CHAPTER - III

Data Base and Methodology
3.1 Introduction

Many studies that have tried to analyze the factors responsible for observed trends in the incidence of rural poverty in India have focused primarily on the question of whether or not the positive effect of agricultural growth trickle down to the poor through its indirect effects on income and employment opportunities. With few exceptions (Bardhan 1973; Griffin and Ghose 1979), most of these studies have found an inverse relationship between growth in agricultural income and the incidence of rural poverty. According to Ahluwalia (1978), the relationship between rural poverty and agricultural performance has been a subject of extensive empirical research. He observed an inverse relationship between the two variables and, thereby, asserted the existence of trickle-down mechanisms in the Indian rural economy during 1956-57 to 1973-74. The existence of trickle-down mechanism has been further reinforced by the results of his subsequent study (1986) with expanded data set.

In this context, the researcher tries to study and analyse various issues related to Rural Poverty in India, as well as in major states, with the following objectives:

i) to study the growth pattern and extent of instability in area, production and productivity of food grains

ii) to examine the trends in poverty

iii) to examine the effect of agricultural performance on rural poverty

iv) to study the determinants of rural poverty.

3.2 Data base for the Study

Most of the studies are in the context of Indian economy but more or less varied with respect to different time periods and across its regions. These studies are based on data gathered mostly up to 1990’s. Keeping in view the above, the present study seeks to study trends in agriculture and rural poverty in India and major states, the effect of agricultural performance on rural poverty in India and major states and the determinants of rural poverty using the expanded data set up to 2004-05.
Thirteen (13) major states, namely, Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal and India in general have been chosen for this study. The period of reference for the study is 1970-71 to 2004-05.


To study the growth pattern and extent of instability in area, production and productivity of food grains, the data on Area, Production and productivity of Food grains for the period 1970-71 to 2004-05 have been taken from various sources, as stated above, for all India as well as for different major states.

The trends in poverty have been studied by collecting data on rural and urban poverty ratios of various NSS rounds from 1970-71 to 2004-05. The state-specific poverty lines and distribution of persons by expenditure groups are obtained from the NSS data on consumer expenditure. (The NSS consumption distribution was used without any adjustment to CSO consumption—a major departure from Task Force method, which did this adjustment on a pro-rate basis). The aggregate poverty ratio of the state is worked out by combining the rural urban poverty ratios. The estimates of poverty at national level are worked out as an average of state-wise poverty.

Rural people derive their livelihood primarily from agriculture. Many studies used State Domestic Product in Agriculture per head of Rural Population as a measure of agricultural performance and found an inverse relationship between rural poverty and agricultural performance.
In a later article, Datt and Ravallion (1998b) also relate rural wage rate and food prices to poverty. Ravallion and Datt observed that wage rate has higher effect on poverty reduction and that higher farm productivity is closely associated with higher wage rates. Similarly, food prices are important and higher farm productivity reduces food prices. Thus, it is farm productions that drives non-farm employment and, hence wage rates. The rural people depend upon agriculture to a large extent and, therefore, their living conditions depend to a significant extent upon the performance of this agricultural sector.

In this study Per capita Net State Domestic Agricultural Production of Rural Population (Ag NSDP) has been used as a measure of agricultural performance. Improved agricultural performance is supposed to affect all sectors of rural population including the poor and, therefore, Ag NSDP may be considered as a factor influencing of the incidence of rural poverty. Therefore, the two variables Viz., Per capita Agricultural Net Domestic Product and Wage rates, have been considered to study their effect on rural poverty.

**Net state domestic agriculture production**: Net state domestic agricultural production data is taken from Economic Intelligence Service (CMIE), National Account Statistics, and Central Statistical Organization reports and deflated by CPIAL Rs (1960-61).

**Net domestic agriculture production per rural person (base Rs (1960-61))**: This is the ratio of the i\textsuperscript{th} year deflated net state domestic agriculture production and i\textsuperscript{th} year rural population.

**Rural Wage Rate**: Rural wage rates from 1970 to 1993 have been taken from Thorat (1999, 1994 and 2000), Himanshu (2005) and the remaining data was compiled by researcher, deflated by consumer price Index for Agricultural labour (CPIAL) from Ministry of Agricultural Reports.

