during the same period. However Kerala recorded highest increase in consumer price during 1960-61 to 1986-87.

In general money wage rate increased throughout the period under study. Certain agriculturally better endowed regions maintained high level of average money wage rate. Moreover apart from the natural resources certain man made factors also favoured states like Kerala to maintain absolute high level of average money wage rates throughout the period under study.

On the other hand highly populated state like Bihar, Orissa, West Bengal, Tamil Nadu, Madhya Pradesh recorded low level of money wage rate during entire period 1960-61 to 1986-87.

III (b) - TREND IN REAL WAGE RATE

Table (17A & 17B) presents real wage rate for different year starting from 1960/61 to 1986/87 with

Table 17A : Statewise Real Wage Rate of Male Agricultural Workers from 1960/61 to 1986/87 - 1981/82 = 100 (in Rs/day)

States Year	Andhra -	Assam	Bihar	Gujarat	Haryana	Karna-taka	Kerala	M.P
1960/61	5.05	2.29	6.29	7.50	11.36	7.48	7.12	5.95
1961/62	5.99	2.30	6.02	7.74	11.24	7.67	8.26	5.76
1962/63	6.01	2.27	5.34	7.59	8.59	7.21	8.45	5.76
1963/64	6.09	2.49	5.65	6.77	11.76	7.56	8.20	5.71
1964/65	5.39	2.75	5.42	6.71	7.47	6.83	7.83	4.53
1965/66	5.34	3.09	5.54	6.85	10.69	5.51	7.45	5.01
1966/67	5.31	3.60	5.31	6.51	10.08	5.80	6.16	4.73
1967/68	5.74	2.89	4.96	6.92	11.39	5.07	8.40	4.20
1968/69	5.82	3.55	6.45	7.04	13.07	5.41	9.06	4.76
1969/70	5.69	3.83	6.02	6.79	13.55	6.76	9.62	4.68
1970/71	6.29	4.02	6.13	7.54	15.32	6.45	9.53	5.04
1971/72	6.03	3.79	6.24	7.94	15.32	6.92	10.14	5.04
1972/73	5.70	4.12	5.71	6.21	14.42	6.22	9.76	4.90
1973/74	5.17	4.63	5.36	6.24	13.90	5.64	8.72	3.54
1974/75	4.28	5.10	4.98	4.86	15.97	4.83	7.32	3.68
1975/76	5.65	5.00	7.18	6.94	12.85	6.22	9.03	5.29
1976/77	6.63	5.59	7.87	8.93	13.67	7.40	10.50	6.12
1977/78	6.55	5.90	7.07	11.60	13.98	7.85	9.68	5.65
1978/79	7.20	6.27	7.51	8.92	15.28	8.09	11.10	5.88
1979/80	7.26	6.77	6.80	8.49	14.85	7.70	12.43	5.31
1980/81	6.90	7.26	6.40	8.11	13.32	7.03	13.27	5.05
1981/82	6.80	8.40	7.21	7.86	14.48	6.55	12.91	5.36
1982/83	7.81	9.54	7.07	10.46	15.68	6.78	12.75	6.48
1983/84	8.63	11.16	7.36	10.90	16.66	6.13	10.96	7.13
1984/85	9.64	12.37	8.50	11.50	16.28	6.19	12.60	7.62
1985/86	9.75	14.03	8.91	10.82	15.92	8.07	13.89	7 56
1986/87	10.29	15.00	9.59	11.01	17.18	19.10	12.94	8.36

Table 17B : Statewise Real Wage Rate of Male Agricultural Workers from 1960/61 to 1986/87 - 1981/82 = 100 (in Rs/day)

Year \ States	Maharashtra	Orissa	Punjab	Rajas-than	Tamilnadu	U.P.	W.B.
1960/61	6.93	6.22	11.36	9.76	5.88	7.24	8.55
1961/62	6.85	5.43	11.24	9.73	6.11	6.03	8.08
1962/63	6.81	5.51	12.00	9.24	6.81	6.11	7.03
1963/64	6.83	5.50	11.76	8.88	5.42	5.20	6.86
1964/65	5.93	5.29	10.81	7.84	5.85	4.85	7.49
1965/66	6.28	5.78	10.69	7.72	5.92	4.14	6.60
1966/67	6.26	5.58	9.41	6.91	5.43	4 32	6.40
1967/68	6.25	5.29	10.45	7.52	5.95	4 31	5.90
1968/69	6.74	5.05	14.64	7.78	6.19	6.16	6.64
1969/70	7.12	5.01	15.26	7.11	6.04	6.19	6.71
1970/71	6.95	5.10	15.57	9.25	6.77	6.79	6.64
1971/72	6.36	5.07	15.14	9.33	6.23	9.26	7.29
1972/73	5.45	4.72	14.53	7.94	6.66	6.32	7.36
1973/74	5.39	4.61	12.67	6.91	5.98	5.79	6.52
1974/75	4.49	3.93	11.85	5.76	5.09	5.68	5.57
1975/76	4.87	4.63	13.01	8.94	6.28	7.52	6.68
1976/77	5.57	5.98	13.83	11.84	5.94	8.47	7.52
1977/78	5.60	5.92	13.78	9.20	6.19	7.48	8.25
1978/79	6.03	6.18	14.25	10.46	6.99	7.70	8.34
1979/80	6.39	5.40	13.46	8.91	6.71	7.23	8.04
1980/81	5.85	5.41	12.46	9.28	6.20	6.51	7.84
1981/82	5.79	5.30	12.32	10.32	6.61	8.12	7.43
1982/83	6.49	5.00	13.12	14.00	6.23	7.78	7.08
1983/84	6.96	5.82	14.36	13.79	6.59	7.98	7.18
1984/85	9.28	7.15	15.30	9.59	7.27	8.60	8.63
1985/86	9.49	6.90	15.34	11.17	7.41	8.83	11.26
1986/87	8.57	7.33	16.30	13.61	7.45	9.61	18.49

1981/82 as the base year. Moreover (18A & 18B) tables also present index number of real wage rate of agricultural male worker for entire period under study derived after appropriate deflation.

