

**EPTD DISCUSSION PAPER NO. 33**

**GOVERNMENT SPENDING, GROWTH AND  
POVERTY: AN ANALYSIS OF INTERLINKAGES  
IN RURAL INDIA**

**Shenggen Fan, Peter Hazell, and Sukhadeo Thorat**

**Environment and Production Technology Division**

**International Food Policy Research Institute**

**2033 K Street, N.W.**

**Washington, D.C. 20006 U.S.A.**

**March 1998**

**Revised - December 1998**

*EPTD Discussion Papers contain preliminary material and research results, and are circulated prior to a full peer review in order to stimulate discussion and critical comment. It is expected that most Discussion Papers will eventually be published in some other form, and that their content may also be revised.*

## ABSTRACT

Poverty in rural India has declined substantially in recent decades. The percentage of the rural population living below the poverty line fluctuated between 50 and 65 percent prior to the mid-1960s, but then declined steadily to about one-third of the rural population by the early 1990s. This steady decline in poverty was strongly associated with agricultural growth, particularly the green revolution, which in turn was a response to massive public investments in agriculture and rural infrastructure. Public investment in rural areas has also benefitted the poor through its impact on the growth of the rural non-farm economy, and government expenditure on rural poverty and employment programs, which has grown rapidly, has directly benefitted the rural poor.

The primary purpose of this study is to investigate the causes of the decline in rural poverty in India, and particularly to disentangle the specific role that government investments have played. We seek to quantify the effectiveness of different types of government expenditures in contributing to poverty alleviation. Such information can assist policy makers in targeting their investments more effectively to reduce poverty. More efficient targeting has become increasingly important in an era of macroeconomic reforms in which the government is under pressure to reduce its total budget.

The study uses state level data for 1970 to 1993 to estimate an econometric model that permits calculation of the number of poor people raised above the poverty line for each additional million rupees spent on different expenditure items. The model is also structured to enable identification of the different channels through which different types of government expenditures impact on the poor. We distinguish between direct and indirect effects. The direct effects arise in the form of benefits the poor receive from employment programs directly targeted to rural poor. The indirect effects arise when government investments in rural infrastructure, agricultural research, 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. Understanding these different effects provides useful policy insights for helping to improve the effectiveness of government expenditures in reducing poverty.

But targeting government expenditures simply to reduce poverty is not sufficient. Government expenditures also need to stimulate economic growth. This is needed to help generate the resources needed for future government expenditures. It is also the only way of providing a permanent solution to the poverty problem, as well as to increase the overall welfare of rural people. The model is therefore formulated so as to measure the growth as well as the poverty impact of different items of government expenditure. This enables us not only to rank different types of investment in terms of their growth and poverty impacts, but also to quantify any tradeoffs or complementarities that may arise between the achievement of these two goals.

The results from our model show that government spending on productivity enhancing investments, such as agricultural R&D and irrigation, rural infrastructure (including roads and electricity), and rural development targeted directly on the rural poor, have all contributed to reductions in rural poverty, and most have also contributed to growth in agricultural productivity. But differences in their poverty and productivity

effects are large.

The model has also been used to estimate the marginal returns to agricultural productivity growth and poverty reduction obtainable from additional government expenditures on different technology, infrastructure and social investments. Additional government expenditure on roads is found to have the largest impact on poverty reduction as well as a significant impact on productivity growth. It is a dominant “win-win” strategy. Additional government spending on agricultural research and extension has the largest impact on agricultural productivity growth, and it also leads to large benefits for the rural poor. It is another dominant “win-win” strategy. Additional government spending on education has the third largest impact on rural poverty reduction, largely as a result of the increases in non-farm employment and rural wages that it induces.

Additional irrigation investment has only a modest impact on growth in agricultural productivity and an even smaller impact on rural poverty reduction, even after trickle down benefits have been allowed for. Additional government spending on rural and community development, including Integrated Rural Development Programs (IRDP), contributes to reductions in rural poverty, but its impact is smaller than expenditures on roads, agricultural R&D, and education. Additional government expenditures on soil and water conservation and health have no impact on productivity growth, and their poverty effects through employment generation and wage increase are also small.

The results of this study have very important policy implications. In order to reduce rural poverty, the Indian government should give priority to increasing its spending on rural roads and agricultural research and extension. These types of investment not only have large poverty impact per rupee spent, but also give the greatest growth in agricultural productivity growth. Additional government spending on irrigation and rural electrification has low productivity effects, and no discernable impact on poverty reduction. While these investments have been essential investments in the past for sustaining agricultural growth, the levels of investment stocks achieved may now be such that it may be more important to maintain those current stocks rather than to increasing them further. On the other hand, additional government spending on rural development is an effective way of helping the poor in the short-term, but since it has little impact on agricultural productivity, then it contributes little to long-term solutions to the poverty problem.

# CONTENTS

	Page
1. Introduction . . . . .	1
2. Context . . . . .	3
3. Government Expenditure, Agricultural Growth, and Rural Poverty . . . . .	7
Government Expenditure . . . . .	7
Technology, Infrastructure and Growth . . . . .	11
Technologies and Infrastructure . . . . .	11
Production and Productivity Growth . . . . .	14
Rural Employment and Wages . . . . .	17
Rural Poverty . . . . .	18
4. Conceptual Framework . . . . .	21
A Simultaneous Equations System . . . . .	22
Marginal Effects of Government Expenditures on Poverty . . . . .	28
5. Data, Model Estimation, and Results . . . . .	32
Data Sources and Measurement . . . . .	32
Model Estimation . . . . .	35
Lags and Distributions of Public Investments . . . . .	36
Estimation Results . . . . .	38
Rural Poverty Elasticities and Marginal Impact . . . . .	41
6. Conclusions . . . . .	45
References . . . . .	83

## TABLES

- Table 1: Government Expenditure in India, Million Rupees in 1960/61 Prices  
Table 2: Technology, Infrastructure, Production and Productivity in Indian Agriculture  
Table 3: Rural Wages and Employment  
Table 4: Definition of Exogenous and Endogenous Variables  
Table 5: Determinants of Rural Poverty in India: A Simultaneous Equation System  
Table 6: Poverty and Productivity Effects of Government Expenditures
- Appendix Table 1: Development Expenditures by State  
Appendix Table 2: Per Capita Development Expenditures by State  
Appendix Table 3: Percentage of Cropped Areas with High-Yielding Varieties  
Appendix Table 4: Percentage of Cropped Areas with Irrigation  
Appendix Table 5: Percentage of Electrified Villages  
Appendix Table 6: Literacy Rate of Rural Population  
Appendix Table 7: Road Density in Rural India  
Appendix Table 8: Production Growth in Indian Agriculture  
Appendix Table 9: Total Factor Productivity in Indian Agriculture  
Appendix Table 10: Rural Employment by State  
Appendix Table 11: Changes in Rural Wages by State  
Appendix Table 12: Poverty Changes by State, Head-Count Ratio  
Appendix Table 13: Population under Poverty Line by State, Thousand  
Appendix Table 14: Poor Population Concentration by State (%)

## FIGURES

Figure 1: Changes of Poverty in India

Figure 2: Composition of Government Expenditure in India

Figure 3: Current vs. Capital Expenditure (1960/61 Constant Million Rupees)

Figure 4: Technology, Infrastructure, Production and Productivity

Figure 5: Effects of Government Expenditures on Rural Poverty

Figure 6: Poverty Effects of Governmental Expenditures in Agricultural R&D

Figure 7: Poverty Effects of Governmental Expenditures in Irrigation

Figure 8: Poverty Effects of Governmental Expenditures in Roads

Figure 9: Poverty Effects of Governmental Expenditures in Education

Figure 10: Poverty Effects of Governmental Expenditures in Rural and Community  
Development

Figure 11: Poverty Effects of Governmental Expenditures in Power

Figure 12: Poverty Effects of Governmental Expenditures in Health

Figure 13: Poverty Effects of Governmental Expenditures in Soil and Water Conservation

# GOVERNMENT SPENDING, GROWTH AND POVERTY: AN ANALYSIS OF INTERLINKAGES IN RURAL INDIA

Shenggen Fan, Peter Hazell, and Sukhadeo Thorat\*

## 1. INTRODUCTION

Poverty in rural India has declined substantially in recent decades. The percentage of the rural population living below the poverty line fluctuated between 50 and 65 percent prior to the mid-1960s, but then declined steadily to about one-third of the rural population by 1990 (Figure 1). It increased again to about 40 percent of the population at the time of implementation of the policy reforms in the early 1990s, but now seems to be declining again.

The steady decline in poverty from the mid-1960s to the early 1980s was strongly associated with agricultural growth, particularly the green revolution. But the causes seem to have become more complex since then. Non-farm wages and employment now play a much larger role in reducing poverty, and these are less driven by agricultural growth than before. Further, government spending on rural poverty and employment programs has increased substantially in recent years, and this has directly benefitted the rural poor.

The primary purpose of this study is to investigate the causes of the decline in rural poverty in India, and particularly to disentangle the role that government investments

---

\* Shenggen Fan and Peter Hazell are Research Fellow and Director, respectively, Environment and Production Technology Division, International Food Policy Research Institute, Washington, D.C. Sukhadeo Thorat is Professor at Jawaharlal Nehru University, New Delhi. They are also grateful for Benoit Blarel for his comments and suggestions.

have played. Government spending can have direct and indirect effects on poverty. The direct effects arise in the form of benefits the poor receive from expenditures on employment and welfare programs. The indirect effects arise when government investments in rural infrastructure, agricultural research, and the 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. We seek to quantify the effectiveness of different types of government expenditures in contributing to poverty alleviation. Such information can assist policy makers in targeting their investments more effectively to reduce poverty. More efficient targeting has become increasingly important in an era of macroeconomic reforms in which the government is under pressure to reduce its total budget. We shall formulate and estimate an econometric model that permits calculation of the number of poor people raised above the poverty line for each additional million rupees spent on different expenditure items.

But targeting government expenditures simply to reduce poverty is not sufficient. Government expenditures also need to stimulate economic growth. This is needed to help generate the resources needed for future government expenditures. It is also the only sure way of providing a permanent solution to the poverty problem, as well as to increase the overall welfare of rural people. Our model is therefore formulated so as to measure the growth as well as the poverty impact of different items of government expenditure. This enables us not only to rank different types of investment in terms of their growth and poverty impacts, but also to quantify any tradeoffs or complementarities that may arise between the achievement of these two goals.



## 2. CONTEXT

There is a large literature on the trends and determinants of rural poverty in India. The wide fluctuations in the incidence of rural poverty that occurred during the 1950s and early 1960s (Figure 1) understandably led to considerable controversy about both the direction of change in rural poverty and the causal factors. Researchers obtained quite different trend results depending on the period they chose for their analysis, and particularly the beginning and end points used for comparison (Bardhan 1973; Vaidyanathan 1974; Ahluwalia 1978; Gaiha 1989; Ghose 1989; Griffin and Ghose 1979; Saith 1981). But once the incidence of rural poverty began its trend decline in the mid-1960s, a greater consensus began to emerge in the literature (Ghose 1989; Ravallion and Datt 1995; Ninan 1994).

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 agricultural growth trickles down to 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. Some economists, inspired by the late Dharm Narain, realized that prices of commodities consumed by the rural poor are also a very important factor in explaining changes in rural poverty (Saith 1981; Ahluwalia 1985; Srinivasan 1985; Ghose 1989; Gaiha 1989; Bell and Rich 1994). The role of the labor market in transmitting the benefits of technical change and government employment

programs to the rural poor was only recognized recently (Ravallion and Datt 1994; Sen 1997). Despite the large literature, little attention has previously been paid to the role of government spending in alleviating poverty.

The lack of progress in reducing rural poverty during the 1950s and 1960s is generally attributed to stagnation in the growth of per capita agricultural output (Ahluwalia 1978, 1985). However, this changed dramatically in the late 1960s with the spread of the green revolution, leading to a sharp increase in the rate of agricultural growth. The incidence of rural poverty declined markedly in those regions that most benefitted from the green revolution.

Interestingly, the incidence of rural poverty has also declined in many states that did not benefit so much from the green revolution, particularly in the 1980s (Sen 1997; Tendulkar et al. 1990). It also continued to decline at the national level even after the agricultural growth rate slowed.

The significant feature of this later period, however, is that the agricultural wage rate, which had been stagnant until the mid-1970s, subsequently increased sharply in most parts of India, and appears to have been a major factor (or a significant explanation) in the decline in rural poverty (Tendulkar et al. 1995; Sen 1997; Mukerjee 1996; Ravallion and Datt 1995). While much recent research recognizes this rise in real wages, explanations vary. Some attribute this rise to yield growth in agriculture (Ravallion and Datt 1995). Others argue that the increase in the real wage rate during this period far outstripped any increase in agricultural labor productivity. In fact, after the mid-1970s, real wages went up everywhere, even in states where agricultural labor productivity had been declining for

some time (Bhalla 1997). It has been argued that the increase in the real wage in agriculture arose mainly from an increase in the share of the work force employed in non-agricultural activities (Mukherjee 1996; Sen 1997).

Since there is a weak relationship between agricultural growth and the growth of rural non-farm activity in many parts of the country (it is much more significant in agriculturally advanced regions such as Punjab and Hariyana (Hazell and Haggblade 1991), several researchers have suggested that the reason for the expansion of rural non-farm employment lies in an accompanying expansion in government expenditures (Sen 1997; Visaria and Basant 1994). According to these authors, government expenditure has been crucial not only in generating agricultural growth through the creation of capital assets and rural infrastructure, but has also directly created employment in rural areas by providing government jobs, particularly for the implementation of targeted employment and welfare schemes. In fact, the 1970s was marked by an important shift in state policy towards the poor, and included a burst of poverty-oriented programs that sought to improve their assets, create employment and increase their access to basic needs.

In sum, researchers seeking explanations for the decline in rural poverty after the mid-1960s have emphasized agricultural growth and price changes as the important determinants. But these factors are not sufficient to explain much of the observed changes in poverty across states and over time since the late-1970s. Growth in the rural non-farm economy and government poverty alleviation and employment programs have also become important. Government expenditure has not only contributed to agricultural growth and hence indirectly to poverty alleviation, but it has directly created rural non-

farm jobs and increased wages. The real significance of government development expenditure lies in the fact that it imparts a greater amount of “trickle down” benefits for the poor in the growth process than agricultural growth alone. Unlike agricultural growth, which often reduces poverty only by increasing mean consumption, government expenditure reduces poverty by increasing both mean income and improving the distribution of income (Sen 1997).