Alleviation of poverty is an essential aspect of national policy agenda all over the world including India. India has been attempting poverty alleviation with several plans and policies since her independence, even much earlier ever since 1938 (Radhakrishna and Ray, 2004-05). One way to achieve the desired objective of poverty alleviation is to understand the mechanization through which poverty can be
reduced (Mirros, 1999). This necessitates the need to identify the determinants of rural poverty first and then go for its mechanism. For instance, since agricultural growth plays a vital role in poverty alleviation, the best mechanism is to invest more in agriculture (Rudra Prakash Pradhan, 2008). Agricultural growth was a very contributory factor of rural poverty alleviation in the 1970’s and growth of rural nonfarm employment and increase of rural wage were the responsive ingredients in the 1980’s.

The empirical investigation of (Alston et. al., 2000) suggests that agricultural research yields favorable economic returns and contributes significantly to the reduction of rural poverty (Hazell and Haddad, 2001; Kerr and Kolavalli, 1999) as well as urban poverty (Fan, 2002a; Fan et.al. 2001). Government spending can have direct and indirect effects on poverty. The direct effects are benefits the poor receive from expenditures on employment and welfare programs. The indirect effects arise when government investments in rural infrastructure, agricultural research, and health and education of rural people stimulate agricultural and nonagricultural growth, leading to greater employment and income earning opportunities for the poor, and to cheaper food. There is need to quantify the effectiveness of different types of government expenditures in contributing to poverty alleviation.

The literature signalizes that the factors affecting India’s rural poverty are not uniform all over the country. For instance, while agricultural growth was responsible for rural poverty alleviation in 1970’s Growth of rural non-farm employment and increase of rural wages in the 1980’s. The major factors, as per the cited literature, that affect India’s rural poverty are: Net Domestic Agricultural Production, Development Expenditure, Real Rural Wages, Food prices, Productivity of Food grains, Irrigation, Rural literacy rate etc. The present study picked up some of these relevant variables and re-examined the determinants of rural poverty in Indian economy during the last three decades as well as pre and post-reform periods.

In the context, the following factors have been considered to examine the determinants of rural poverty and the data for these factors have been collected from various sources as stated above.
1) Denotes aggregate rural poverty for all classes (or) Head count ratio.

2) Rural wage rates deflated by CPIAL (base (1960-61) Rs.).

3) Per capita net state domestic agricultural production deflated by CPIAL, (base (1960- 61) Rs).

4) Development expenditure deflated by CPIAL (base (1960-61) in millions)

5) Consumer Price Index for Agricultural Labour (base year (1960-61) Rs.)

6) Food grains productivity (Kg/hectare)

7) Percentage of cropped area under irrigation and

8) Rural Literacy rate.

All India rural wage rates: All India rural wage rates are measured with weighted average of rural wage rates of 13 major states.

Rural Population, Rural Literacy Rate: Annual estimates of rural population are constructed using census data from all five censuses conducted in the post-independence period. Population is assumed to grow at constant grow rate between censuses.

The Price Indices: The CPI for Agricultural Labour (CPIAL) is taken from Reserve Bank of India Annual Reports. The Consumer Price Index for Agricultural Labour was deflated with base year as 1960-61.

Development Expenditure: Development expenditure includes expenditure on both economic and social services. Economic services include agriculture and allied activities, rural development, special area programmes, irrigation and flood control, energy, industry and minerals, transport and communications, science, technology and environment. On other hand, social services include education, housing, urban development, Labour and labour welfare, social security and welfare, nutrition and relief on account of national calamities. Development Expenditure data was taken from Thorat (1999) Research Report 110 and indiastat.com.

Percentage of cropped area under Irrigation: Percentage of cropped area under irrigation means the ratio of the total irrigated area under all crops to total cropped area.
3.3 Methodology

Most of the studies on growth pattern used linear method of the formula
\[ Y = a + bt \]
to estimate the linear growth rates of area, production and productivity. In
the present study we have also used the same formula for estimating the trends.