North western region observed an increase in the real wage rate throughout the period under study. However, Haryana recorded a relatively high trend in the level of wage rate than other two states. All these states in the north western region that is Punjab, Haryana and Uttar Pradesh recorded a decline in the wage rate during 1960-61 to 1968-69. But after that a reverse trend is recorded for four years namely 1968-69 to 1972-73. However it again started declining and the lowest level in the real wage rate was recorded during 1974/75 and 1975/76. 1974/75 had a severe drought as a consequence of which agricultural sector recorded a low output and in turn it must have depressed the real wage rate. On the other hand Consumer Price Index recorded a high increase during these years. This being so, real value of wage rate declined during this year. The reversal of wage rate trend started from 1977/78 except during 1980/81.

All states in the central region recorded a decline in the real wage rate till 1974/75 from the earlier 1960's level. In this region also lowest level was recorded during 1974/75. From mid 1970 a reverse trend was recorded in the wage rate. But 1981/82 recorded a

Table 18A: Statewise Index Numbers of Real Wages of Male Agricultural Workers from 1960/61 to 1986/87 - 1981/82 = 100

States Year	Andhra	Assam	Bihar	Gujarat	Haryana	Karna-taka	Kerala	M.P
1960/61	74.29	80.89	87.25	95.51	78.46	114.33	55.15	111.11
1961/62	88.13	118.09	83.54	98.54	77.62	117.13	67.70	107.48
1962/63	76.65	108.86	74.07	96.64	59.32	110.20	65.45	107.27
1963/64	89.64	111.03	78.44	86.24	81.21	115.52	67.26	106.69
1964/65	79.39	106.71	75.18	85.44	81.58	104.33	60.65	84.68
1965/66	78.58	108.32	76.84	87.27	73.82	84.20	57.70	93.52
1966/67	78.15	96.31	73.72	82.86	69.61	88.63	47.70	88.27
1967/68	84.43	67.08	68.82	88.07	78.66	77.44	65.45	78.37
1968/69	85.71	86.75	89.58	89.65	90.26	82.69	70.17	88.90
1969/70	83.72	104.67	83.58	86.45	100.48	103.26	74.51	87.47
1970/71	92.50	100.66	85.12	96.05	100.99	98.55	73.81	94.05
1971/72	88.74	90.87	86.60	101.01	109.25	105.74	78.54	94.07
1972/73	83.91	97.41	79.22	79.01	99.58	95.09	75.60	91.54
1973/74	76.05	90.52	74.47	79.45	95.99	86.22	67.62	66.05
1974/75	62.94	75.80	69.17	61.90	110.29	73.88	56.77	68.65
1975/76	83.08	84.44	99.69	88.30	88.74	95.09	69.94	98.71
1976/77	97.60	96.65	109.23	113.74	95.71	113.03	86.77	114.33
1977/78	96.39	95.21	98.06	147.62	96.54	119.85	75.05	105.07
1978/79	106.00	96.00	104.26	113.51	105.52	123.57	85.97	109.83
1979/80	106.86	90.32	94.37	108.09	102.55	117.61	96.35	99.19
1980/81	101.55	91.34	88.79	103.28	99.18	107.38	102.78	94.34
1981/82	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1982/83	133.09	116.57	98.09	133.15	108.28	103.60	98.76	121.06
1983/84	126.91	130.11	102.17	138.75	115.05	93.70	84.89	133.13
1984/85	141.86	144.55	117.92	146.34	112.43	94.61	97.67	142.24
1985/86	143.44	126.45	123.61	137.77	109.99	123.26	107.59	141.10
1986/87	151.42	125.82	133.11	140.18	118.69	291.61	100.23	156.09

Table 18B : Statewise Index Numbers of Real Wages of Male Agricultural Workers from 1960/61 to 1986/87 - 1981/82 = 100

Year	States Maharashtra	Orissa	Punjab	Rajasthan	Tamil-nadu	U.P.	W.B.
1960/61	119.72	117.41	92.27	94.59	89.00	89.25	115.13
1961/62	118.41	102.60	91.25	94.36	92.53	74.31	108.77
1962/63	117.61	103.98	97.43	90.04	103.06	75.27	94.74
1963/64	117.97	103.83	95.47	87.84	82.09	39.51	92.72
1964/65	102.57	99.81	87.78	75.97	88.56	59.74	100.86
1965/66	108.49	109.11	86.78	74.82	89.57	51.04	88.86
1966/67	108.19	105.41	76.40	66.99	82.16	53.22	86.19
1967/68	107.97	99.95	84.88	72.91	90.05	53.18	79.48
1968/69	116.50	95.39	118.84	75.43	93.78	75.96	89.43
1969/70	122.97	94.52	123.93	68.90	91.49	76.28	90.34
1970/71	120.06	96.31	126.38	89.66	102.54	83.62	89.47
1971/72	109.85	95.79	122.90	90.41	94.36	114.11	98.12
1972/73	94.15	89.19	117.94	77.02	100.75	77.86	99.13
1973/74	93.18	87.15	102.91	67.01	90.47	71.40	87.79
1974/75	77.54	74.28	96.22	55.83	77.13	70.04	75.09
1975/76	84.26	87.40	105.65	86.70	95.00	92.70	89.95
1976/77	96.36	112.92	112.24	114.80	89.91	104.35	101.27
1977/78	96.78	111.76	111.85	89.14	93.69	92.24	111.07
1978/79	104.21	116.67	115.67	101.28	105.86	94.94	112.25
1979/80	110.46	102.00	109.26	86.42	101.55	89.10	108.32
1980/81	101.06	102.24	101.17	89.98	93.93	80.22	105.30
1981/82	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1982/83	112.11	94.37	106.55	135.71	94.32	95.91	95.30
1983/84	120.31	109.86	116.57	133.62	99.76	98.35	96.69
1984/85	160.60	135.01	124.25	92.96	110.03	105.91	116.21
1985/86	164.04	130.21	124.52	108.26	112.21	108.79	151.55
1986/87	148.04	138.41	132.31	131.90	112.75	118.36	181.69

depressed wage rate in all the states, even lower than 1976/77 period. Maharashtra, unlike other states recorded a high wage during 1970/71 and 1971/72 but it observed a low wage rate during 1980/81 although its level was higher than in 1976/77 level. Between 1961/62 to 1986/87, the highest increase of 47 percent in real wage rate was recorded by Gujarat followed by Madhya Pradesh with an increase of 41 percent Maharashtra recorded a low increase of 24 percent only