Another significant feature in the literature on rural poverty in India is that most of the previous studies have used a single equation approach (Ahluwalia 1978; Saith 1981; Gaiha 1989; Ravallion and Datt 1995; Datt and Ravallion 1997). There are at least two disadvantages with this approach. First, many poverty determinants such as income, production or productivity growth, prices, wages and non-farm employment are generated from the same economic process as rural poverty. In other words, these variables are also endogenous variables, and ignoring this characteristic leads to biased estimates of the poverty effects (van de Walle 1985; Bell and Rich 1994). Second, certain economic variables affect poverty through multiple channels. For example, improved rural infrastructure will not only reduce rural poverty through improved agricultural productivity, but also affect rural poverty through improved wages and non-farm employment. It is very difficult to capture these different effects in a single equation approach.

Building on previous studies of the determinants of rural poverty in India, this study develops a simultaneous equations model to estimate the various direct and indirect effects of government expenditures on productivity and poverty. Such information can be

especially helpful to policy makers who wish to more efficiently target government expenditures to benefit the poor.

### **3. GOVERNMENT EXPENDITURE, AGRICULTURAL GROWTH, AND RURAL POVERTY**

#### **GOVERNMENT EXPENDITURE**

Total government expenditure in India is divided into non-development and development spending, and the latter is further sub-divided into spending on social and economic services.<sup>1</sup> Social services include health, labor, and other community services, while economic services include sectors like agriculture, industry, trade, and transportation.

Most public development expenditure on agriculture and rural development is undertaken by the state governments in India. This includes expenditures financed from the states' own revenues, but even the Central Government's expenditure on agriculture and rural development is largely channeled through the state governments. In 1995/96, for example, direct spending by the Central Government on agriculture and rural development was only about 30 percent of the total, and the bulk of this was for fertilizer and other subsidies that are non-productive. Since we are primarily interested in productive investments in this paper, we rely entirely on state level expenditure data. Small omissions arise because part of total agricultural research expenditure remains

---

<sup>1</sup> India was the largest public spender on agriculture in 1993 among all Asian countries, and its expenditure was 16 percent higher than those of the Chinese government (Fan and Pardey 1997).

within national institutions, and because part of the total investment in transportation and communications does not pass through the state accounts. We try to allow for these omissions in interpreting our results.

Total state government expenditure has grown substantially in recent decades (Table 1); in fact there was a fivefold increase in real terms between the early 1970s and the early 1990s. But the rate of increase is now slowing. It grew at about 8 percent per year during the 1970s and 1980s, but declined to 3.14 percent in the early 1990s.

Development expenditure has followed a similar pattern, though the recent drop in the rate of increase is more dramatic; from 13 percent in the 1970s, to 7 percent in the 1980s to only 1 percent in the early 1990s. Within development expenditure, social services expenditure grew the least in the 1990s (only 0.42 percent per annum, compared with about 9 percent in the 1970s and 1980s).

The expenditure items that grew most rapidly over the period 1970-93 were welfare and rural development. The growth in rural development expenditure (consisting of wage employment schemes and integrated rural development programs) has been particularly rapid, and it is the one item that continued to grow at a respectable 5.1 percent per year even during the early 1990s.

In terms of composition of state government spending, development expenditure accounted for 75 percent of total government expenditure in 1993, and the remaining 25 percent went to non-development expenditure. Social and economic services accounted for 47 percent and 53 percent of total development expenditure, respectively (or 35 percent and 40 percent of total government expenditure in rural areas), as shown in Figure 2.

Among social service expenditures, education accounted for 52 percent, health for 16 percent, and welfare of scheduled castes and tribes for 7 percent. Among five major components of economic services, the agricultural sector accounted for 20 percent, the irrigation sector for 22 percent, transportation and communication for 11 percent, the power sector for 17 percent, and rural development programs for 16 percent.

Since 1980, agriculture's share in total expenditure on economic services has declined from 30 percent to 20 percent, and irrigation's share has also declined. In contrast, expenditure on rural development programs has expanded from 6.3 to 16.4 percent of total economic services, causing some concern that resources have been reallocated away from productivity enhancing investments to those that have a much smaller impact on agricultural productivity and growth.

Disaggregating government expenditure into its current and capital accounts reveals that almost all the increase in total expenditure since 1970 has been due to rapid growth in the current account (Figure 3). Capital account expenditure has remained flat since 1970 when measured in 1960/61 prices. The majority of the expenditure on social services has also been under the current account. While expenditures from the current and capital accounts for economic services were equally important between 1970 and 1982, expenditures from the current account more than doubled between 1982 and 1993 while expenditures from the capital account remained flat.

For irrigation expenditure, both the capital and current accounts have kept pace with each other since 1970. But for agriculture, more than 95 percent of expenditure (which includes agricultural R&D, extension, and other productivity increasing

programs), has been from the current account. Similarly, government expenditure for rural and community development was also mainly from the current account. On the other hand, expenditure on power was mainly from the capital account until 1990, but has since shifted to the current account. By 1993, more than one-third of the expenditure on power came from the current account.

The rapid expansion of current expenditure across all expenditure items raises questions about the efficiency of government expenditures. However, whether this disturbing trend is caused by changes in the accounting system or by policy changes towards shorter term spending programs, is not clear.

There exist large regional variations in government expenditure. This can be illustrated by the patterns of expenditure on development activities related to agricultural growth and rural poverty reduction. Among all states, Maharashtra has always had the largest development expenditure, followed by Andhra Pradesh, Uttar Pradesh and Tamil Nadu (Appendix Table 1). Among the 17 states studied here, Himachal Pradesh and Jammu & Kashmir have had the smallest development expenditure.

In per capita terms, poorer states like Bihar, Assam, Madhya Pradesh, Orissa, Uttar Pradesh, and West Bengal spend much less compared to advanced states like Punjab, Haryana, Maharashtra, Gujarat, and Tamil Nadu (Appendix Table 2). The difference between these two groups is large. For example, on a per capita basis, Maharashtra spent 3.8 times more than Bihar in 1993. Not surprisingly, Bihar is also the state that has the highest incidence of poverty.



## TECHNOLOGY, INFRASTRUCTURE AND GROWTH

The introduction of new technologies, improved infrastructure (roads and electrification) and education have all contributed to agricultural growth in India. This section analyzes these developments, and provides a basis for the analysis in later sections on how these government investments have reduced rural poverty indirectly through improved agricultural productivity.

### *Technologies and Infrastructure*

One of the most significant changes in Indian agriculture in recent decades has been the widespread adoption of high-yielding varieties. During the green revolution of the 1970s, the crop area planted to high-yielding varieties (HYVs) for five major crops (rice, wheat, maize, sorghum, and pearl millet) increased from less than 21 percent to 41 percent (Table 2).<sup>2</sup> Even after the green revolution, the percentage of the crop area planted with HYVs continued to increase. It reached 53 percent by 1990, and 60 percent of the crop area by 1995. This has been one of the major engines of productivity growth in Indian agriculture. However, there have been substantial regional differences. The low poverty states have generally out-performed other states in HYV adoption (Appendix Table 3). In 1970, the adoption rate of HYVs in Punjab was already high at 56 percent, and it increased to 78 percent by 1979, and to more than 90 percent of the crop area by

---

<sup>2</sup> High-yielding varieties (also referred to as modern varieties) are those released by the Indian national agricultural research system and the international agricultural research centers. The yields of these varieties are usually substantially higher than those of traditional varieties.

the mid-1980s. In Andhra Pradesh, where the adoption rate of HYVs was only 12 percent in 1970, more than 60 percent of the crop areas in the state was planted with HYVs by the mid-1980, and more than 86 percent by 1995. But in high poverty states such as Bihar and Orissa, 60 percent of total crop area was still planted with traditional varieties, even in 1995. Although many factors may contribute to rural poverty, the lower rate of technology adoption in these states is definitely correlated with high rural poverty.

Irrigation, another important factor in Indian agriculture, has also increased dramatically, but with considerable regional variation. For all India, the percentage of the cropped area that is irrigated increased from 23 percent in 1970 to 31 percent in 1985 (Table 2). But the increase has been only marginal in more recent years. In the last 10 years, the percentage area irrigated increased by only 2 percentage points. As with the adoption of HYVs, there seems to be a strong correlation between poverty and extent of irrigation among states. In Punjab, more than 90 percent of the gross cropped area is irrigated (Appendix Table 4). Similarly in Haryana, almost 80 percent of the total cropped area is irrigated. On the other hand, in high poverty states such as Orissa, Assam, and Madhya Pradesh, irrigation has increased very little in recent decades, and they are still the least irrigated states. Since HYVs respond well to irrigation and high rates of fertilizer usage, lack of irrigation facilities in these states has hindered more widespread adoption and effectiveness of HYVs.

One of the greatest achievements in the development of rural India has been the rapid increase of electrification. In 1970, only 34 percent of the villages in rural India had access to electricity. But in 1995, this percentage had increased to almost 90 percent

(Table 2). This rapid increase in electrification not only contributed to agricultural productivity growth through encouraging more irrigation, but also contributed to reductions in rural poverty through the generation of nonagricultural employment opportunities. Among all states, Bihar has the lowest electrification rate (Appendix Table 5). Even in 1995, more than 34 percent of the villages in that state still did not have access to electricity. Similarly, in West Bengal and Uttar Pradesh, more than 20 percent of the villages were still not electrified in 1995. While in Punjab, Haryana, Karnataka, Kerala, and Himachal Pradesh, all the villages in these states have access to electricity.

For the country as a whole, the literacy rate in rural India has increased steadily from 23 percent in 1970 to 40 percent in 1995, but with great regional variation (Table 2). In Bihar and Rajasthan, more than 70 percent of the rural population was still illiterate in 1995, while more than 50 percent of the rural population had the ability to read and write in Kerala, Himachal Pradesh, and West Bengal (Appendix Table 6). Surprisingly, the literacy rate in some well developed states such as Andhra Pradesh and Haryana remains below the national average.

Road density in rural India, measured as the length of roads in kilometers per thousand square kilometers of geographic area, increased from 2,414 in 1970 to 5,196 in 1995; a growth rate of over 3 percent a year (Table 2). Surprisingly, the road density in rural areas is highest in some of the poorer states, such as Tamil Nadu and Orissa (Appendix Table 7).

### *Production and Productivity Growth*

As a result of rapid adoption of new technologies and improved rural infrastructure, agricultural production and factor productivity have both grown rapidly in India. Five major crops (rice, wheat, sorghum, pearl millet, and maize), 14 minor crops (barley, cotton, groundnut, other grain, other pulses, potato, rapeseed, mustard, sesame, sugar, tobacco, soybeans, jute, and sunflower), and three major livestock products (milk, meat, and chicken) are included in our measure of total production. Unlike traditional measures of production growth which use constant output prices, we use the more appropriate Tornqvist-Theil index (a discrete approximation to the Divisia index).<sup>3</sup> As Richter (1966) has shown, the Divisia index is desirable because of its invariance property: if nothing real has changed (e.g., the only input quantity changes involve movements along an unchanged isoquant) then the index itself is unchanged (Alston, Pardey, and Norton 1995). The formula for the index of aggregate production is:

$$\ln YI_t = \sum_i 1/2 * (S_{i,t} + S_{i,t-1}) * \ln(Y_{i,t} / Y_{i,t-1}), \quad (1)$$

where  $\ln YI_t$  is the log of the production index at time  $t$ ,  $S_{i,t}$  and  $S_{i,t-1}$  are output  $i$ 's share in total production value at time  $t$  and  $t-1$ , respectively; and  $Y_{i,t}$  and  $Y_{i,t-1}$  are quantities of output  $i$  at time  $t$  and  $t-1$ , respectively. Farm prices are used to calculate the weights of each crop in the value of total production.

---

<sup>3</sup> Using the case of China, Fan (1997) has shown the bias is potentially large when constant prices are used in the aggregation of output.

For all India, agricultural production grew at 2.11 percent per annum between 1970 and 1995 (Table 2). In the 1970s, production growth was comparatively low, growing at an average annual rate of only 1.98 percent. In the 1980s, it grew at 3.82 percent per annum, a much higher growth rate than most other countries achieved during the same period. Since 1990, production growth has slowed, growing at only 2.10 percent per annum. Agricultural production grew slowly in the high-poverty states like Bihar and Assam, but much faster in the low-poverty states like Punjab, Andhra Pradesh, and Karnataka (Appendix Table 8).

To gain richer insights into the sources and efficiency of agricultural production growth, a “total” factor productivity index was calculated. Total factor productivity is defined as aggregate output minus aggregated inputs. Again, a Tornqvist-Theil index is used to aggregate both inputs and outputs. Specifically,

$$\ln TFP_t = \sum_i 1/2 * (S_{i,t} + S_{i,t-1}) * \ln(Y_{i,t} / Y_{i,t-1}) - \sum_i 1/2 * (W_{i,t} + W_{i,t-1}) * \ln(X_{i,t} / X_{i,t-1}) \quad (2)$$

where  $\ln TFP_t$  is the log of the total factor productivity index;  $W_{i,t}$  and  $W_{i,t-1}$  are cost shares of input  $I$  in total cost at time  $t$  and  $t-1$ , respectively; and  $X_{i,t}$  and  $X_{i,t-1}$  are quantities of input  $I$  at time  $t$  and  $t-1$ , respectively. Five inputs (labor, land, fertilizer, tractors and buffalos) are included. Labor input is measured as the total number of male and female workers employed in agriculture at the end of each year; land is measured as gross cropped area; fertilizer input is measured as the total amount of nitrogen, phosphate, and potassium used; tractor input is measured as the number of four-wheel tractors; and bullock input is measured as the number of adult bullocks. The wage rate for agricultural

labor is used as the price of labor; rental rates of tractors and bullocks are used for their respective prices; and the fertilizer price is calculated as a weighted average of the prices of nitrogen, phosphate, and potassium. The land price is measured as the residual of total revenue net of measured costs for labor, fertilizer, tractors, and bullocks.<sup>4</sup>

Total factor productivity for India grew at an average annual rate of 0.69 percent between 1970 and 1995 (Table 2). In the 1970s, total factor productivity improved rapidly, growing at 1.44 percent per annum. It grew even faster in the 1980s, at 1.99 percent per annum. But since 1990, total factor productivity growth in Indian agriculture has actually declined, by 0.59 percent per annum. This indicates that the growth in agricultural output achieved since 1990 has been achieved simply by using more inputs, and that the marginal productivity of those inputs is now declining. If this worrying new trend in total factor productivity continues, India will have major difficulties sustaining future agricultural growth, and will become less competitive in world agricultural markets.

For the whole period 1970 to 1994, J&K, West Bengal, Punjab, and Hariyana had the highest growth rates in total factor productivity, while in Gujarat, Assam, and Ranjastan, total factor productivity declined during this period (Appendix Table 9). The correlation between productivity growth and poverty reduction is stronger than that between production growth and poverty reduction, suggesting that productivity growth may be the more important variable to use for explaining poverty.

---

<sup>4</sup> This approach implicitly assumes that there is a perfect land rental market. If the residual is negative, the average shares of the zone where the district is located are used for aggregation.