Linear growth trend equation is generally \( y = a + b \) \( \ldots \ldots (1) \)

Where, \( y = \) Area under food grains/ production/ yield and
\( t = \) time

Linear Growth Rate (LGR) = \( \frac{\delta \times 100}{y} \) \( \ldots \ldots (2) \)

Where, \( \bar{y} = \) Mean value of area under food grains/ production/productivity

To test significance of growth rates of area, production and productivity of
food grains, the 't' test has been used with the followings formula:

\[ 't' = \frac{\hat{b}}{\text{Standard error of } \hat{b}} \approx t_{(n-2, \alpha/2)} \]

Co-efficient of variation was used to measure the magnitude of instability in
the area, production and productivity of food grains.

It is defined as
\[ CV = \frac{1}{N-1} \sum \left( \frac{x_i - \bar{x}}{x} \right)^2 \times 100 \] \( \ldots \ldots (3) \)

Where, \( x_i = \) Area/ Production/ Productivity in the year 't'
\( \bar{x} = \) Mean of area/ Production/ Productivity.
\( N = \) Number of years
Exponential function of the following formula was used for estimating the growth trend of Total Population, Rural Population, Cultivators, and Agricultural Labour.

\[ Y = a e^{bt} \]  \hspace{1cm} (4)

Where, \( y \) = Total population/rural population/ cultivators, agriculture labour

and \( t \) = time

Annual percentage of growth rate was generally \( b \times 100 \)

To examine the effect of agricultural performance on the incidence of rural poverty the following three equations have been adopted.

Equation I: \( RPOV = \beta_0 + \beta_1 \text{Ag NSDP} + u \) \hspace{1cm} (5)

Equation II: \( RPOV = \alpha_0 + \alpha_1 \text{Wage} + u \) \hspace{1cm} (6)

Equation III: \( RPOV = \gamma_0 + \gamma_1 \text{Ag NSDP} + \gamma_2 \text{Wage} + u \) \hspace{1cm} (7)

Where, \( RPOV \) is incidence of rural poverty measured by Head Count Ratio,

\( \text{Ag NSDP} \) is the Net State Domestic Agricultural Production and

\( \text{Wage} \) is the Rural wage Rates.

**Head Count Ratio**

Head count ratio is the proportion of population living below the poverty line.

It is frequently expressed in percentage terms.

\[ HC = \frac{q}{n} \times 100 \]  \hspace{1cm} (8)

Where, ‘\( n \)’ is the total population

‘\( q \)’ is the number of persons below poverty line.

The equations 5, 6 and 7 are estimated by Ordinary Least Squares method separately for Pre-reform period (1970-71 to 1990-91) Post-reform period (1991-92 to 2004-05) and for the overall period (1970-71 to 2004-05).
To analyze the determinants of rural poverty, the following linear functional formula was used.

$$RPOV = a_0 + a_1 \text{wage} + a_2 \text{AgNSDP} + a_3 \text{DE} + a_4 \text{CPIAL} + a_5 \text{FgPro} + a_6 \text{Per Cro Irr} + a_7 \text{RLit} \quad ... \quad (9)$$

Where,

- **RPOV** = Denotes aggregate rural poverty for all classes (or) Head count ratio.
- **Wage** = Rural wage rates deflated by CPIAL (base (1960-61) Rs.).
- **Ag NSDP** = Per capita net state domestic agricultural production deflated by CPIAL, (base (1960-61) Rs.)
- **D.E.** = Development expenditure deflated by CPIAL (base (1960-61) in millions)
- **CPIAL** = Consumer Price Index for Agricultural Labour (base year Rs 1960-61.)
- **Fg Pro** = Food grains productivity (Kg/hectare)
- **Prc Cro Irr** = Percentage of cropped area under irrigation
- **R Lit** = Rural Literacy rate

- $a_1 - a_7$ respective elasticity coefficient of the variable
- $a_0$ = constant

The above equation was estimated using Ordinary Least Squares method and individual regression coefficients were tested for significance using the usual t-test. The summary statistics $R^2$ was computed and tested for overall significance using F- test.

The explanatory variables with each other and hence the least squares estimates obtained are not reliable. Therefore, step wise regression analysis was carried out to determine the variables that influence of poverty.