Southern Region. Unlike states of Central Region does not saw any consistent increase or decrease in the real wage rate from 1960-61 till 1974/75. However unlike other states, states of the southern region recorded low level of real wage rate than that of early 60's level except Kerala. In southern region between 1960/61 to 1986/87, lowest increase was recorded by Tamil Nadu of 27 percent per annum. But very high increase in real wage rate of 155 percent was recorded by Karnataka, followed by a rise of 151 percentage or Kerala and 104 percentage in Andhra Pradesh.

Eastern Region Like the other Regions of India recorded decline in the level of average real wage rate from 1960-61 till

1974/75. However except Orissa no other states in the eastern region recorded a consistent decline till 1974/75. All states in the eastern region recorded relatively high increase in the level of real wage rate during the 80's than that of late 70's.

As far as increase in the real wage rate is concerned all states recorded an increase in the range of 33 percent to 37 percent in the real wage rate from period 1981/82 to 1988-89.

In general, though there was an increase in the wage rate after 1974/75 not even a single state recorded a consistent increase in real wage rate over the entire period. Unlike money wage rate, Punjab and Kerala, did not record relatively high increase in real wage rate with 1981/82 as base year. In contrast, however Haryana, Andhra Pradesh, Madhya Pradesh, recorded more than 50 percent than real index of real wage rate. Populous state like Rajasthan, Tamil Nadu and eastern states recorded a low level of increase in real wage rate except Madhya Pradesh. Lowest was observed by Tamil Nadu. All states of eastern region recorded more than 30 percent increase in real wage rate during the 80's.

It has been reightly pointed out by Jose[1] that decline in real wage during the greater part of year is a general feature of many Indian states. Though

each state recorded an increase after mid 70's but even then any consistent increase was not observed in any state.

As we have noted earlier during the period mid 70's all regions recorded low level of real wage rate which was lower than the level of wage rate achieved during the 60's. The reason for this could be, apart from poor monsoon which resulted in drought, Indian economy faced the lagged effect of inflation resulting from the oil shock and also the effect of Bangladesh war. All these resulted in depressing real value of wage rates.

Second downward swing in the real wage rate was recorded during late seventies/early eighties which again coincided with the second oil-shock, inflation and deficit monsoon. It has been pointed out by Sarthi Acharya[2] in his study that wage rate is sensitive to upward swing and down ward swing of the economy, such as agricultural production and inflation. However in the present study depressing effect on wage rate due to downward swing of the economy is much more pronounced than that of upswing.

Part - (b)

III (c) - Theoretical Background

Against the back ground of trend in money wage rate and real wage rate as provided in the part (a) of this section an attempt would be made to provide

a theoretical framework of labour market that determines wage rate in Indian economy.

Numerous factors are expected to determine the wage rate. However the dominating existing views could be divided into three basic groups that is Lewis/Ranis - Fei thesis, the Neo-Classical, Efficiency theory. According to the Lewis/Ranis ,Fei thesis , as long as there is surplus labour in the economy, wage would continue to remain at subsistence level. Once demand for labour in other sectors increases, leading to decrease in the surplus labour, wage rate would automatically increase above the subsistence level. Second dominating view comes from neoclassical theory which stresses on the importance of labour being paid according to their marginal productivity. Third dominating thought is efficiency wage theory which proposes minimisation of cost of 'work hour'.

More over there are other studies (Bardhan , Rosenzweig) which stress the importance of institutional linkage of land, labour, and credit in determining wage-rate.

As noted earlier, almost all states recorded an increase in the level of average real wage rate after

mid-seventies till early 80's. Moreover, along with the cost of living index, money wage rate saw a consistent increase throughout the period under study.

In contrast to Lewis/Ranis - Fei view, labour surplus Indian economy recorded an increase in the money-wage rate. Moreover real wage-rate, also recorded an increase after mid 70's although the same was not consistent. Therefore question arise as to how the price of biological resource recorded an increase inspite of the prevalence of surplus labour. Wages should have remained at subsistence level on account of presence of surplus labour. Moreover Hanumanta Rao[3] points out that unemployment and under employment is growing in the Indian economy. This also is not consistent with the fact of increasing real wage. Ricardian theory could provide an answer at least for increases in money wages which is also supported by various studies. Every increase in capital and population leads to an increase in the food prices as cultivation extends to marginal land leading to a increase in money wages.

Some region of India not only observed an absolute increase in level of wage rate but also under went labour saving techniques in agricultural productivity. A study by Jose[4] observed an increase in the number of tractors in Punjab from 10,600 to 67,900 and in Haryana

from 4,800 to 30,400 during 1966 to 1977. Further three states namely Punjab Haryana, and Uttar Pradesh together accounted for more than 60 percent of total farm tractors in India. Moreover studies by Vaidyanathan[5] (1983) and Bhalla (1987)[6] also supported the above argument. Punjab, Haryana inspite of low growth rate during the entire period under study recorded the highest absolute level of money wage rate. This being so, rise in the absolute level wage rate may have tilted the techniques in favour of labour saving technology. Therefore the case study of various Indian states does not fully support the view of Lewis/Ranis - Fei

However our study does not deny the importance of efficiency theory which tries to minimize the cost of agricultural production. It appears that achievements of efficient and low cost production has a significant role in affecting the nature of labour market. Relative increase in the price of labour than capital, along with an increasing ease with which capital could be substituted for labour, would have led to labour-saving bias in technological change.