## RURAL EMPLOYMENT AND WAGES

Rural employment in India has undergone several significant changes since the 1970s. Total rural employment grew very little in the 1970s, and even declined in the 1980s (Table 3). But since 1987, total employment in rural India has been growing at almost 2 percent per annum. Nonagricultural employment has grown faster than agricultural employment, and growth in nonagricultural employment has even accelerated in recent years. In the 1990s, it grew at 2.59 percent per annum compared with 1.17 per annum in the 1970s, and 1.79 percent per annum in the 1980s.

As a percentage of total rural employment, nonagricultural employment increased from 19 percent in 1970 to 26 percent in 1993 (Table 3). The biggest increase in this share occurred in the 1980s. Government investment in roads, power, and rural development may have contributed to this rapid increase as we will analyze later. Rural development investment is specifically targeted by the government to alleviate rural poverty by generating rural employment.

Rural wages in real terms have increased faster than both agricultural and nonagricultural employment; they grew at an average annual rate of 2.16 percent between 1970 and 1993 (Table 3). As with nonagricultural employment, the most rapid increase was in the 1980s when wages increased by almost 5 percent per year. Again, government investment in rural infrastructure and rural development may have contributed to this rapid growth.

The level and structure of employment and wages seem to have moved together since the early 1970s, but in a peculiar manner. First, there is a clear contrast between the

pre- and post-1987 situation. Agricultural employment actually declined between 1970 and 1987, while non-farm employment grew at an increasing rate. The increase in non-farm employment coincides with a steady increase in rural wages since the early 1970s. Thus we have reason to believe that rural poverty declined during 1972-1987 largely due to increases in rural wages, which in turn were induced by the expansion of rural non-farm employment.

Agricultural and nonagricultural employment grew at increasing rates in the early 1990s, while the growth in rural wage rates slowed down (Table 3). The increase in rural poverty associated with the introduction of the policy reforms may have induced workers to accept lower productivity jobs.

State-level data reveal that in poor states such as Bihar, Orissa, and Uttar Pradesh, not only is nonagricultural employment less important in total rural employment, but its growth rate is the lowest among all states (Appendix Table 10).

## RURAL POVERTY

Figure 1 shows the changes in rural poverty since 1951 measured as the head-count ratio. The head-count ratio is the percentage of the rural population falling below the poverty line, defined as Rs 49 of income per month at 1973/74 prices. Rural poverty fluctuated between 50 and 65 percent in the 1950s and early 1960s, before beginning a steady decline from the mid-1960s until the late 1980s. It declined from about two-thirds to one-third of the rural population. It increased again to about 40 percent in the early 1990s, at the time of implementation of the policy reforms, but declined again in 1993, the last year for which we have data.



The long downward trend in rural poverty from 1967 to 1989 coincided with several important factors. As already discussed, the rapid adoption of HYVs together with improved irrigation increased agricultural production and productivity growth sharply during this period. This change in technology was a direct result of increased government investment in agricultural research and extension, infrastructure, irrigation, and education during the 1960s, 1970s, and 1980s. The increase in government investment also improved nonagricultural employment opportunities and wages, contributing directly to further reductions in rural poverty. The stagnation in agricultural productivity growth and the increase in rural poverty observed in the early 1990s may have resulted from reduced government investment in rural areas during this period.

State-level data reveal wide variations in the level and change in the incidence of rural poverty (Appendix Table 12). The poverty ratio declined in all states except Assam between 1957 and 1993. The poverty ratios declined at relatively higher rates per annum in Andhra Pradesh, Tamil Nadu, Punjab, Kerala, West Bengal, and Maharashtra, and at lower rates in Bihar, Rajasthan, and Haryana.

All states but Assam and J&K achieved reductions in rural poverty between the mid-1960s and the late 1980s when farmers adopted HYVs. Poverty fell to below 20 percent in Punjab and Haryana, but remained close to 50 percent in Bihar, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu and Rajasthan. Most states experienced an increase in poverty after 1990. For example, in Orissa, the poverty ratio increased from 27 percent in 1990 to 40 percent in 1993. Even in Punjab, the rural poverty ratio increased from 19 percent to 25 percent. However, West Bengal, one of the states with

the highest incidence of poverty in the early 1970s, had one of the lowest in 1993. West Bengal has also achieved the most rapid growth in total factor productivity in agriculture since 1970.

Given the observed diversity in the rates of poverty alleviation across states, it is important to ask whether there is a relationship between the rates of change and the initial levels of poverty. Does poverty go down faster in those states that had less poverty to begin with, or in those states that had higher initial poverty levels? To answer this question we calculated correlation coefficients across the 14 states between the head count ratios and the annual rates of change in poverty.

The correlations indicate that the relationship between the level of poverty in 1957 and the percentage change in the level of poverty during 1957-60 was negative and significant. This means that the biggest reductions in rural poverty occurred in the poorest states. But in the 1960s, the relationship was reversed. The correlation was positive (0.789) and significant, which shows that the annual rate of decline in poverty tends to be greatest in those states that had the lowest poverty ratio in 1960. In the 1970s, the correlation between the initial level of poverty and the percentage change in poverty was positive, but it was weak and insignificant (0.351). It is interesting to note that this relationship changed again during 1983-1990, and poverty fell fastest in those states that had the highest poverty rates in 1983.

Another important issue is whether the decline in rural poverty was sufficient to reduce the absolute number of persons falling below the poverty line. At the all-India level, the absolute number of poor people increased from 177 million in 1960 to 278 in

1993, a net increase of 101 million persons (equivalent to an annual rate of increase of 1.38). Most of the states experienced a net increase in the size of their poor population (Appendix Table 13). The only exceptions were Andhra Pradesh, Kerala, and Tamil Nadu. In Bihar, the number of poor people under the poverty was 20 million in 1960, but increased to 51.5 million in 1993; a growth of 2.89 percent per annum. Uttar Pradesh also experienced rapid growth in the number of poor people; from 25.6 million in 1960 to 50.1 million in 1993, (equivalent to an annual growth rate of 1.94 percent per annum).

Another related feature of rural poverty in India is its continuing concentration in some regions. Two states, Bihar and Uttar Pradesh, accounted for 26 percent of the total rural poor in 1960, but this share had increased to 36.5 percent in 1993 (Appendix Table 14). Andhra Pradesh and Tamil Nadu have reduced their shares of poor people in the national total.

#### **4. CONCEPTUAL FRAMEWORK**

Most previous studies on the determinants of rural poverty in India have used a single equation approach, and have tried to explain rural poverty as a function of explanatory variables like agricultural production, wages and the price of food. The conceptual framework we propose for our analysis is a simultaneous equations system in which many economic variables are endogenous, and their direct and indirect interactions are explicitly considered in the model.

## A SIMULTANEOUS EQUATIONS SYSTEM

The conceptual framework for the model is portrayed in figure 5, and the formal structure of the system is given in equations 3 to 13.

Equation (3) models the determinants of rural poverty ( $P$ ).<sup>5</sup> They include growth in total factor productivity in agricultural production ( $TFP$ ), changes in the percentage of landless households in total households ( $LANDN$ ), changes in agricultural wages ( $WAGES$ ) and the terms of trade ( $TT$ ), changes in nonagricultural employment ( $NAGEMPLY$ ), growth in rural population ( $POP$ ), changes in annual rainfall and a time trend variable. Total factor productivity rather than agricultural income is used because we want to capture the impact on rural poverty of technology driven shifts in the production function rather than simply increased input use. Some economists, such as Datt and Ravillion (1997), used output per hectare (land productivity) as a proxy for agricultural performance or to represent changes in agricultural technology. But changes in land productivity do not necessarily imply technical change because farmers can simply use more inputs on a per hectare basis to increase land productivity. Wages are the second most important sources of income after agricultural production for rural residents in India. Income from wages can derive from both agricultural and

---

<sup>5</sup> All variables without subscripts indicate observations in year  $t$  at the state level. For presentation reason, we omit the subscript. The variables with subscript “ $-1, \dots, -j$ ” indicate observations in year  $t-1, \dots, t-j$ .

$$P = f(TFP, WAGE, NAGEMPLY, TT, LANDN, POP, RAIN, T) \quad (3)$$

$$TFP = f(RDE, RDE_{&1}, \dots, RDE_{&i}, IR, LITE, ROADS, RAIN, T) \quad (4)$$

$$WAGE = f(TFP, ROADS, LITE, HELE, HELE_{&1}, \dots, HELE_{&l}, T) \quad (5)$$

$$NAGEMPLY = f(GERDEV, ROADS, LITE, GCSSL, PVELE, T) \quad (6)$$

$$PUIR = f(IRE, IRE_{&1}, \dots, IRE_{&j}, PVELE, ATT, T) \quad (7)$$

$$PRIR = f(PUIR, PVELE, ATT, T) \quad (8)$$

$$ROADS = f(ROADE_{&1}, \dots, ROADE_{&k}, T) \quad (9)$$

$$LITE = f(EDE, EDE_{&1}, \dots, EDE_{&m}, T) \quad (10)$$

$$PUELE = f(PWRE, PWRE_{&1}, \dots, EDE_{&m}, T) \quad (11)$$

$$LANDN = f(TFP, T) \quad (12)$$

$$TT = f(TFP, TFPn, WAPI, T) \quad (13)$$

nonagricultural sources. The terms of trade variable measures the impact of changes in agricultural prices relative to nonagricultural prices on rural poverty.<sup>6</sup> It is hypothesized that in the short run, the poor may suffer from higher agricultural prices because they are usually net buyers of foodgrains. Population growth also affects rural poverty since higher growth in population may increase rural poverty if there is insufficient growth in rural employment. This is particularly important for a country like India where resources are limited, and the population base is large. The percentage of landless households is included in the equation to measure the potential impact of access to land on rural poverty. Rainfall is included to capture the direct effects of variations in agricultural production on the poor, particularly the effects of drought. The time trend variable should capture the effects of other variables that are not included in the equation.

Equation (4) models the determination of total factor productivity growth in agriculture. The TFP growth index is the ratio of an aggregated output index to an aggregated input index (see equation (2)).<sup>7</sup> We included the following variables in the equation: current and lagged government spending on agricultural research and extension

---

<sup>6</sup> Instead of using the inflation rate in rural areas (Saith 1981; Ahluwalia 1985; Bell and Rich 1994; Datt and Ravallion 1997), we use the terms of trade (agricultural prices relative to nonagricultural prices). The reason is that increases in agricultural prices may have even greater impact than the general price index on rural poor since they are usually net buyers of agricultural products.

<sup>7</sup> Another advantage of using TFP growth instead of production growth is that the TFP function has significantly fewer independent variables than the production function. The production function includes input variables like labor, land, fertilizer, machinery, and draft animals as independent variables in addition to those variables included in the TFP function. Fewer independent variables in the TFP function will help reduce potential multicollinearity problem in the estimation, and help increase the reliability of the estimated coefficients.

( $RDE$ ,  $RDE_{-1}$ , ...,  $RD_{-1}$ ), the percentage of irrigated cropped area in total cropped area ( $IR$ ), the literacy rate of the rural population ( $LITE$ ), road density ( $ROADS$ ), annual rainfall ( $RAIN$ ), and a time trend.<sup>8</sup> The first four variables should capture the productivity enhancing effects of technologies, infrastructure, and education, while the last two variables should capture the impact of rainfall and other omitted variables on growth in total factor productivity. In our initial estimation, we attempted to separate out the differential impacts of public and private irrigation in the equation, but these two variables are too highly correlated. Instead, we use the percentage of cropped area under both private and public irrigation in the final specification. Government investments in soil and water conservation ( $GCSSL$ ) were also included in earlier versions of the equation, but since the estimated coefficient was not statistically significant and its sign was very sensitive to the model specification, we decided to drop the variable in the final model.

Equation (5) is a wage determination function. Agricultural wages are determined by growth in total factor productivity, roads, literacy, health and time trend. The impact of improved roads on wages is often ignored in specifying wage determination equations. Ignoring this effect is likely to lead to underestimation of the impact of government spending on poverty, since wage increases induced by improved rural roads can be

---

<sup>8</sup> The expenditure in the current year is included because some government expenditure on extension may affect current production growth. This is also true for other expenditures such as those on roads, irrigation, power, and education.

potentially large, benefitting workers in agricultural and nonagricultural activities. Since data on the health condition of the rural population are not available, we use current and past government expenditures on health as independent variables in the wage equation.

Equation (6) determines nonagricultural employment. It is modeled as a function of rural roads, electrification and education, government expenditures on rural development programs and soil and water conservation, and a time trend. Improved roads should help farmers to set up small non-farm businesses and to market their products. Improved roads and education also help farmers to find jobs in towns. Government programs in rural development such as the Integrated Rural Development Programs (IRDP) and Rural Employment Schemes are designed to alleviate rural poverty by the government to generate nonagricultural and wage employment opportunities for rural laborers. Government spending on soil and water conservation is also often used by the government to generate wage employment for farmers, particularly in drought years.

Equation (7) models the relationship between government investment in irrigation and the percentage of the cropped area under canal irrigation. Since nearly all canal irrigation results from government investment, we use the cropped area under canal irrigation as a proxy for public irrigation. Included in the equation are variables that represent current and past government spending on irrigation ( $IRE$ ,  $IRE_{-1}, \dots, IRE_{-j}$ ), the extent of rural electrification (the percentage of villages that have been electrified), a lagged terms of trade variable ( $ATT$ ),<sup>9</sup> and time trend.

---

<sup>9</sup> To test whether there is any difference in the impact of between current and capital account expenditure, we included both a capital stock variable (using seven years lag) and a current expenditure variable for irrigation in equation (8). The results revealed



Equation (8) models the determinants of private irrigation. It is hypothesized that canal irrigation supported by government is often a precursor to private irrigation, because it increases the economic returns to investments in wells and pump sets (e.g., by raising the groundwater level). Private irrigation is defined as the percentage of the cropped area under wells, tube wells, and tanks which are mostly the result of farmers' private initiatives. Other determinants of private irrigation investment in equation (8) are rural electrification, the terms of trade, and time trend.

Equations (9), (10) and (11) model the relationships between lagged government expenditures on roads, education and rural electrification and the available stock of these variables. In equation (9), the stock of roads (measured in density form) is specified as a lagged function of government expenditures on roads ( $ROADE, ROADE_{-1}, \dots, ROADE_{-k}$ ) and time trend T. Similarly, the literacy rate at any point in time is a lagged function of past government spending on education ( $EDU, EDU_{-1}, \dots, EDU_{-m}$ ) and time T (equation (10)), and the percentage of villages that are electrified depends on past government spending on power ( $PWRE, PWRE_{-1}, \dots, PWRE_{-n}$ ) and time (equation (11)).

Equation (12) models the effect of productivity growth on access to land (measured as the incidence of landlessness). It has often been argued that improved productivity due

---

that capital expenditure has a significant and positive effect on the percentage of irrigation, but the current expenditure has a small, negative, but statistically insignificant impact on the percentage of irrigation. This seems to indicate that government may have overspent on the current account and underspent on the capital account. But further study is needed to clarify the exact definition of these two accounts. Similar tests could not be done for government expenditure on roads, education, agricultural R&D, rural development, welfare of scheduled castes and tribes and other backward classes, because these government expenditures are mainly from the current account.

to technological change and infrastructure improvements has worsened equity problems in rural areas. Endogenizing access to land in the model should capture these effects.