But India being developing country, institutional factors along with political factors play an equally important role in determining the wage rate in the labour

market. One of it is the facing of minimum wage rates. Although the legislation is not being implemented in most parts, however, it has tended to becomes a floor land in states where trade union organisations of landless labourer are strong.

SECTION - II

III (d)- Productivity and wage rate linkage

Generally it is argued that there exists a relation between productivity and wage rate. Labour is paid according to their productivity. Neo-classical economics assumes wages productive linkages determine the nature and function of labour market. And if we accept this it might in turn imply betterment of agricultural labourer's condition through 'productivity wage' linkage effect.

Indian economy has recorded changes in agricultural front. The advent of green revolution during the mid 60's has helped the economy to achieve relatively high growth rate in agriculture. It has been possible due to an increase in productivity of inputs. Labour being one of the important input should also have recorded an increase in productivity. The present section would try to highlight (a) Growth of real wage rate in different states and reasons for various factors affecting it (b) how far productivity wage linkage is operative in labour surplus Indian economy? whether or not icrease in productivity. succeded in increasing wage rate?

What is the correlation that exists between independent variable productivity and dependent variable real wage rate (c) How has the relation between productivity of wage rate changed from the pre-green revolution to the post green revolution period at the state level? (d) Increase in productivity should lead to betterment of male agricultural workers. Answer to this will be given by elasticity of wage rate with respect to productivity of agricultural workers. (e) what are the other factors, apart from productivity, which determine wage rate in Indian economy?

It has been pointed out by scholars that wage rates happened to be directly linked with the absolute level of productivity /worker in agriculture. They have established Neo-classical 'wage-productivity' linkages for Indian agriculture sector.

In this paper, against the background of the level of labour productivity and level of real wage rate, as already discussed, an attempt would be made to find out the strength of the above relationship between these two variables at the state level.

To determine the strength of two variables with respect to each other, we carry out regression analysis between real wage rate and productivity.

III (e)- Inter Relation between Real Wage Rate & Labour Productivity

Log WR = log a + b log PRD

1. $LWR - M_{1962/65}$ = -0.90132 + 0.49570 LPRD (2.73) $\bar{R}^2$ = 0.3966

2. $LWR - M_{1970/73}$ = -0.2985 + 0.61400 LPRD (4.150) $\bar{R}^2$ = 0.53674

3. $LWR - M_{1980/83}$ = -0.86363 + 0.49554 LPRD (3.80) $\bar{R}^2$ = 0.49065

4. $LWR - M_{1984/87}$ = -0.35679 + 0.38248 LPRD (3.51) $\bar{R}^2$ = 0.44734

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Where LWR = real wage rate

LPRD = labour productivity

M = male agricultural workers

Note :-Figures in the parenthesis are t values.

From the above equations one can find out the strength of the relationship that exists between the level of real wage rate and the level of productivity prior to and ofter green revolution. As against the study of A.V. Jose who brought a correlation co-efficient as high as 70 percent between labour productivity and real wage rate, our study brings out that relatively less correlation co-efficient between these variables. Further more it has declined over time. Prior to the green revolution, nearly, 40 percent variation in real wage rate were explained by variations in labour productivity. With the advent of green revolution after mid 60's, correlation coefficient increased to 53 percent. But early and late 80's saw a slight deceleration in correlation coefficient.

Another intersting feature that comes up during the post green revolution period phase is the declining value of elasticity of real wage rate with respect to level of labour productivity. It declined

to 0.38 during 1984/87 from 0.61 during 1970/73.

All these imply the role of other factors having become important during the post green revolution as variation in real wage rate is being explained by factors other than labour productivity. In India, productivity and real wage rate are complex phenomenon determined by interaction between technology and institutions. Irrigation, multiple cropping, use of fertilizer and high yielding varities are major elements of technological changes. Among institutional factors average size of holidngs, percentage of area leased in, bargaining power of labourers, absence of outside employment opportunities, involuntary unemployment, feudal landlord with monopolistic power are prominent. Number of studies have been carried out by scholars on this aspect. On the one hand some stress the influence of market forces that is demand of labour and supply of labour in determining wage rate. While on the other hand there are some who bring out the inefficiency in the operation of the market forces in the existing institutional framework of Indian economy in determining real wage rate. This being so, the present paper along with the growth of the real wage rate discusses the factors which determine wage rate in the states under study. India, however, being a vast country

with different regions have different social, institutional and political set up, the determination of wage rate in a particular region or state is likely to depend on a configuration of different forces.

III (f) - Levels and Growth of Real Wage Rate

Wide and persistent variations in the levels and growth of real wage rate in the different states bring out the importance for undertaking dynamic analysis of growth rate of wages over various time periods.

Table (19 &20) gives the growth rate of real wage rate for different states for the period 1962/65 to 1970-73, 1970/73, 1980/83 - 1984/87 & 1962/65 - 1984-87

Except for the states of north west region under study, where growth rate was high all other states recorded either very low or negative growth rate during 1962/65 - 1970/73. Lowest growth of -0.47 percent in real wage was recorded by Assam. Highest growth of of 6.53 percent was recorded by Haryana during the same period.

However during the 1970-73 - 1980/83, there was a deceleration the growth rate of real wage rate in the north west region. During this period both Haryana and Punjab recorded negative growth rate of -0.63 percent and -1.75 percent respectively. During the same periods

Table 19. Statewise Levels of Real Wage rate During 1962-65, 1970-73, 1980-83 and 1984-87 (at constant 1981/82 Prices)

Sl.No.	State	Levels of Real Wage Rate (rupees)			
		1962-65	1970-73	1980-83	1984-87
1	2	3	4	5	6
1	Andhra Pradesh	5.834	6.010	7.173	9.899
2	Assam	9.114	8.090	8.621°	11.111
3	Bihar	5.472	6.033	6.894	9.004
4	Gujarat	7.030	7.233	8.814	11.116
5	Haryana	9.279	15.393	14.439	16.466
8	Karnataka	7.206	6.536	6.789	11.124
9	Kerala	8.163	8.053	12.590	13.147
10	Madhya Pradsh	5.330	4.996	5.635	7.851
11	Maharashtra	6.526	6.254	6.044	9.119
12	Orissa	5.434	4.969	5.240	7.131
13	Panjab	11.527	15.081	12.637	15.649
14	Rajasthan	9.293	8.844	11.204	11.459
15	Tamil Nadu	6.030	6.558	6.351	7.381
16	Uttar Pradesh	4.724	7.459	7.479	9.015
17	West Bengal	7.140	7.101	7.445	11.131

Table 20. Statewise Growth of Real Wage Rate During 1962-65, 1970-73, 1980-83 and 1984-87

Sl.No.	State	% Annual Compound Growth*			
		(A)	(B)	(C)	(D)
1	2	3	4	5	6
1	Andhra Pradesh	0.372	1.785	8.386	2.432
2	Assam	-1.479	0.638	6.549	0.905
3	Bihar	1.227	1.343	6.903	2.290
4	Gujarat	0.356	1.997	5.973	2.105
5	Haryana	6.531	-0.638	3.339	2.641
8	Karnataka	-1.212	0.381	13.139	1.993
9	Kerala	-0.169	5.227	1.088	2.190
10	Madhya Pradsh	-0.806	1.211	8.645	1.776
11	Maharashtra	-0.531	-0.341	10.830	1.532
12	Orissa	-1.112	0.532	8.008	1.243
13	Panjab	3.416	-1.753	5.490	1.399
14	Rajasthan	-0.617	2.394	0.564	0.957
15	Tamil Nadu	1.055	-0.320	3.829	0.923
16	Uttar Pradesh	5.876	0.027	4.781	2.981
17	West Bengal	-0.068	0.474	10.578	2.039

* %age Annual Compound Growth Rate:
(A) 1970-73 over 1962-65;
(B) 1980-83 over 1970-73;
(C) 1984-87 over 1980-83; and
(D) 1984-87 over 1962-65

Kerala recorded exceptionally high growth rate of 5.22 percent per annum, the highest among all the Indian states. Next to Kerala, Rajasthan and Andhra Pradesh also recorded relatively high growth rate in real wage ratio of 2.39 per cent 1.78 percent respectively.

During the third period 1980/83 - 1984/87, Kerala and Rajsthan recorded a growth rates of 1.088 and 0.57 percent per annum respectively thus showing a deceleration. However, Punjab, Haryana and Uttar Pradesh managed to have positive growth in the real wage rate during eighties. Highest growth rate was recorded by Karnataka of 13.13 per cent which was followed by Maharashtra and West Bengal with the growth rates of 10.83 percent 10.57 percent respectively, during 1980-83 to 1984-87.

For the entire period 1962-65 to 1984-87 except Uttar Pradesh and Haryana, all states under study recorded less than 2.5 percent. Rajasthan, Tamil Nadu, Assam recorded growth rate below 1 percent. In eastern region populous state like Bihar and West Bengal maintained growth rate of more than 2 percent per annum. In the central region apart from Gujarat, other states recorded low growth rates in real wage rate. Punjab observed a peculiar feature during the same period. Inspite of being most agriculturally dynamic state of India, it recorded a low growth rate of 1.39 percent during the 1962-65 to 1984/87 period

A.V. Jose in his study has pointed out the positive and direct relationship between labour productivity and level of wage rage of agricultural workers in Indian agriculture. Our study, however, apart from the first period that is 1962/65 to 1970/73 does not seem to be supporting the above mentioned line of argument to the same extent as the level of explanation has declined

III (g) - Growth of Labour Productivity and Real Wage Rate

During the period 1962/65 to 1970/73, Punjab, Haryana,, Uttar Pradesh, recorded large increase in both labour productivity and growth in real wage rates. Spread of new technology to these areas seems to have transformed itself into general benefits which not only increased labour productivity in these areas but also led to an increase in the wage rate of agriculture workers. However this relationship seems to have weakened over time.

There are few states which because of presence of certain institutional constraints in land and labour etc, require relatively greater public investment in various kinds to overcome basic hurdles in development. Government, apart from its initiative to increase yield from crops like wheat, rice should take appropriate steps to extend new technology to more crops like oilseeds and pulses and to rain fed areas through special programmes. This is likely to have a positive effect

on growth of agricultural output. Goernment's intervention for rural employment promotion since mid seventies has been a prominent factor exerting an upward influence on rural wages particularly in populous eastern regions. Moreover it has been pointed out by V.K.R.V. Rao[9] that the contribution of these programme is relatively much more prononunced in those areas where agricultural growth has been below average national level. Further A.V. Jose[10] has pointed out the importance of wage increments, which has been given by govt. in those states which along with fall in agricultural output observe fall in employment inorder to prevent any further fall in the subsistence income of wage labour households. These measures must be exerting an influence on real wage rates much of these will explain an increase in growth of real wage rate during the third period in eastern regions and Madhya Pradesh and Maharashtra. Kerala more or less maintained relatively high levels of real wage rate without corresponding high level of labour productivity. It has been pointed out by various studies that high literacy rate, increased politicisation of rural poor, the presence of trade union has been influencing positively the wage employment conditions of agricultural labourers.[11] Further more Government intervention in rural labour market is not less important[12] All these together decisively influence the upward movement of

real wage rates in the states during the eighties. However, the rate of growth of real wage rate for the entire period recorded by Kerala does not stand significantly higher than that of other states

Another peculiar feature comes up in case of Punjab Punjab agriculturally being the most dynamic state, recorded low growth in the real wage rate. Further more the growth rate during 19770/73 to 1980/83 observed a negative growth rate of -1.75 percent. This could be partly attibuted to the extention of cultivation to the marginal land which in turn led to an increase in the cost of input along with labour input which in turned favourable labour saving technology[13] Moreover, labour migration from less developed states like Bihar, West Bengal also has depressing effect on the real wage rate of Punjab. Various studies have emphasised the cumulative effect of the two factors that is in-migration of labour and technological changes which contributed to the decline in the real wages ratio in this states

It has been argued that agricultural growth has not resulted in any imporvement in level of living of rural poor and may instead have been accompanied by their immiserisation. Further inspite of increased demand for agricultural labour, there is not any increase in the real wage rate during same period.