Equation (13) determines the terms of trade. Growth in total factor productivity in the state and at the national level (TFP<sub>n</sub>) increases the aggregate supply of agricultural products, and therefore reduces agricultural prices. Lower prices will help the poor if they are net buyers of grains. The inclusion of national TFP growth will help to reduce any upward bias in the estimation of the poverty alleviation effects of government spending within each state, since TFP growth in other states will also contribute to lower food prices through the national market. A world price index of rice, wheat and corn prices is also included in the equation to capture the impact of international markets on domestic agricultural prices. We also included some demand side variables in an earlier version of the equation, such as population and income growth, but they were not significant and have been dropped from the equation. Part of the effects of these omitted variables is captured by the time trend variable.

#### MARGINAL EFFECTS OF GOVERNMENT EXPENDITURES ON POVERTY

By differentiating equations (3) to (13), we can derive the marginal impact and elasticities of different types of government expenditures on rural poverty.

The impact of government investment in agricultural research and development in year  $t-1$  on poverty at year  $t$  can be derived as:

$$\begin{aligned}
dP/dRDE_{.i} = & \\
& (MP/MTFP)(MTFP/MRDE_{.j})+ \\
& (MP/MWAGES)(MWAGES/MTFP)(MTFP/MRDE_{.j})+ \\
& (MP/LANDN)(MLANDN/MTFP)(MTFP/MRDE_{.j})+ \\
& (MP/MTT)(MTT/MTFP)(MTFP/MRDE_{.j}).
\end{aligned} \tag{14}$$

The first term on the right hand side of equation (14) captures the impact on poverty of government investments in R&D through yield enhancing technologies such as improved varieties, and therefore total factor productivity. Increased total factor productivity also affects poverty through changes in wages, access to land, and relative prices, which are captured in the remaining terms of the right hand of the equation. By aggregating the total effects of all past government expenditures over the lag period, the sum of marginal effects is obtained for any particular year.

The impact of government investment in irrigation in year  $t-j$  on poverty in year  $t$  is derived as:<sup>10</sup>

$$\begin{aligned}
dP/dIRE_{.j} = & \\
& (MP/MTFP)(MTFP/MIR)(MPUIR/MIRE_{.j})+ \\
& (MP/MWAGES)(MWAGES/MTFP)(MTFP/MIR)(MPUIR/MIRE_{.j})+ \\
& (MP/LANDN)(MLANDN/MTFP)(MTFP/MIR)(MPUIR/MIRE_{.j})+ \\
& (MP/MTT)(MTT/MTFP)(MTFP)(MTFP/MIR)(MPUIR/MIRE_{.j})+ \\
& (MP/MTFP)(MTFP/MIR)(MPRIR/MPUIR)(MPUIR/MIRE_{.j})+ \\
& (MP/MWAGES)(MWAGES/MTFP)(MTFP/MIR)(MPRIR/MPUIR)(MPUIR/MIRE_{.j})+ \\
& (MP/LANDN)(MLANDN/MTFP)(MTFP/MIR)(MPRIR/MPUIR)(MPUIR/MIRE_{.j})+ \\
& (MP/MTT)(MTT/MTFP)(MTFP)(MTFP/MIR)(MPRIR/MPUIR)(MPUIR/MIRE_{.j}).
\end{aligned} \tag{15}$$

As with government investments in agricultural R&D, the impact of government investments in irrigation is captured through improved productivity, wages, access to

---

<sup>10</sup> We assume that both private and public irrigation have the same impact on productivity growth which is calculated through equation (4).

land, and relative prices (terms 1-4 of equation (15)). But government irrigation also affects private irrigation, which in turn also affects productivity and poverty. These indirect effects are captured in terms 5-8 of equation (15).

The impact of government investment in rural roads in year  $t-k$  on poverty in year  $t$  is derived as:

$$\begin{aligned}
 dP/dROADE_{-k} = & \\
 & (MP/MTFP)(MTFP/MROADS)(MROADS/MROADE_{-k}) + \\
 & (MP/MWAGES)(MWAGES/MTFP)(MTFP/MROADS)(MROADS/MROADE_{-k}) + \\
 & (MP/MLANDN)(MLANDN/MTFP)(MTFP/MROADS)(MROADS/MROADE_{-k}) + \\
 & (MP/MTT)(MTT/MTFP)(MTFP/MROADS)(MROADS/MROADE_{-k}) + \\
 & (MP/MNAEMPLY)(MNAEMPLY/MROADS)(MROADS/MROADE_{-k}) + \\
 & (MP/MWAGES)(MWAGES/MROADS)(MROADS/MROADE_{-k}). \tag{16}
 \end{aligned}$$

The first term on the right hand side of equation (16) measures the direct effects of improved productivity on poverty attributable to a greater road density. Terms 2, 3, and 4 are the indirect effects of improved productivity through changes in wages, access to land, and prices. Terms 5 captures the effects on poverty of greater nonagricultural employment opportunities. The sixth term of the equation is the impact of improved agricultural wages arising from government investment in roads.

The impact of government investment in education in year  $t-m$  on poverty in year  $t$  is derived as:

$$\begin{aligned}
 dP/dEDE_{-m} = & \\
 & (MP/MTFP)(MTFP/MLITE)(MLITE/MEDE_{-m}) + \\
 & (MP/MTT)(MTT/MTFP)(MTFP/MLITE)(MLITE/MEDE_{-m}) + \\
 & (MP/MLANDN)(MLANDN/MTFP)(MTFP/MLITE)(MLITE/MEDE_{-m}) + \\
 & (MP/MWAGES)(MWAGES/MTFP)(MTFP/MLITE)(MLITE/MEDE_{-m}) + \\
 & (MP/MNAEMPLY)(MNAEMPLY/MLITE)(MLITE/MEDE_{-m}) +
 \end{aligned}$$

$$(MP/MWAGES)(MWAGES/MLITE)(MLITE/MEDE_{-n}). \quad (17)$$

As with government investment in roads, the first four terms of equation (17) capture the impact of government investment in education through improved agricultural productivity. Terms 5 and 6 capture the impact of government investments in education on poverty through improved non-farm employment opportunities and changes in rural wages.

The impact of government investment in electricity in year  $t-n$  on rural poverty in year  $t$  is derived as follows:

$$\begin{aligned} dP/dPWRE_{-n} = & \\ & (MP/MTFP)(MTFP/MIR)(MPUIR/MPVELE)(MPVELE/MPWRE_{-n}) + \\ & (MP/MWAGES)(MWAGES/MTFP)(MTFP/MIR)(MPUIR/MPVELE)(MPVELE/MPWRE_{-n}) + \\ & (MP/(LANDN)(MLANDN/MTFP)(MTFP/MIR)(MPUIR/MPVELE)(MPVELE/MPWRE_{-n}) + \\ & (MP/MTT)(MTT/MTFP)(MTFP/MIR)(MPUIR/MPVELE)(MPVELE/MPWRE_{-n}) + \\ & (MP/MTFP)(MTFP/MIR)(MPRIR/MPUIR)(MPUIR/MPVELE)(MPVELE/MPWRE_{-n}) + \\ & (MP/MWAGES)(MWAGES/MTFP)(MTFP/MIR)(MPRIR/MPUIR) \\ & \quad (MPUIR/MPVELE)(MPVELE/MPWRE_{-n}) + \\ & (MP/(LANDN)(MLANDN/MTFP)(MTFP/MIR)(MPRIR/MPUIR) \\ & \quad (MPUIR/MPVELE)(MPVELE/MPWRE_{-n}) + \\ & (MP/MTT)(MTT/MTFP)(MTFP/MIR)(MPRIR/MPUIR)(MPUIR/MPVELE)(MPVELE/MPWRE_{-n}) \\ & (MP/MNAEMPLY)(MNAEMPLY/MPVELE)(MPVELE/MPWRE_{-n}). \quad (18) \end{aligned}$$

The first 10 terms measure the effect of government investment in power through improved irrigation. The last terms capture the effect of improved electrification on poverty arising from nonagricultural employment opportunities.

The effects of government expenditures on rural and community development expenditures is derived as:

$$dP/dGERDEV = (MP/MNAEMPLY)(MNAEMPLY/MGERDEV). \quad (19)$$

This type of expenditure affects rural poverty by improving nonagricultural employment opportunities.

Government investments in health affect poverty through improved agricultural wages:

$$dP/dHEL_r = (MP/MWAGES)/(MWAGES/MHEL_r). \quad (20)$$

Government investments in soil and water conservation affect rural poverty through improved non-farm employment:

$$dP/dGCSSL = (MP/MNAEMPLY)(MNAEMPLY/MGCSSL) \quad (21)$$

## 5. DATA, MODEL ESTIMATION, AND RESULTS

### DATA SOURCES AND MEASUREMENT

Table 4 presents the definitions of each variable used in the estimation of the model. The head-count ratio, which measures poverty as a percentage of the rural population falling below the poverty line, is used in our analysis. Other measures, such as the poverty-gap index, the squared poverty-gap index, the Sen index, are also used by many scholars to supplement the head-count ratio.<sup>11</sup> But the head-count ratio is the most

---

<sup>11</sup> For more information on poverty measures, refer to Ravallion 1996, and Foster, Greer, and Thorbecke 1984.

important indicator used by the Indian government in setting its goals to alleviate rural poverty. Time series data on other poverty measures at the state level are also not available. The head-count ratio data used in this analysis were constructed by Gaurav Datt, and are published in a World Bank publication (World Bank 1997). Datt used the poverty line originally defined by the Planning Commission, and more recently endorsed by the Planning Commission, which is based on a nutritional norm of 2,400 calories per person per day. It is defined as the level of average per capita total expenditure at which this norm is typically attained, and is equal to a per capita monthly expenditure of Rs 49 at October 1973-June 1974 all-India rural prices.

Our measure of total factor productivity growth has already been defined. The road density variable is defined as the length of road per unit of geographic area. Education is measured as the literacy rate, defined as the percentage of literate people in the total rural population. Public irrigation is defined as the percentage of the total cropped area under canal irrigation, and private irrigation is defined as the percentage of the total cropped area under well, tube well, and tank irrigation. The electrification variable measures the of all villages that have access to electricity. The rural wage used is the male labor rate in real terms deflated by the consumer price index for agricultural labor. These variables were aggregated from district level data, which were obtained from the Planning Commission through the National Center for Agricultural Policy and Economics Research, New Delhi.

Nonagricultural employment is measured as the percentage of nonagricultural employment in total rural employment.<sup>12</sup> Data on nonagricultural employment are only

---

<sup>12</sup> Employment is defined as usual status, i.e., if more than half of his time is engaged in a particular employment category.

reported by the NSS for every five years beginning in 1973. The data for other years were estimated by geometric interpolation.

The terms of trade variable is measured as the change in agricultural prices relative to nonagricultural prices. The landless variable is measured as the percentage of rural households classified as landless. Since the data are only available every 10 years beginning in 1953, the data for intermediate years were estimated by geometric interpolation.

Government expenditure data by state were obtained from *Finances of State Governments*, various issues, published by the Reserve Bank of India.<sup>13</sup> All the expenditures are deflated into 1960/61 prices using a national GDP deflator. They include expenditures from both revenue (for maintenance) and capital (investment) account.

Agricultural R&D expenditure includes government expenditure on agricultural research and extension, while government expenditure on irrigation includes irrigation and flood control. Government expenditure on roads, education, power, and health in rural areas are calculated from total state level expenditures scaled down by the proportion of the total population living in rural areas.

Instead of using current and past expenditures, we use stock variables to measure the impact of government spending on rural development, and soil and water conservation. We use a three-year lag structure with weights of 0.4, 0.3 and 0.2, and 0.1

---

<sup>13</sup> For more details on the definition and classification of government expenditures on agriculture, refer to *Database & Guide on Government Finances in Indian Agriculture*, The new Concept Consulting Services, New Delhi, April 1990.



for the current year,  $t-1$ ,  $t-2$ , and  $t-3$ , respectively. These expenditures usually have immediate and short-run impact on rural poverty.

## MODEL ESTIMATION

We used double-log functional forms for all the equations in the system. More flexible functional forms such as the translog or quadratic impose fewer restrictions on the estimated parameters, but when tried we found that many of the estimated coefficients were not statistically significant because of multicollinearity problems.

The model defined by equation system (3) to (13) incorporates inter-dependencies among government investment, technology, infrastructure, productivity growth, rural employment generation, wages, and rural poverty. However, many economists have argued that government investment may itself be an endogenous variable. Binswanger et al. (1989) argued that government may allocate its investment based on agroclimatic conditions, i.e., high potential areas may receive more resources from government. If this is true, we should model government investment behavior in the equations system as well. However, it is difficult to quantify the agroclimatic conditions needed as potential explanatory variables, which may include seasonal rainfall, temperature, soil, topology, etc. But since these conditions are fixed over time, then, in order to reduce any bias from this endogeneity problem, we use the following estimation procedure. Let the following equation represent any equation in the simultaneous system:

$$Y = \beta X + (Z + g) \quad (22)$$

where  $Y$  is the dependent variable,  $X$  is a vector of government investment variables,  $Z$  is

a vector of other independent variables, and  $g$  is an error term. If government allocates its investment based on agroclimatic conditions, then  $X$  is correlated with the error term  $g$ . By ignoring this endogeneity, the estimates of  $\beta$  vector will be biased.

Suppose  $g = e_i + e_{it}$ , where  $e_i$  is a time invariant regional fixed effect representing agroclimatic conditions and  $e_{it}$  is a white noise. This fixed effect can, in principle, be predicted by government in determining its investment allocation across regions.

Taking the first difference of equation (23),

$$Y_{it} - Y_{i,t-1} = \beta(X_{it} - X_{i,t-1}) + (Z_{it} - Z_{i,t-1}) + g_{it} - g_{i,t-1}, \text{ or}$$

$$y = \beta x + (z + \epsilon_t), \quad (23)$$

where  $y$  and  $z$  are the first differences of  $Y$  and  $X$ , and  $\epsilon_t = e_{it} - e_{i,t-1}$ . Since  $e_{it}$  is purely white noise, it is unlikely that  $x$  is correlated with  $\epsilon_t$ . Therefore, any bias in the  $\beta$  estimates will be reduced.

Based on the above reasoning, all variables in our analysis were first transformed into geometric annual growth rates in logarithm form, i.e.,  $dx = \ln(x_t/x_{t-n})/n$ , where  $x_t$  and  $x_{t-n}$  represent the observations on  $x$  at time  $t$  and  $t-n$ , respectively, and  $n$  is the number of the years between two periods when data are available. If  $n = 1$ , then  $dx$  is simply a first difference in logarithms. This transformation avoids the problem of different time intervals between observations. It also alleviates potential multicollinearity problems among many dependent variables on the right hand side of the equations.

### *Lags and Distributions of Public Investments*

Government investments in R&D, roads, education, power, health, and irrigation can have long lead times in affecting agricultural production, as well as long-term effects

once they kick in. One of the thornier problems to resolve when including government investment variables in a production or productivity function concerns the choice of appropriate lag structure. Most past studies use stock variables which are usually weighted averages of current and past government expenditures on certain investments such as R&D. But what weights and how many years lag should be used in the aggregation are currently an issue of some contention in the literature.<sup>14</sup> Since the shape and length of these investments are largely unknown, we first use a free form lag structure in our estimation, i.e., we include current and past government expenditures on certain investment items such as R&D, irrigation, roads, power, and education in the respective productivity, technology, infrastructure, and education equations. Then we use statistical tools to test and determine the appropriate length of lag for each investment expenditure.

Various procedures have been suggested for determining the appropriate lag length. The adjusted  $R^2$  and Akaike's Information Criteria (AIC) are often used by many economists (Greene 1993). In this report, we simply use the adjusted  $R^2$ . Since  $R^2$  estimated from the simultaneous system does not provide the correct information on the fitness of the estimation, we use the adjusted  $R^2$  estimated from the single equation. The optimal length is determined when the adjusted  $R^2$  reaches its maximum. The AIC is similar in spirit to the adjusted  $R^2$  in that it rewards goodness of fit, but it penalizes the loss of degrees of freedom. The lags determined by the adjusted  $R^2$  approach are 13, 8,

---

<sup>14</sup> Alston et al. argue that research lag may be much longer than previously thought, or even infinite. But for many developing countries where the national agricultural research systems are much younger than those in developed countries (often 30 to 50 years old), and their research are more applied types. Therefore, it is certain that research lags in developing countries are much shorter than those in developed countries.

11, 7, and 7 years for R&D, irrigation, education, power, and roads, respectively. These are generally very short when compared to much longer lags obtained for the U.S. (Craig and Pardey 1987; Alston et al. 1998).

Another problem related to the estimation of lag distribution is that independent variables (for example,  $RDE$ ,  $RDE_{-1}$ ,  $RDE_{-2}$ , ... and  $RDE_{-l}$  in the TFP function) are often highly correlated, making the estimated coefficients statistically insignificant. To avoid this problem, many ways of tackling this problem have been proposed. The most popular approach is to use what are called *polynomial distributed lags*, or *PDLs*. In a polynomial distributed lag, the coefficients are all required to lie on a polynomial of some degree  $d$ . In this report, we use *PDLs* with degree 2. In this case, we only need to estimate three instead of  $i+1$  parameters for the lag distribution. For more detailed information on this subject, refer to Davidson and MacKinnon (1993). Once the lengths of lags are determined, we estimate the simultaneous equation system with the *PLDs* and appropriate lag length for each investment.<sup>15</sup>

## ESTIMATION RESULTS

The results of the systems equation estimation are presented in Table 5. Most of the coefficients in the estimated system are statistically significant at the 5 percent

---

<sup>15</sup> The sums of the coefficients from *PLDs* and free forms lag structure are not significantly different for all types of expenditure except R&D. The summed coefficient of R&D expenditure from *PLDs* is substantially large than that from free form lag structure (0.296 vs 0.091). Therefore, the estimated productivity and poverty effects from free forms lag structure are also substantially lower than those from *PLDs* distribution.

confidence level (one-tail test) or better.<sup>16</sup>

The estimated poverty equation (equation (3)) supports the findings of many previous studies. Improvements in agricultural productivity, higher agricultural wages, and increased nonagricultural employment opportunities have all contributed significantly to reducing poverty, whereas improvements in the terms of trade for agriculture have an immediate and negative short term impact on the rural poor (Misra and Hazell 1996).<sup>17</sup> Population growth, the incidence of landlessness and annual rainfall all have insignificant direct effects on poverty.

The estimated total factor productivity equation (equation (4)) shows that, agricultural research and extension, improved roads, irrigation, and education have all contributed significantly to growth in total factor productivity. The coefficient reported here for agricultural research and extension is the sum of the past 13 years coefficients from the *PLDs* distribution. The significance test is the joint *t* test of the three parameters of the *PLDs*.

The estimated wage equation (5) shows that total factor productivity growth, and investments in rural roads, education, and health have all contributed to increases in

---

<sup>16</sup>  $R^2$  is usually lower when dependent and independent variables are transformed into the difference form. Growth rates we used for both dependent and independent variables are equivalent to different form in logarithm. The model with traditional double-log forms for all equations were also estimated for the comparison purpose. Both *t*-value and  $R^2$  are much better than those we obtained under the difference form in Table 4.1 (almost all coefficients are statistically significant, and  $R^2$ 's range from 0.70 to 0.95).

<sup>17</sup> We also included the variable of expenditure on rural development variable (measured in stock terms with three-year lag) in our road and productivity equations. The coefficients are not statistically significant in either of the equations.

agricultural wages. The estimated nonagricultural employment equation (equation (6)) shows the importance of government expenditures on rural development and soil and water conservation in creating additional rural employment. Additionally, investments in roads and literacy have also been successful in promoting nonagricultural employment.

The estimated public irrigation equation (equation (7)) confirms that the percentage of the cropped area under canal irrigation is primarily a result of government investment, and that this has also been a significant catalytic force in driving private investment in well and tank irrigation (equation (8)). Improvements in the terms of trade seem not to have been a significant factor in encouraging either public or private investment in irrigation.

The estimated results for equations (9), (10), and (11) show that government investments in roads, education, and power have contributed to the development of roads, to increased literacy, and to the percentage of villages that are electrified. Most of the coefficients are statistically significant.

The estimated equation (12) for the incidence of rural landlessness shows that growth in total factor productivity does lead to an increase in landlessness. But the coefficient is small and statistically insignificant. Finally, the estimated terms of trade equation (equation (13)) confirms that increases in total factor productivity at the national and state levels do exert a downward pressure on agricultural prices, worsening the terms of trade for agriculture. It also shows that domestic agricultural prices are highly correlated with world agricultural prices.

The estimated model shows clearly that improvements in agricultural productivity not only reduce rural poverty directly by increasing income (equation (3)), but they also reduce poverty indirectly by improving wages (equation (5)) and lowering agricultural prices (equation (13)). On the other hand, improvements in agricultural productivity contribute to worsening poverty by increasing landlessness (equation (12)), though this effect is relatively small.

#### RURAL POVERTY ELASTICITIES AND MARGINAL IMPACT

The total effects of government spending on rural poverty and agricultural productivity are shown in Table 6. Two impact measures are presented. The first measure is the elasticity of each item of government spending, and this gives the percentage change in poverty or productivity corresponding to a 1-percent change in government expenditure on that item. Because we used a double log function, the elasticities are obtained directly from the derivatives in equations (14) through (21). Since all expenditures are measured in rupees, then these elasticities provide a measure of the relative growth and poverty reducing benefits that arise from additional expenditures on different items, where the increases are proportional to existing levels of expenditure. The total elasticities for each expenditure item are decomposed into their various direct and indirect components in Figures 6 to 13.<sup>18</sup>

---

<sup>18</sup> TRDE, TIRE, TROADE, TEDE, TPWRE, and THELE in Figures 6, 7, 8, 9, 11, and 12 represent the coefficients summed over the lag period that impact the current year production growth and poverty alleviation.

The second measure is the marginal return (measured in poverty and productivity units) for an additional 100 billion rupees of government expenditure. This measure is directly useful for comparing the relative benefits of equal incremental increases in expenditures on different items, and provides crucial information for policymakers in setting future priorities for government expenditure in order to further increase productivity and reduce rural poverty. The marginal returns were calculated by multiplying the elasticities by the ratio of the poverty or productivity variable to the relevant government expenditure item in 1993. Table 6 also shows the number of poor people who would be raised above the poverty line for each one million rupees of additional investment in an expenditure item.

An important feature of the results in Table 6 is that all the productivity enhancing investments considered offer a “win-win” strategy for reducing poverty while at the same time increasing agricultural productivity. There appear to be no tradeoffs between these two goals. However, there are sizable differences in the productivity gains and poverty reductions obtained for incremental increases in each expenditure item.

Government expenditure on roads has by far the largest impact on rural poverty. If the government were to increase its investment in roads by 100 billion rupees (at 1993 constant prices), the incidence of rural poverty would be reduced by 0.87 percent. Moreover, for each one million rupee increase in investment in roads, 165 poor people would be lifted above the poverty line. These poverty impacts are nearly twice as large as the impacts of the next best poverty reducer, viz. government investment in agricultural R&D. Investment in roads also contributes importantly to growth in total factor



productivity. An additional 100 billion rupees invested in roads would increase TFP growth by 3.03 percent. This growth effect is second only to investments in agricultural R&D.

Investment in roads reduces rural poverty through productivity growth, as well as increased nonagricultural employment opportunities and higher wages (Figure 8). The productivity effect accounts for 24 percent of the total impact on poverty, nonagricultural employment for 55 percent, and the remaining 31 percent is accounted for by increases in rural wages. Of the total productivity effect on poverty, 75 percent arises from the direct impact of roads in increasing incomes, while the remaining 25 percent arises from lower agricultural prices (15 percent) and increased wages (10 percent). An increase in the incidence of landlessness arising from the induced productivity growth has no significant impact on rural poverty.

Government investment in agricultural research and extension has the second largest impact on rural poverty, but the largest impact of any investment on growth in total factor productivity. Another 100 billion rupees of investment in R&D would increase TFP growth by 6.98 percent and reduce the incidence of rural poverty by 0.48 percent. Moreover, another million rupees spent on R&D would raise 91.4 poor people above the poverty line (Table 6). R&D has a smaller impact on poverty than roads because it only affects poverty through improved productivity, and it has not been particularly targeted on the poor by the government (Figure 6). If future agricultural research and extension were more deliberately targeted on the poor, it might well achieve a greater poverty impact (Hazell and Fan 1998).

Government spending on education has the third largest impact on rural poverty reduction. An additional million rupees spent on education would raise 31.7 poor people above the poverty line. Most of this effect arises from greater non-farm employment opportunities and increased wages (Figure 9). Education, at least as measured here as a simple literacy ratio, has only a modest impact on growth in agriculture's total factor productivity.

Government expenditures on rural development has the fourth largest impact on poverty reduction. Another million rupees of expenditure would raise 27.8 poor people above the poverty line, a comparable impact to additional investment in education. But unlike other investments with similar or greater poverty impacts, rural development expenditures have no discernable impact on total factor productivity growth in agriculture, and hence do not provide a long-term solution to the poverty problem (Figure 10).

Government expenditure on irrigation has the fifth largest impact on rural poverty reduction. Another million rupees of expenditure would raise 7.4 poor people above the poverty line. However, it should be noted that statistically this impact is not significantly different from zero. Public irrigation investments also have the third largest impact on TFP growth; an additional billion rupees would add 0.56 percent to the TFP growth rate. Public irrigation impacts on poverty through its productivity effect, and this impact is enhanced by its catalytic role in stimulating additional private investment in irrigation (Figure 7).

Government expenditure on power has positive but small and statistically insignificant impacts on both rural poverty and productivity growth. This may be because the government has already invested heavily in rural electrification and the marginal returns from additional investments are now low. Not only is the size of power expenditure relatively large in the government's budget (50 percent greater than road expenditure in 1993), but current expenditure has also increased enormously since 1990 and about 90 percent of all rural villages are already electrified (Table 2). More than 90 percent of the total power effects are derived from non-farm employment, while the remaining effect arises from productivity increases obtained through improved irrigation (Figure 11).

Additional government expenditures on soil and water conservation and health have small impacts on rural poverty, and the impact is statistically insignificant in the case of health. They also have no discernable impacts on agricultural productivity growth.

## **6. CONCLUSIONS**

Using state-level data for 1970 to 1993, this study has developed a simultaneous equations model to estimate the direct and indirect effects of different types of government expenditure on rural poverty and productivity growth in India. The results show that government spending on productivity enhancing investments (especially agricultural research and extension), rural infrastructure (especially roads and education),

and rural development targeted directly on the rural poor, have all contributed to reductions in rural poverty, and most have also contributed to growth in agricultural productivity.<sup>19</sup> But differences in their poverty and productivity effects are large.

The model has also been used to estimate the marginal returns to agricultural productivity growth and poverty reduction obtainable from additional government expenditures on different technology, infrastructure and social investments. Additional government expenditure on roads is found to have the largest impact on poverty reduction as well as a significant impact on productivity growth. It is a dominant “win-win” strategy. Additional government spending on agricultural research and extension has the largest impact on agricultural productivity growth, and it also leads to large benefits for the rural poor. It is another dominant “win-win” strategy. Additional government spending on education has the third largest impact on rural poverty reduction, largely as a result of the increases in non-farm employment and rural wages that it induces.

Additional irrigation investment has only a modest impact on growth in agricultural productivity and an even smaller impact on rural poverty reduction, even after trickle down benefits have been allowed for. Additional government spending on rural and community development, including Integrated Rural Development Programs (IRDP), contributes to reductions in rural poverty, but its impact is smaller than expenditures on

---

<sup>19</sup> The results we obtained from this study differ sharply from Datt and Ravillion (1997) who used the state aggregate development expenditures and found insignificant correlation with rural poverty reduction. In another study, Sen (1997) found that while the aggregate state expenditures have a positive and significant impact on rural poverty, he failed to obtain the similar results using the individual items of government expenditures. This may be due to the different specifications of the models.

roads, agricultural R&D, and education. Additional government expenditures on soil and water conservation and health have no impact on productivity growth, and their poverty effects through employment generation and wage increase are also small.

The results of this study have very important policy implications. In order to reduce rural poverty, the Indian government should give priority to increasing its spending on rural roads and agricultural research and extension. These types of investment not only have large poverty impact per rupee spent, but also give the greatest growth in agricultural productivity growth. Additional government spending on irrigation and rural electrification has low productivity effects, and no discernable impact on poverty reduction. While these investments have been essential investments in the past for sustaining agricultural growth, the levels of investment stocks achieved may now be such that it may be more important to maintain those current stocks rather than to increasing them further. On the other hand, additional government spending on rural development is an effective way of helping the poor in the short-term, but since it has little impact on agricultural productivity, then it contributes little to long-term solutions to the poverty problem.