However if we look at growth rates of real wage rate we would find that disparities in it has decelerated over time. This could be due to government's special emphasis on backward regions and states. As a result of these interventions during the post seventy period saw an improvement in the level of real wage rate in most of the states and in particular in the poorer state. Moreover, gorwth rate during 1980/83 to 1984/87 is relatively higher compared to than that of 1962/65-1970/73 and 1970/73-1980/83. As a result when we take growth-rate for the entire period from 1962/65 to 1984/87, except few states relative differences in real wage rate in various states have tended to come down. This emphasises the fact that as a result of an increased growth in real wage rate living standard of male agricultural workers must have improved during the late eighties compared to early sixties and seventies.[14] Therefore because of much concentrated efforts towards agricultural modernisation and towards various employment generating programmes etc. there is an improvement in the real wage rate situations leading to improvement in living condition of agricultural workers compared to the early green revolution period during 1970/73 and 1980/83.

III (h)- CONCLUSION

An improvement in living conditions warrants a favourable movement of the demand for labour in relation

to its supply, and a rise in agricultural wage rate relative to price of wage good mainly food consumed by labour households.

As already discussed, the advent of green revolution during the mid sixties not only helped the indigenous economy to achieve relatively high growth rate in agriculture but also led to an increase in the labour productivity in many states of India. Inspite of this the real wage rates did not increase untill mid seventies. Trend in real wage rates shows that except in the state of Punjab and Haryana and states in southern region all other states and in the north western region (mainly U.P.), central states and states in eastern region recorded a decline in the real wage from 1960/61 to 1974/75. From 1975/76 onwards though each state under the present study an increase in the real wage rate, however not even a single state observed a consistent increase in it. Further populous state recorded a low level of real wage rate, thereby placing the need for some internal factors to extert its influence to enhance the living condition of these backward and poorer states.

While analysising the role of labour productivity in determining real wage rate prior to and after the green revolution it was observed that the role of other factors are equally important. There is no doubt that

variation in labour productivity has played an important role in determining variation in real wage rate during mid 60's and early 70's however, early and late eighties saw slight deceleration in the explainatory power of labour productivity.

In a country like India, labour productivity and real wages are a complex phenomenon determined by a constant interaction between technology and institution. This we have seen while analysising growth rate of real wage rate with that of labour productivity. Labour productivity and real wage rate increased in Punjab, Haryana and Uttar Pradesh during 1962/65 and 1970/73. Introduction and wide spread new technology in these area seems to have contributed towards general benefits which not only increased labour productivity but also led to an increase in wage rate of agricultural labourers. However during 1970/73 to 1980/83, there are states which inspite of positive growth in labour productivity recorded negative growth in real wage rate. This perhaps because of increasing capitalisation in agricultural leading to increase in labour supply and also interaction of other institutional factors. During 1980/83 to 1984/87 all states observed a high growth rate in real wage rate compared to other periods. Besides this,

growth in real wage rate is much more than that of labour productivity. All these emphasise once more on the growing importance of other factors such as presence of trade union, politicisation of rural poor, government intervention for rural employment, etc, etc. becoming prominant factors in exerting an upward influence on rural wages.

Public investment through both investment in infrastructure and in new technology for augmenting agricultural production on the one hand and through anti-poverty and employment generation programme on the other, have had a positive impact on improving the living condition of the rural poor.

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13. As already discussed, could be on the Ricordian line of argument for increase in the prices of inputs as cultivation extend to marginal land. This could also make labour relatively costlier and therefore would favour labour saving technology

14. This is because of the decline in inter-state disparities in agricultural wages. Further according to C.H.H. Rao (1989) this decline is because the decline in the relative prices of food grains had greater impact on the purchasing power of wage earners in low wage areas.

CHAPTER - IV

SUMMARY AND CONCLUSIONS

Modern seed - fertilizer technology was primarily responsible for bringing out phenomenal increase in land yield and created a momentum for the spread of the rapid output increase and were associated with increases in pests and weeds also and this led increasing use of pesticides and weedicides. It was expected that new breakthrough in the agricultural sector would reflect itself in an overall increase in productivity of agricultural production. Many of these expectations did come true. As a result of introduction of new technology, growth of agricultural output from mere 0.37 percent per annum during the pre-independence days increased to about 2.7 percent per annum after independence. This increase has come on account of increased productivity of factors. The advent of green revolution not only helped in increasing agricultural output by raising land productivity but also led to a significant increase in the labuor productivity. The present study, while analysing levels of growth of agricultural output at state level make an attempt to analyse the growth in land productivity and labour productivity. Besides focussing attention on labour productivity it further analyses how labour productivity has changed with the change in the

agricultural production occurred on account of changed land productivity. There is no doubt that increased use of fertilizers, number of tractors and such other mechanised devices, increase in cropping intensity etc. has led to an increase in land productivity. This being so, this thesis examines the extent of variations in labour productivity prior to and after the green revolution, besides seeking for an explanation for these variations. In India, the change in labour productivity occurred due to increase in land productivity which increased as a result of rise in intensity of cropping, wider utilization of tractors, use of fertilizers etc. An attempt is made to investigate these factors taken as a proxy of land productivity which in turn offer an explanation for variations in labour productivity.

What was the extent of the impact of green revolution on the real wage rate along with the labour productivity in a labour surplus, agricultural predominant country like India? Has it led to an unequal benefit among agriculturist classes? Has it not transformed the plight of the poor despite the introduction of new technology? The study attempts to throw light on these queries besides analysing the condition of agricultural labour across the states prior to and after green revolution. This has been done keeping in view the disparities that Indian economy as a whole possesses and the time factor

that could determine such a study. Neverthless, an attempt is made to study the relative condition of agricultural labourer in India by analysing relevent data of level and growth of land productivity at state levels and the male work force and wage rate during 1962-65, 1970-73, 1980-83, and 1984-87. The value of land productivity has been calculated by taking the value of output of as many as 41 crops during all the periods of valued at constant (1980's) prices. Data on agricultural wage rate have been taken from Agricultural Wage Rate in India, published by Directorate of Economics and Statistical Ministry of Agriculture.

Punjab was the first to experience revolutionary introduction of Dwarf wheat seed varieties on her agricultural front. Sound basic infrastructure made her to be the best of the new agricultural techniques from 1965/66 onwards. Later on Haryana and Uttar Pradesh also adopted the new agricultural strategy successfully, as a result of which north west region recorded highest increase in land productivity leading to highest growth in value of agricultural output. Along with these states, Punjab also recorded a growth rate of 6.99 percent per annum and U.P. 2.77 percent per annum growth of output from 1962/65 to 1970/73. An extension of green revolution to rice and and cotton was observed during the early seventies. As a result

Andhra Pradesh and Gujarat saw an improvement in the growth rate during 1970/73 to 1980/83 of 3.78 percent per annum and 2.98 percent per annum respectively. Further good monsoon resulted in a remarkable increase in the growth performance of Maharashtra. During third period a remarkable performance was observed by eastern region of India. All states of this region, Tamil Nadu and Karnataka, registered significant improvement in growth performance in agricultural output. During the entire period, most of the states witnessed positive growth rates. There are however a few states which were not able to maintain high growth rates which they had recorded during the early phase of green revolution. Haryana, Kerala, Rajasthan are few examples of these. On the other hand, there are states like Karnataka, West Bengal and Bihar, which recorded an increase in growth rates during eighties. As a result their overall performance improved in comparison with the initial stages of green revolution. Punjab and Uttar Pradesh recorded a slight improvement during the eighties than that of early seventies but maintained more or less a constant increase in the rate of growth throughout the entire period of 1962/65 to 1984/87.

A close examination of land productivity indicates that mid sixties in Indian agriculture recorded

a considerable increase in the productivity of different states which resulted from various technical as well as institutional changes. In the northwest region, after a slight decline in the land productivity during 1970/73 to 1980/83 except Haryana, the other states managed to record increase in their land productivity during 1984-87. As far as central and southern regions of India were concerened, low but positive growth in land productivity was maintained throughout the period under study. Highest growth rate of 3.02 percent per annum was recorded by Karnataka during 1964/65 to 1984/87. Andhra Pradesh and Tamil Nadu also recorded growth rates of more than 2 percent per annum. In the eastern region, the period between 1980/83 to 1984/87 recorded a remarkable increase in the growth rate of land productivity of all states relatively to the two periods that is period between 1962/65 to 1970/73 and 1970/73 to 1980/83. Bihar recorded the highest growth rate during this period. In general we will find that the states which recorded an increase in growth rates of output were also one which accounted for an increase in land productivity. This increase in the land productivity was on an account of a favourable movement by both net sown area and intensity of cropping. Land productivity measured in terms of output per unit of net sown area increased not only as a result of higher

yields, but also because increasing intensity of cultivation made possible due to irrigation and introduction of short duration crops. Increased productivity in crop production led to increase in net sown area also. Cropping intensity during early and late eighties has played an important role in increasing land productivity compared to earlier one. Similarly extension of cultivation to rainfed area and unirrigated area during 1980/83 to 1984/87, had led to an improvement in intensity of cropping of eastern region leading to an improvement in growth performance of this region.

Growth of labour productivity at state level seems to be highly related with land productivity and that of growth of output. North western region of India recorded a high growth in the labour productivity for the entire time periods under study except for 1970/73 to 1980/83. Highest growth rate of 4.4 percent per annum was observed by Punjab during 1962/65 to 1980/83. In southern region though low growth rate was observed by states for the first 1962/65 to 1970/73 and second period 1970/73 to 1980/83, but during 1980/83 to 1984/87, Maharashtra and Tamil Nadu recorded a high growth rate of 4.79 percent per annum and 3.64 percent per annum respectively. Central region had no consistent rise or fall in labour productivity. Further unlike, other

states of India, growth rate of labour productivity of states of this region remained at a very low level during 1980/83 to 1984/87. The most populous region of India, that is the eastern region, recorded an improvement in labour productivity during the third period, 1980/83 to 1984/87 compared to that of early decades of green revolution. As a result of which this region has improved its growth rates r _ compared with the early decades of green revolution. For the entire period, 1962-65 to 1984-87, not a single state maintained a consistant level of increase in labour productivity during the first period 1962/65 to 1970/73. States like Madhya Pradesh, Rajasthan, Uttar Pradesh, Punjab and Haryana had recorded a very high growth rate in labour productivity. Their growth rate tended to decelerate in the subsequent periods. During the second period 1970-73 to 1980-83 while Uttar Pradesh and Punjab experienced a slight deceleration in the growth of labour productivity, Haryana observed a significant deceleration during the third period 1980-83 to 1984-87, Punjab and Uttar Pradesh once again recorded an acceleration in labour productivity while Haryana's productivity continued to decelerate. Gorwth of agricultural output has made a direct impact on the growth in labour productivity. North west states have shown a significant increase in labour productivity

during early decades of green revolution. Some of southern states and central region experienced highest grwoth in labour productivity during seventies. Similarly extension of green revolution to rainfed areas and eastern region has led to an improvement in labour productivity of these regions.

Keeping in view the fact that labour productivity being a function of land productivity, a significant level of variation in labour productivity is experienced by the variations in land productivity. However when we take cropping intensity, use of fertilizer, number of tractors as a proxy for land productivity these in turn as a function explain very insignificant level of variation in labour productivity. Neverthless, these factors become slightly significant in explaining variation during early and late eighties. This emphasises that there are factors other than cropping intensity, use of fertilizer that are important in explaining strength of variation in labour productivity. These could be trade unions, labour legislation, food for work programmes etc.