**Table 1 Government expenditure in India, million rupees in 1960/61 prices**

	Total	Development	Social Service	Education et al.	Health	Welfare	Economic Service	Agriculture	Irrigation	Transportation	Power	Rural Development
(million rupees)												
1970	19,660	12,387	6,364	4,002	1,731	268	6,023	1,889	2,582	636	1,209	411
1971	22,112	15,471	8,132	3,578	1,685	380	7,339	1,623	3,065	907	1,025	526
1972	22,899	16,786	9,029	3,759	1,813	630	7,703	2,923	3,119	1,358	1,166	708
1973	23,054	16,643	8,902	3,906	1,848	636	7,978	3,014	3,185	1,206	1,159	658
1974	18,793	16,089	7,156	3,688	1,673	501	8,933	2,716	2,738	1,129	1,345	517
1975	25,158	21,933	9,477	5,068	2,225	657	12,496	3,925	4,586	1,395	2,083	653
1976	30,608	27,105	11,563	6,018	2,693	818	15,571	4,412	4,768	1,724	2,811	711
1977	32,043	28,213	12,065	6,280	2,858	878	16,496	4,364	6,310	1,851	3,024	681
1978	38,435	35,209	14,126	7,198	3,450	1,002	21,084	5,782	7,595	2,387	3,800	1,024
1979	39,516	36,192	14,864	7,160	3,624	1,062	21,415	6,239	7,505	2,423	3,663	1,183
1980	42,110	38,215	15,846	7,589	3,810	1,123	22,369	6,665	7,263	2,691	3,675	1,418
1981	48,759	43,289	18,843	8,973	4,639	1,334	24,444	7,444	8,102	3,009	3,889	1,765
1982	56,527	49,952	22,498	10,600	5,520	1,593	27,451	8,591	8,892	3,178	4,472	2,196
1983	52,329	45,821	20,626	9,678	5,378	1,541	25,200	8,395	7,917	2,804	3,461	2,104
1984	60,754	52,075	23,263	11,035	5,894	1,717	28,790	13,048	8,473	3,082	4,230	3,146
1985	65,048	55,521	25,671	12,152	5,220	1,904	29,850	6,577	7,599	3,038	3,948	3,888
1986	72,450	61,681	28,148	13,157	4,427	2,191	33,533	5,859	9,366	3,708	4,904	5,146
1987	74,646	62,914	28,876	13,621	4,812	1,927	34,038	5,962	9,045	3,516	5,381	5,132
1988	77,435	63,484	29,886	14,784	4,941	1,950	33,598	6,162	8,725	3,458	4,930	5,216
1989	85,130	67,879	32,957	17,748	5,299	2,057	34,922	6,739	8,740	3,688	5,622	3,991
1990	91,285	72,728	34,690	18,273	5,541	2,313	38,442	7,821	8,754	4,018	6,225	5,640
1991	89,891	71,322	32,267	16,622	5,089	2,184	38,839	6,744	7,519	3,757	10,079	5,543
1992	93,817	72,837	33,789	17,741	5,349	2,293	39,047	8,209	7,963	4,087	7,099	6,177
1993	100,161	75,072	35,127	18,392	5,761	2,411	39,947	8,072	8,785	4,330	6,873	6,546
<i>Annual Growth Rate</i>												
1970-79	8.07	12.65	9.88	6.68	8.56	16.55	15.14	14.20	12.59	16.02	13.11	12.46
1980-89	8.14	6.59	8.48	9.90	3.73	6.95	5.07	0.12	2.08	3.56	4.84	12.18
1990-93	3.14	1.06	0.42	0.22	1.31	1.38	1.29	1.05	0.12	2.52	3.36	5.09
1970-93	7.34	8.15	7.71	6.86	5.37	10.03	8.57	6.52	5.47	8.69	7.85	12.79

- Notes: 1. All figures in this table include both revenue and capital expenditure, and are aggregated from 17 major states.  
2. Expenditure on education et al. include those on education, culture and sport.  
3. Expenditure on transportation include those on transportation and communication.  
4. Rural development expenditure is included in agriculture expenditure for some years. Therefore, the sum of the expenditure for agriculture, irrigation, transportation, power, and rural development is not necessarily equal to total economic service expenditure.

**Table 2 Technology, infrastructure, production and productivity in Indian agriculture**

	HYVs	Irrigation	Village electrified	Literacy rate	Road density	Production growth	Productivity growth
	%	%	%	%	km/1000 sq. km	%	%
1970	21	23	34	23	2414	100	100.00
1971	24	23	36	24	2523	100	99.11
1972	23	23	37	25	2641	93	91.61
1973	25	24	39	25	2768	97	97.73
1974	26	24	41	26	2858	101	99.64
1975	29	25	44	27	2955	114	113.18
1976	31	25	46	27	3042	105	103.15
1977	34	26	48	28	3309	115	111.70
1978	36	27	51	28	3492	119	113.78
1979	37	27	54	29	3587	119	113.00
1980	41	28	57	30	3670	120	112.05
1981	40	29	60	31	3791	127	116.23
1982	43	29	63	31	3915	125	110.05
1983	41	29	67	31	4011	135	117.88
1984	45	29	70	32	4127	131	113.53
1985	44	30	73	32	4261	141	120.13
1986	46	31	75	33	4400	133	113.86
1987	48	32	78	33	4513	136	113.68
1988	47	34	81	34	4651	152	129.50
1989	53	33	83	34	4809	168	133.75
1990	53	33	85	35	4861	152	120.69
1991	57	33	86	36	4935	152	118.52
1992	56	32	87	37	5035	153	117.56
1993	57	32	87	37	5105	156	118.05
1994	64	33	89	39	5221	165	117.86
1995	59	31	89	40	5196	n.a.	n.a.
<i>Annual Growth Rate (%)</i>							
1970-79	6.25	1.84	5.37	2.47	4.50	1.95	1.37
1980-89	3.10	1.69	4.38	1.61	3.05	3.82	1.99
1990-95	2.10	-0.88	0.96	2.68	1.34	2.09	-0.59
1970-95	4.19	1.20	3.96	2.17	3.11	2.11	0.69

**Table 3 Rural wages and employment in India**

	Total rural employment	Agricultural employment	Non -agricultural employment	Rural	Non-agricultural employment
	Thousand	Thousand	Thousand	Index	%
1970	220,755	178,812	41,943	100.00	19.00
1971	220,910	178,937	41,973	97.48	19.00
1972	221,064	178,399	42,665	91.97	19.30
1973	221,289	178,492	42,797	86.46	19.34
1974	221,444	178,529	42,915	74.23	19.38
1975	221,599	178,565	43,034	90.88	19.42
1976	221,755	178,601	43,153	105.35	19.46
1977	221,910	178,637	43,272	104.81	19.50
1978	223,684	178,839	44,845	110.25	20.05
1979	225,920	179,354	46,567	105.52	20.61
1980	228,180	179,825	48,355	101.11	21.19
1981	230,461	180,250	50,212	103.66	21.79
1982	232,766	180,626	52,140	106.20	22.40
1983	235,094	182,433	52,661	112.84	22.40
1984	230,016	176,790	53,226	122.41	23.14
1985	225,094	171,293	53,801	135.09	23.90
1986	220,277	165,895	54,381	143.00	24.69
1987	215,563	160,594	54,968	136.38	25.50
1988	219,883	164,584	55,299	147.18	25.15
1989	224,259	167,526	56,732	154.71	25.30
1990	228,721	170,519	58,203	158.35	25.45
1991	233,273	173,562	59,711	148.06	25.60
1992	237,915	176,656	61,259	158.31	25.75
1993	242,649	179,803	62,846	163.59	25.90
<i>Annual Growth Rate</i>					
1970-79	0.26	0.03	1.17	0.60	0.91
1980-89	-0.19	-0.78	1.79	4.84	1.99
1990-93	1.99	1.78	2.59	1.09	0.59
1970-93	0.41	0.02	1.77	2.16	1.36

Notes: Employment figures are available for 1972, 1977, 1983, 1987, and 1993 from the Government of India. The figures for the rest of the years are interpolated using the time trend.



**Table 4 Definition of exogenous and endogenous variables**


---

*Exogenous Variables*

<i>POP:</i>	Rural population growth.
<i>WAPI:</i>	World agricultural price index (average export price for rice, wheat and corn).
<i>IRE:</i>	Government expenditure on irrigation, both from revenue and capital accounts.
<i>RDE:</i>	Government spending (both revenue and capital) on agricultural R&D.
<i>ROADE:</i>	Government investment and spending in rural roads.
<i>EDE:</i>	Government spending on rural education.
<i>PWRE:</i>	Government revenue and capital spending on rural power.
<i>GCSSL:</i>	Government capital stock accumulated in soil and water conservation investment. It is the weighted average of the past government expenditure on soil and water conservation, i.e., $GCSSL_t = \sum_m w_m ESL_{t-m}$ , where $ESL_{t-m}$ is government expenditure on soil and water conservation at time $t-m$ . The weights are 0.4, 0.3, 0.2, and 0.1, respectively with three years lag.
<i>HELE:</i>	Government spending on medical and public health and family welfare measured in stock terms using the three years lag similar to soil and water conservation.
<i>GERDEV:</i>	Government expenditure on rural and community development measured in stock terms using three years lag similar to expenditures on soil and water conservation.
<i>RAIN:</i>	Annual rainfall.
<i>T:</i>	Time trend.
<i>ATT:</i>	Moving 5-year average of the terms of trade (predetermined endogenous variable).

---

Table 4 (continued)

---

<i>Exogenous Variables</i>	
<i>P:</i>	Percentage of rural population falling below poverty line.
<i>LITE:</i>	Literacy rate of rural population.
<i>ROADS:</i>	Road density in rural areas.
<i>IR:</i>	Percentage of total cropped areas that is irrigated (sum of both public and private irrigation).
<i>PUIR:</i>	Percentage of total cropped areas under public irrigation (canal irrigation).
<i>PRIR:</i>	Percentage of total cropped areas under private irrigation (wells, tube wells, and tanks).
<i>PVELE:</i>	Percentage of rural villages that are electrified.
<i>WAGE:</i>	Wage rate of agricultural labor.
<i>NAEMPLY:</i>	Percentage of nonagricultural employment in total rural employment.
<i>TFP:</i>	Total factor productivity growth (Tornqvist-Theil index). It is defined as aggregate output minus aggregated inputs.
<i>TFPn</i>	Total factor productivity growth at the national level.
<i>LANDN:</i>	Percentage of rural households that are landless.
<i>TT:</i>	Terms of trade, measured as agricultural prices divided by a relevant non agricultural GNP deflator.

---

**Table 5 Determinants of rural poverty in India: Simultaneous equation system**

(3)	P	=	-0.073*	-	0.164 TFP*	-	0.205 WAGES*	+	0.189 TT*	-	0.458 NAEMAPL*	+	0.000 LANDN	-	0.847 POP	+	0.380 RAIN	<b>R<sup>2</sup>=0.117</b>
(4)	TFP	=	-0.034	+	0.296 TRDE*	+	0.145 IR*	+	0.231 ROADS*	+	0.532 LITE*	+	0.356 RAIN*					<b>R<sup>2</sup>=0.296</b>
(5)	WAGES	=	0.089*	+	0.111 TFP*	+	0.316 ROADS*	+	1.457 LITE*	+	0.005 GCSHEL							<b>0.133</b>
(6)	NAEMPLY	=	-0.027	+	0.046 GERDEV*	+	0.208 ROADS*	+	0.503 LITE*	+	0.025 GCSSL*							<b>R<sup>2</sup>=0.022</b>
(7)	PUIR	=	-0.035	+	0.120 TIRE*	+	0.06 PVELE	+	0.07 ATT									<b>R<sup>2</sup>=0.127</b>
(8)	PRIR	=	-0.007	+	0.926 PUIR*	-	0.127 ATT	+	0.013 PVELE									<b>R<sup>2</sup>=0.697</b>
(9)	ROADS	=	0.007*	+	0.315 TROADE*	+	-0.004 T*											<b>R<sup>2</sup>=0.113</b>
(10)	LITE	=	0.032*	+	0.084 TEDE*	+	-0.001 T*											<b>R<sup>2</sup>=0.270</b>
(11)	PVELE	=	0.232	+	0.072 TPWRE*	+	-0.009 T*											<b>R<sup>2</sup>=0.167</b>
(12)	LANDN	=	0.031	+	0.026 TFP	+	-0.001 T											<b>R<sup>2</sup>=0.022</b>
(13)	TT	=	-0.025 (0.19)	-	0.176 TFP* (-3.44)	-	0.563 TFPn* (-0.20)	+	0.279 WAPI *									<b>R<sup>2</sup>=0.379</b>

NOTES: Coefficients for expenditures on R&D (TRDE), irrigation (TIRE), roads (TROADE), education (TEDE), power (TPWRE) are sums of coefficients of current and lagged expenditures. Coefficients for time-trend variables are not reported. “\*” indicates significance at the 5% level.

**Table 6 Poverty and productivity effects of additional government expenditures**

Expenditure variable	Elasticities		Marginal impact		No. of poor reduced (per million rupees)
	Poverty	TFP	Poverty (% point) (per 100 billion rupees at 1993 prices)	TFP (% point)	
R&D	-0.065* (2)	0.296* (1)	-0.48* (2)	6.98* (1)	91.4* (2)
Irrigation	-0.007 (5)	0.034* (4)	-0.04 (6)	0.56* (3)	7.4 (5)
Road	-0.066* (1)	0.072* (2)	-0.87* (1)	3.03* (2)	165.0* (1)
Education	-0.054* (3)	0.045* (3)	-0.17* (3)	0.43* (4)	31.7* (3)
Power	-0.002 (6)	0.0007 (5)	-0.015 (8)	0.02 (5)	2.9 (7)
Soil and Water	-0.0004 (7)	0 (6)	-0.035* (7)	0 (6)	6.7* (6)
Rural Development	-0.019* (4)	n.a.	-0.15* (5)	n.a.	27.8* (4)
Health	-0.0007 (8)	n.a.	-0.02 (4)	n.a.	4.0 (8)

Note: Numbers in parentheses are ranks. “\*” indicates significance at the 5% level.

Appendix Table 1 Development expenditures by state

	Andhra Pradesh	Assam	Bihar	Gujarat	Haryana	HP	J&K	Karnataka	Kerala	MP	Maharashtra	Orissa	Punjab	Rajasthan	Tamil Nadu	UP	West Bengal	Total
	(million 1960/61 rupees)																	
1970	1,083	462	795	877	344	70	276	753	612	770	1,504	443	449	709	1,155	1,252	842	12,398
1971	1,350	478	926	1,114	506	235	385	858	743	1,003	1,433	564	588	913	1,450	1,821	1,146	15,513
1972	1,347	439	963	1,226	420	269	410	1,190	720	983	1,810	610	664	935	1,528	1,956	1,331	16,803
1973	1,339	403	856	1,180	503	236	414	1,042	729	956	2,360	623	742	866	1,467	1,885	1,040	16,639
1974	1,325	426	911	1,269	528	234	418	1,023	691	975	1,946	521	726	763	1,105	2,057	1,157	16,076
1975	1,949	505	1,470	1,315	683	225	549	1,452	886	1,366	2,541	665	976	1,185	1,541	2,991	1,602	21,900
1976	2,353	593	1,662	1,821	829	267	542	1,600	1,090	1,866	3,242	869	1,315	1,438	1,953	3,884	1,770	27,094
1977	2,870	796	1,471	1,980	789	358	667	1,796	1,251	1,883	3,558	987	1,026	1,420	2,245	3,447	1,744	28,287
1978	3,347	892	2,020	2,245	1,051	500	930	2,247	1,414	2,252	4,522	1,235	1,216	1,834	2,591	4,382	2,716	35,392
1979	3,406	854	2,077	2,657	1,100	518	754	2,326	1,554	2,475	4,622	1,104	1,515	1,890	2,662	4,396	2,415	36,325
1980	3,386	975	2,402	2,901	1,100	534	818	2,242	1,742	2,842	4,649	1,414	1,360	1,793	3,239	4,292	2,647	38,336
1981	3,517	1,073	2,682	3,237	1,214	617	862	2,645	1,841	3,099	5,335	1,588	1,617	2,224	3,728	4,998	3,145	43,421
1982	4,152	1,268	3,266	4,044	1,485	683	874	3,180	1,924	3,441	6,305	1,860	1,856	2,402	4,260	5,493	3,598	50,091
1983	4,493	1,309	2,494	3,682	1,356	565	824	2,599	1,619	3,376	5,878	1,262	1,838	2,379	3,715	5,585	2,818	45,792
1984	5,057	1,566	3,159	4,081	1,486	669	967	3,096	1,727	3,644	6,575	1,555	1,868	2,252	4,244	6,748	3,451	52,145
1985	5,549	1,711	3,852	3,699	1,605	811	1,163	3,481	2,169	3,713	7,262	1,716	2,275	2,437	4,427	6,265	3,562	55,697
1986	6,332	1,793	4,009	4,759	1,700	894	1,273	3,994	2,120	4,104	7,997	1,978	2,073	3,112	4,542	7,392	3,770	61,843
1987	5,887	1,925	3,909	5,262	1,726	994	1,463	3,939	2,008	4,372	7,887	1,940	2,888	3,713	4,878	6,534	3,825	63,148
1988	6,238	1,928	4,208	5,183	1,691	998	1,288	3,613	2,039	4,375	8,342	2,090	2,487	3,162	4,735	7,182	4,077	63,634
1989	6,756	2,053	4,353	5,337	1,769	951	1,410	4,000	2,159	4,313	9,488	2,164	2,455	2,955	5,672	7,819	4,417	68,070
1990	7,282	2,068	4,864	5,482	1,795	994	1,661	4,007	2,330	4,860	9,654	2,524	2,542	3,466	6,043	8,656	4,852	73,080
1991	6,592	2,176	4,238	5,574	1,774	861	1,420	4,461	2,324	4,568	7,873	2,387	3,716	4,021	7,896	7,490	4,028	71,397
1992	6,693	1,960	4,381	6,029	1,861	851	1,327	4,386	2,300	4,978	8,842	2,516	2,307	4,188	6,945	9,123	4,095	72,782
1993	8,003	2,033	4,341	5,749	1,781	1,044	1,474	5,253	2,407	5,327	10,580	2,540	2,201	4,146	6,689	7,351	4,539	75,457
<i>Annual Growth Rate (%)</i>																		
1970-79	13.57	7.05	11.26	13.11	13.78	24.97	11.81	13.35	10.91	13.85	13.28	10.68	14.46	11.50	9.72	14.98	12.42	12.69
1980-89	7.98	8.63	6.83	7.01	5.42	6.62	6.24	6.65	2.41	4.74	8.25	4.84	6.78	5.71	6.42	6.89	5.85	6.59
1990-93	3.19	-0.57	-3.72	1.60	-0.26	1.64	-3.91	9.44	1.09	3.11	3.10	0.22	-4.70	6.15	3.44	-5.30	-2.20	1.07
1970-93	9.08	6.65	7.66	8.52	7.41	12.49	7.55	8.81	6.14	8.77	8.85	7.89	7.15	7.98	7.94	8.00	7.60	8.17

Notes: Assam's expenditures are deflated using West Bengal's consumer price index for agricultural labor, and Himachal Pradesh and Jammu & Kashmir's expenditures are deflated by Punjab's consumer price index for labor.

Appendix Table 2 Per capita development expenditures by state

	Andhra Pradesh	Assam	Bihar	Gujarat	Haryana	HP	J&K	Karnataka	Kerala	MP	Maharashtra	Orissa	Punjab	Rajasthan	Tamil Nadu	UP	West Bengal
	(1960/61 rupees/person)																
1970	31	34	16	46	42	21	72	34	34	22	43	22	43	33	40	16	25
1971	38	34	18	57	60	69	98	38	41	28	41	28	56	42	50	24	34
1972	37	31	18	61	49	78	102	52	39	27	50	29	62	42	52	25	38
1973	36	28	16	58	57	67	101	45	39	26	65	30	68	38	49	23	29
1974	35	29	17	60	58	65	100	44	36	26	52	24	65	32	36	25	32
1975	51	34	26	61	74	62	128	61	46	35	67	30	86	49	50	36	43
1976	60	39	29	83	88	72	124	64	55	47	84	39	114	57	63	45	47
1977	72	51	25	88	81	95	149	70	62	47	90	44	87	55	71	39	45
1978	83	56	34	99	107	130	203	86	70	55	113	54	102	70	81	49	69
1979	83	53	34	115	110	133	161	88	77	60	114	48	126	71	82	49	60
1980	82	59	39	123	108	134	171	84	85	67	113	60	111	66	99	47	65
1981	84	64	43	136	117	152	176	98	89	72	128	67	130	80	113	53	76
1982	97	74	51	167	140	166	175	116	92	79	149	77	147	84	127	58	85
1983	103	76	38	149	125	135	161	93	77	76	136	51	143	81	110	57	65
1984	114	89	47	163	134	156	184	109	82	80	149	62	143	75	123	68	78
1985	123	94	56	145	141	186	215	120	103	80	161	67	171	79	127	61	79
1986	137	96	57	184	146	200	229	135	100	86	174	76	153	99	128	71	82
1987	126	101	54	200	145	218	257	131	94	90	169	73	209	115	136	61	81
1988	131	99	57	195	140	215	221	118	96	88	176	78	177	96	131	66	85
1989	139	103	58	198	143	201	236	129	101	85	197	79	172	87	155	70	90
1990	148	102	64	200	142	206	272	127	108	94	197	91	176	100	163	76	97
1991	131	105	54	201	138	175	227	139	108	87	158	84	252	114	210	65	79
1992	131	93	55	214	141	169	207	135	106	92	174	88	154	116	182	77	78
1993	154	94	54	201	133	204	225	159	111	97	205	87	145	112	173	61	85
<i>Annual Growth Rate (%)</i>																	
1970-79	11.67	5.10	9.03	10.79	11.37	22.77	9.40	11.13	9.37	11.67	11.34	8.89	12.51	8.68	8.30	12.76	10.19
1980-89	6.12	6.39	4.61	5.37	3.20	4.57	3.66	4.89	1.91	2.61	6.36	3.09	5.00	3.23	5.06	4.69	3.63
1990-93	1.47	-2.53	-5.65	0.17	-2.28	-0.35	-6.11	7.68	0.74	1.07	1.37	-1.41	-6.23	3.79	2.16	-7.20	-4.19
1970-93	7.25	4.58	5.48	6.66	5.17	10.39	5.09	6.94	5.25	6.64	6.98	6.13	5.37	5.40	6.56	5.85	5.42

Notes: Rural population is used to calculate per capita expenditure.

Appendix Table 3 Percentage of cropped areas with high-yielding varieties

	Andhra Pradesh	Haryana	MP	Maharashtra	Karnataka	Punjab	Tamil Nadu	UP	Bihar	Gujarat	Assam	HP	Rajasthan	Orissa	J&K	West Bengal	Kerala	All India
1970	11.91	23.98	4.80	15.38	10.39	55.81	37.31	37.91	13.53	14.90	6.16	6.09	4.89	4.10	n.a.	12.42	17.50	21.20
1971	15.29	34.94	8.00	11.40	10.84	54.67	47.83	38.05	18.12	15.33	9.65	5.89	6.11	6.38	n.a.	13.53	27.97	24.16
1972	24.88	39.94	11.00	15.15	17.47	58.10	53.01	38.29	27.74	12.93	12.36	6.62	7.58	8.66	n.a.	17.38	15.38	22.87
1973	31.77	51.39	16.50	21.08	18.34	63.85	51.39	38.03	34.61	15.09	13.04	6.50	7.63	7.27	n.a.	16.68	18.45	25.23
1974	40.22	51.64	19.45	19.48	21.96	71.78	48.56	40.48	21.20	14.08	14.94	6.48	10.12	6.79	n.a.	18.52	11.15	26.09
1975	40.26	52.70	21.85	27.55	36.01	71.55	40.45	41.04	26.42	15.72	14.08	6.14	12.62	9.87	n.a.	21.12	17.39	28.75
1976	37.66	52.05	25.35	34.22	25.14	70.98	50.17	41.73	31.52	17.78	18.26	5.93	13.62	12.14	n.a.	26.30	18.05	31.41
1977	42.61	59.87	26.52	39.48	32.40	78.48	51.23	42.13	34.18	18.56	23.68	6.09	12.75	13.93	n.a.	30.94	20.50	34.41
1978	43.45	62.44	27.07	37.54	34.64	73.47	50.42	52.05	29.80	19.40	24.81	6.00	12.99	18.47	n.a.	36.06	20.14	36.12
1979	42.40	62.23	19.95	38.78	33.93	78.71	49.24	54.36	33.78	23.92	16.93	5.93	12.83	22.53	n.a.	36.83	22.15	36.59
1980	53.70	65.29	33.90	49.95	42.61	84.22	59.53	47.00	31.54	23.46	19.09	5.71	17.34	24.23	n.a.	30.71	28.71	40.56
1981	49.23	68.15	28.14	38.69	38.56	87.79	61.33	54.71	32.07	24.06	23.45	5.89	11.50	27.31	n.a.	32.80	22.59	40.12
1982	54.30	71.05	28.70	42.05	35.81	87.00	70.06	59.17	35.06	22.67	27.10	5.87	12.18	30.06	n.a.	35.35	28.04	42.61
1983	52.23	70.43	33.39	42.10	37.65	88.74	56.54	47.09	33.51	28.19	26.02	5.86	14.06	30.34	n.a.	35.46	28.65	40.50
1984	59.28	74.87	35.75	51.42	39.82	91.08	58.79	47.80	34.15	27.58	29.18	5.62	18.15	33.02	n.a.	39.86	28.19	44.56
1985	63.23	69.77	37.46	50.87	40.41	94.56	56.92	45.25	34.35	23.03	34.02	5.78	16.96	30.64	n.a.	39.75	28.73	44.31
1986	64.12	65.47	44.04	54.83	35.51	92.43	55.27	52.42	35.07	21.20	36.93	5.79	15.60	35.58	n.a.	38.60	23.26	45.62
1987	68.40	77.19	42.63	56.72	36.19	96.99	53.15	52.45	36.22	26.56	36.34	5.91	17.95	42.61	n.a.	42.82	24.43	48.46
1988	65.63	74.41	44.79	56.55	39.42	90.79	58.45	50.52	36.07	31.96	36.68	5.91	13.25	39.68	n.a.	45.34	19.88	46.82
1989	74.82	79.63	49.36	61.52	78.16	93.55	50.88	68.42	40.68	28.92	38.43	6.08	11.85	42.57	n.a.	45.01	22.82	53.39
1990	75.70	80.12	47.65	64.39	87.04	96.91	67.44	51.84	38.17	35.05	46.14	5.99	13.47	50.66	n.a.	38.79	25.61	53.36
1991	80.17	89.26	56.51	67.38	89.11	97.31	64.04	48.29	39.60	31.27	52.47	6.42	15.54	51.85	n.a.	51.06	28.70	57.29
1992	82.47	65.34	59.79	67.49	47.20	96.89	52.84	49.37	38.69	35.16	38.74	6.47	16.77	50.78	n.a.	46.86	26.22	55.83
1993	86.41	68.90	62.66	67.77	46.55	95.76	59.32	50.31	46.66	33.86	38.29	6.84	20.48	47.01	n.a.	48.02	35.10	57.48
1994	86.47	75.73	65.68	69.77	45.40	95.91	57.53	51.16	40.58	39.53	41.59	7.79	20.59	43.92	n.a.	54.91	34.21	64.49
1995	86.21	78.41	65.74	71.17	43.40	95.90	54.07	51.97	41.47	40.00	41.59	8.02	16.63	44.99	n.a.	56.94	33.35	59.20