From the present study it emerges that the real wage rate did not increase until mid seventies. Trend in real wage rates shows that except in the states of Punjab and Haryana and states in southern region all

other states in the north western region (mainly Uttar Pradesh), central states and states in eastern region recorded a decline in the real wage rate from 1960/61 to 1974/75. And from 1974/75 onwards though each state under study recorded an increase in the real wage rate not even a single state recorded a consistent increase in real wage rate. Unlike other regions, eastern region recorded a very low level of real wage rate.

It can also be concluded that unlike first period, 1962/65 to 1970/73 when increase in the labour productivity seemed to transform itself into an increase in the real wage rate in north west region, the above line of arguement in not supported in other periods to the same extent.

Between 1970-73 to 1980/83 there are states, which inspite of positive growth in labour productivity, recorded negative growth in real wage rates. However during 1980/83 to 1984/87, all states observed high growth rate in real wage rate than that of labour productivity. Further taking labour productivity as an independent factor affecting real wage rate at state level prior to and after green revolution, it can be seen that large part of variations in real wage is explained by variations in labour productivity during the post green revolution

period. However, early and late eighties saw a slight improvement in the explanatory power of labour productivity. This once more emphasises the role of factors other than labour productivity in the determination of real wage rate in India. In India determination of productivity of labour and real wage rate are complex phenomenon of interaction between technology and institutions. Irrigation, multiple cropping, use of fertilizer, number of tractors and high yielding varieties of seeds would, no doubt, lead to an increase in labour productivity. However institutional factors, average size of holdings, percentage of area leased in, fuedalistic nature of land relations, growth of labour force, government investment in new technology play an equally important role in determining labour productivity. Similarly involuntary unemployment, absence of outside employment opportunities, presence of trade unions, government anti-poverty and employment generating programme and the like also play an important role in determination of wage rate in the Indian economy.

An elaborate analysis of all the above factors although extremely challenging, is beyond the scope of the present study.

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Table 19 Statewise Growth of Male Agricultural Labourers During 1962-65, 1970-73, 1980-83 and 1984-87

Sl.No.	State	% Annual Compound Growth*			
		(A)	(B)	(C)	(D)
1	2	3	4	5	6
1	Andhra Pradesh	0.3886	1.779	1.779	1.1804
2	Assam	0.4984	1.4758	1.4758	1.0431
3	Bihar	0.3420	1.4203	1.4203	0.9552
4	Gujarat	1.0453	1.1962	1.1962	1.0895
5	Haryana	0.1299	1.6651	1.6651	1.0171
8	Karnataka	-0.1495	1.9196	1.9196	1.0587
9	Kerala	0.8468	-2.4996	-2.4996	-1.1537
10	Madhya Pradsh	0.9112	1.6293	1.6293	1.2912
11	Maharashtra	0.4182	1.5632	1.5632	1.0670
12	Orissa	0.1758	1.3913	1.3913	0.8756
13	Panjab	-0.2028	0.4713	0.4713	0.1984
14	Rajasthan	0.7781	1.6255	1.6255	1.2388
15	Tamil Nadu	-0.3610	0.7967	0.7967	0.3279
16	Uttar Pradesh	0.2607	1.8149	1.8149	1.1534
17	West Bengal	-0.0313	1.2729	1.2729	0.7287

* %age Annual Compound Growth Rate:
(A) 1970-73 over 1962-65;
(B) 1980-83 over 1970-73;
(C) 1984-87 over 1980-83; and
(D) 1984-87 over 1962-65.

Table 20: Statewise Growth of Male Cultivators During 1962-65, 1970-73, 1980-83 and 1984-87

Sl.No.	State	% Annual Compound Growth*			
		(A)	(B)	(C)	(D)
1	2	3	4	5	6
1	Andhra Pradesh	3.0498	1.3216	1.3216	1.9105
2	Assam	7.3667	0.9130	0.9130	3.2473
3	Bihar	5.3757	0.7576	0.7576	2.4329
4	Gujarat	5.0202	2.4950	2.4950	3.3286
5	Haryana	7.7047	2.6635	2.6635	4.4112
8	Karnataka	5.5007	1.0526	1.0526	2.6534
9	Kerala	6.7109	-0.0080	-0.0080	2.4609
10	Madhya Pradsh	3.7638	1.2482	1.2482	2.1315
11	Maharashtra	2.5646	0.6983	0.6983	1.3647
12	Orissa	5.2949	0.4324	0.4324	2.2106
13	Panjab	-0.1655	2.7885	2.7885	1.5542
14	Rajasthan	6.7081	-0.4325	-0.4325	2.2059
15	Tamil Nadu	5.4493	1.2191	1.2191	2.7333
16	Uttar Pradesh	5.7872	-0.5338	-0.5338	1.8137
17	West Bengal	18.8396	1.4353	1.4353	7.5773

* %age Annual Compound Growth Rate:
(A) 1970-73 over 1962-65;
(B) 1980-83 over 1970-73;
(C) 1984-87 over 1980-83; and
(D) 1984-87 over 1962-65.

Table 21: Exponential Growth Rates

To derive total male agricultural worker data for the time period chosen for study exponential growth rates have been applied to census figures.

$$y^t/yo = e^{rt}$$

$$\left(\frac{1971}{1961}\right) = e^{rt}$$

$$\log \left(\frac{1971}{1961}\right) = r_1 \times 10$$

$$1/10 \quad \log e \left(\frac{1971}{1961}\right) = r_1$$

$$y_{1962-65} = y_{1961}\, e^{r1 \times 17/6}$$

$$y_{1970-73} = y_{1971}\, e^{r_2 \times 5/6} \quad r_2 = \log (1981/1971)$$

$$y_{1980-83} = y_{1981}\, e^{r2 \times 5/6}$$

$$y_{1984-87} = y_{1981}\, e^{r2 \times 29/6}$$

Thus the derived data of workers for different time period have been used to determine labour productivity.