Appendix Table 4 Percentage of cropped areas with irrigation

	Andhra Pradesh	Haryana	MP	Maharashtra	Karnataka	Punjab	Tamil Nadu	UP	Bihar	Gujarat	Assam	HP	Rajasthan	Orissa	J&K	West Bengal	Kerala	All India
1970	30.69	41.10	8.13	8.46	13.24	74.72	46.24	38.75	25.54	14.24	9.50	15.25	14.66	16.58	39.42	20.33	18.63	23.32
1971	31.15	41.48	8.32	8.46	13.21	74.72	46.25	38.30	25.65	14.24	9.99	14.52	14.66	16.58	39.64	21.14	18.64	23.35
1972	29.56	42.20	9.06	9.05	15.43	76.47	46.38	39.33	26.48	14.61	10.15	14.93	14.55	10.41	40.12	19.04	18.89	23.08
1973	28.69	46.56	9.20	8.75	13.56	76.70	47.70	40.03	26.44	14.83	10.34	16.87	16.66	16.86	40.95	21.04	20.02	24.34
1974	31.16	49.92	9.16	9.16	12.70	76.77	48.03	40.28	26.94	15.17	10.71	17.25	14.98	17.76	42.06	22.56	19.09	24.29
1975	32.34	50.47	9.04	9.87	14.45	76.77	47.91	40.79	27.97	16.02	10.94	17.30	14.98	18.23	42.45	23.10	18.82	24.89
1976	33.56	53.96	9.04	10.58	16.09	76.77	47.30	41.32	29.03	16.89	11.22	17.28	14.98	18.69	42.83	23.64	18.85	25.49
1977	34.03	54.57	9.04	11.28	16.22	76.77	47.17	41.99	30.07	17.75	11.51	17.27	14.98	19.15	43.21	24.18	18.82	25.95
1978	34.41	53.04	9.92	11.89	16.37	81.29	46.53	42.67	32.83	18.62	11.77	17.27	18.71	18.72	43.57	24.72	13.47	26.91
1979	35.96	52.77	10.62	12.07	16.31	83.05	45.98	43.55	32.89	19.30	12.13	17.37	19.75	19.09	43.68	25.13	13.68	27.47
1980	34.94	60.10	10.14	12.18	15.98	87.21	46.02	43.75	33.39	20.84	12.49	17.33	24.95	19.89	41.90	25.54	13.92	28.40
1981	35.39	61.05	10.99	12.29	16.47	85.48	49.59	44.67	32.76	21.83	12.67	17.38	21.61	19.25	41.43	25.94	14.38	28.55
1982	35.80	58.81	11.02	12.99	16.98	86.09	44.35	44.20	34.14	23.14	12.76	17.43	20.01	19.81	41.66	26.33	14.99	28.55
1983	36.15	66.35	11.02	11.64	17.01	86.09	44.85	45.47	34.20	23.79	12.85	17.42	22.95	21.42	41.98	26.73	14.99	28.84
1984	38.45	59.85	11.02	11.55	17.89	85.49	44.05	47.00	35.14	25.64	12.94	17.42	22.11	23.08	42.12	27.11	14.99	29.32
1985	37.77	63.58	11.02	11.54	19.19	90.50	42.62	48.99	36.33	23.78	13.02	17.41	22.11	25.14	41.84	27.50	14.99	29.89
1986	36.66	66.40	13.21	11.77	18.97	91.01	47.50	50.64	38.81	22.92	13.03	17.41	21.30	26.67	42.16	27.88	17.86	30.84
1987	38.41	62.27	14.94	12.35	20.13	91.31	43.81	53.32	39.29	23.50	13.05	17.42	24.66	27.52	40.35	28.26	14.83	31.96
1988	38.25	81.12	15.78	11.79	19.86	91.74	41.98	57.30	41.21	25.18	13.06	17.75	30.02	28.02	40.47	28.63	18.27	33.52
1989	40.28	63.16	16.40	13.76	23.06	92.42	43.74	55.63	41.10	26.09	13.06	17.64	21.67	29.99	43.88	28.98	17.62	33.02
1990	40.41	70.17	16.32	14.24	22.20	92.40	45.19	54.04	41.10	23.18	13.43	18.12	23.71	30.26	43.15	29.06	12.61	32.82
1991	40.70	75.20	19.39	12.30	22.97	94.99	44.49	55.47	40.62	20.23	13.04	18.51	24.39	23.50	42.29	31.24	12.23	32.61
1992	42.39	79.03	19.39	11.35	24.11	94.11	46.45	55.43	40.62	17.86	13.23	18.60	25.92	21.56	41.76	31.41	12.23	32.42
1993	41.78	77.20	19.39	11.02	23.95	94.44	46.54	56.03	40.62	17.62	13.10	18.68	27.20	19.23	41.27	33.38	12.50	32.01
1994	45.81	78.47	19.41	10.99	25.04	94.78	46.57	56.46	40.62	16.05	13.03	17.58	28.82	17.53	40.79	32.90	12.50	32.98
1995	43.51	78.63	19.39	10.90	25.04	94.96	46.60	57.18	40.62	14.67	12.73	18.99	30.25	16.24	39.41	32.45	12.50	31.39



Appendix Table 5 Percentage of electrified villages

	Andhra Pradesh	Haryana	MP	Maharashtra	Karnataka	Punjab	Tamil Nadu	UP	Bihar	Gujarat	Assam	HP	Rajasthan	Orissa	J&K	West Bengal	Kerala	All India
1970	34.40	68.75	11.81	29.79	59.03	50.53	53.58	25.95	13.36	22.89	63.69	24.90	63.56	7.91	8.54	8.83	100.00	33.62
1971	34.61	91.26	11.99	33.05	59.03	56.04	57.79	26.67	13.73	25.44	64.51	25.38	63.82	11.19	9.15	9.80	100.00	35.51
1972	39.75	91.09	14.57	36.28	58.92	57.83	62.58	27.59	14.21	29.81	65.56	28.48	63.96	16.09	9.76	10.76	100.00	37.25
1973	42.09	92.23	16.23	39.62	59.53	61.70	66.79	28.28	14.96	30.44	66.70	31.80	63.71	16.56	11.30	16.30	100.00	38.97
1974	44.68	92.43	16.86	42.99	58.67	70.52	70.78	28.77	15.09	32.09	67.56	35.53	63.99	21.01	14.69	24.48	100.00	41.08
1975	45.39	92.69	18.66	46.22	62.98	79.07	74.95	29.83	22.70	34.86	68.58	38.83	64.26	26.10	18.43	26.54	100.00	43.72
1976	49.15	92.97	20.20	49.43	65.38	87.63	79.15	31.00	24.16	35.82	69.43	40.12	64.53	29.65	22.11	27.47	100.00	45.62
1977	57.87	93.25	21.13	52.63	65.17	98.55	83.36	32.25	26.18	40.55	70.27	43.00	64.80	33.44	35.47	30.51	100.00	48.49
1978	62.42	93.79	24.77	55.62	69.84	98.61	87.61	33.59	28.18	46.58	71.19	48.40	64.27	37.05	44.31	32.48	100.00	51.17
1979	65.36	93.89	29.29	58.60	72.45	99.20	91.96	34.92	29.59	54.78	72.17	53.80	64.34	40.30	49.80	34.52	100.00	53.83
1980	68.76	94.23	33.92	63.91	75.30	99.50	95.76	36.89	28.90	63.60	73.29	58.74	65.45	43.14	54.66	36.03	100.00	56.50
1981	73.79	100.00	38.52	70.56	80.86	99.50	97.31	40.90	33.60	72.80	74.30	63.19	64.82	45.81	58.87	40.83	100.00	60.32
1982	79.19	100.00	44.17	72.86	86.03	99.52	97.39	43.17	37.95	77.11	75.50	70.10	64.93	45.98	64.18	47.35	100.00	63.45
1983	82.88	100.00	49.66	75.34	90.35	99.59	98.04	47.08	43.65	79.42	76.74	75.53	65.44	48.04	73.80	51.71	100.00	67.07
1984	86.67	100.00	55.12	78.96	93.42	99.75	98.19	50.78	48.68	83.80	78.04	80.99	64.71	50.41	76.25	53.84	100.00	70.09
1985	89.02	100.00	60.23	80.60	97.03	99.85	98.19	55.11	49.58	89.59	79.40	86.47	65.72	51.77	81.53	56.62	100.00	72.79
1986	90.91	100.00	64.44	81.56	99.81	99.94	98.31	58.10	52.39	93.20	80.91	91.80	66.30	54.13	86.32	59.99	100.00	75.11
1987	92.22	100.00	69.26	88.69	100.00	100.00	98.42	62.05	56.39	94.44	82.46	96.87	66.67	57.61	88.62	63.71	100.00	78.18
1988	94.33	100.00	74.30	90.42	100.00	100.00	98.52	65.03	58.62	96.44	84.05	100.00	68.14	60.97	90.14	67.70	100.00	80.51
1989	95.56	100.00	80.74	92.24	100.00	100.00	99.71	68.05	62.26	96.44	85.02	100.00	70.32	63.79	90.63	72.32	100.00	83.09
1990	95.50	100.00	84.02	92.43	100.00	100.00	99.71	68.30	65.08	96.40	85.73	100.00	76.23	65.92	91.85	76.24	100.00	84.55
1991	95.82	100.00	87.36	92.48	100.00	100.00	99.71	71.05	65.70	96.39	86.46	100.00	78.45	70.26	92.90	77.25	100.00	85.78
1992	95.78	100.00	89.55	92.66	100.00	100.00	99.69	72.50	66.02	96.43	86.60	100.00	79.50	74.40	93.13	78.13	100.00	86.61
1993	95.87	100.00	91.71	92.79	100.00	100.00	99.92	73.88	66.22	96.52	86.60	100.00	81.35	78.10	93.37	78.64	100.00	87.46
1994	95.93	100.00	94.34	92.85	100.00	100.00	99.92	75.54	66.43	96.46	86.79	100.00	82.56	80.19	93.59	79.02	100.00	88.66
1995	95.95	100.00	94.23	92.86	100.00	100.00	99.92	76.80	66.50	96.42	86.87	100.00	83.36	86.04	94.52	78.93	100.00	88.67

Appendix Table 6 Literacy rate of rural population

	Andhra Pradesh	Haryana	MP	Maharashtra	Karnataka	Punjab	Tamil Nadu	UP	Bihar	Gujarat	Assam	HP	Rajasthan	Orissa	J&K	West Bengal	Kerala	All India
1970	19.07	25.50	19.97	29.39	23.61	25.12	33.01	16.01	17.53	26.10	27.49	32.57	12.68	23.84	14.23	26.10	54.25	23.40
1971	19.46	25.53	20.29	30.33	24.06	25.74	33.43	15.97	17.78	26.79	28.06	34.46	13.02	24.25	14.71	26.09	55.18	24.18
1972	19.96	25.51	20.66	31.44	24.53	26.50	33.98	16.36	18.02	27.63	28.61	35.06	13.30	25.67	15.09	26.18	56.18	24.76
1973	20.25	25.78	21.13	32.59	24.80	27.22	34.34	16.64	18.28	28.26	29.24	35.27	13.66	23.51	15.52	26.35	56.90	25.33
1974	20.59	25.92	21.48	33.57	25.26	27.95	34.71	16.85	18.71	29.00	30.00	34.42	14.00	25.55	16.19	26.60	57.95	25.92
1975	21.04	26.14	21.94	34.75	25.95	28.64	35.14	17.08	18.89	29.78	30.82	35.05	14.37	26.08	16.75	26.91	58.97	26.53
1976	21.51	26.40	22.39	36.00	26.48	29.35	35.59	17.34	19.10	30.57	31.68	35.68	14.76	26.64	17.34	27.27	60.03	27.15
1977	22.00	26.70	22.86	37.32	26.90	30.08	36.81	17.63	19.34	31.39	32.58	36.33	15.15	27.22	17.96	27.68	61.12	27.87
1978	22.29	26.95	23.24	38.70	27.50	30.67	36.57	17.94	19.61	32.24	33.57	37.02	15.54	27.77	18.60	28.13	62.29	28.40
1979	23.03	27.18	23.73	40.16	28.02	31.49	37.17	18.28	19.97	33.07	34.64	37.67	16.00	28.28	19.27	28.69	63.38	29.14
1980	23.52	27.35	23.85	41.79	28.68	32.32	37.75	18.65	20.14	33.97	35.72	38.43	16.44	28.89	19.96	29.28	64.58	29.86
1981	24.12	27.54	24.71	43.45	29.40	32.92	38.75	18.71	20.60	34.93	36.88	39.08	16.78	29.31	20.69	29.91	65.74	30.57
1982	24.37	27.42	25.34	42.64	29.75	33.65	39.42	19.62	21.05	35.70	37.28	40.21	17.36	29.57	21.33	30.83	66.29	30.97
1983	24.86	27.56	26.06	42.92	30.29	34.47	39.96	20.35	21.41	37.83	37.78	41.35	17.93	29.86	22.08	31.80	67.18	31.20
1984	25.34	27.89	26.81	42.36	30.72	35.22	40.51	21.13	21.77	38.61	38.38	42.52	18.67	30.18	22.83	32.80	68.08	31.64
1985	25.90	28.20	27.59	42.04	31.20	36.21	41.10	21.97	22.12	38.86	39.07	43.72	19.17	30.17	23.53	33.86	68.99	32.11
1986	26.53	29.03	28.43	41.70	31.94	37.04	41.62	23.12	22.52	39.16	39.91	44.96	19.83	30.73	24.38	34.98	69.78	32.61
1987	27.29	29.44	29.07	40.97	32.33	37.92	42.50	23.89	23.01	40.20	40.81	46.26	20.35	31.51	25.02	36.15	70.70	33.16
1988	27.66	29.76	31.68	40.27	32.89	39.07	43.29	24.83	23.44	41.35	41.78	47.52	21.66	31.86	25.82	37.40	71.58	33.71
1989	28.81	30.69	30.63	39.88	33.54	39.70	43.88	25.96	23.90	42.04	42.85	48.81	21.78	32.09	26.68	38.59	71.70	34.49
1990	28.93	30.58	31.74	39.55	34.11	40.72	44.64	26.71	24.34	42.84	43.99	49.99	22.16	32.59	27.49	40.03	72.49	35.02
1991	29.69	32.02	32.69	39.31	34.73	41.62	45.28	27.25	24.80	43.76	45.21	51.40	23.24	36.64	28.33	41.57	73.50	35.69
1992	30.51	32.77	33.67	39.04	35.29	42.63	45.98	29.00	25.27	44.76	46.50	52.86	23.94	39.52	29.19	43.18	74.53	36.52
1993	31.45	33.51	34.68	39.03	35.94	43.83	46.71	30.44	25.75	45.85	47.87	54.37	24.62	41.73	30.08	44.94	76.23	37.29
1994	33.90	35.17	36.46	38.75	37.24	46.15	48.31	33.92	26.74	48.22	50.87	57.29	26.40	44.37	32.07	48.97	78.35	39.14
1995	34.42	36.06	37.92	38.65	37.89	47.47	49.11	35.96	27.26	49.47	52.47	59.04	27.37	46.04	32.73	51.43	79.44	39.98

Appendix Table 7 Road density in rural India

	Andhra Pradesh	Haryana	MP	Maharashtra	Karnataka	Punjab	Tamil Nadu	UP	Bihar	Gujarat	Assam	HP	Rajasthan	Orissa	J&K	West Bengal	Kerala	All India	
	(km/000 sq. km)																		
1970	4,603	4,313	848	2,038	3,436	2,870	4,951	935	5,974	1,721	1,950	2,263	927	2,641	1,480	4,578	3,434	2,414	
1971	4,658	4,654	959	2,017	3,761	2,870	5,363	938	5,974	1,779	2,033	2,471	932	2,641	1,506	5,053	3,527	2,523	
1972	4,713	5,117	1,003	2,370	4,085	3,241	5,801	952	5,974	1,874	2,116	2,587	950	2,650	1,532	5,081	3,621	2,641	
1973	4,857	5,129	1,048	2,724	4,214	3,611	6,252	1,037	5,974	1,937	2,198	2,944	994	2,666	1,575	5,108	3,715	2,768	
1974	5,037	5,140	1,119	2,719	4,205	3,981	6,591	1,112	5,974	1,987	2,273	3,009	1,005	2,688	1,617	5,135	3,808	2,858	
1975	5,216	5,152	1,163	2,784	4,567	4,351	7,105	1,182	5,974	2,016	2,348	3,049	1,050	2,697	1,660	5,214	3,902	2,955	
1976	5,353	5,731	1,207	2,775	4,821	4,643	7,601	1,220	5,974	2,035	2,349	3,089	1,094	2,735	1,702	5,261	3,996	3,042	
1977	5,418	6,058	1,253	4,109	4,861	4,858	7,834	1,257	5,974	2,081	2,416	3,128	1,138	4,190	1,739	5,291	4,089	3,309	
1978	5,725	6,383	1,298	4,219	4,991	5,149	8,080	1,380	5,974	2,161	2,484	3,168	1,146	5,754	1,775	5,325	4,183	3,492	
1979	5,656	6,383	1,344	4,333	5,108	5,356	8,440	1,482	5,974	2,207	2,520	3,208	1,166	6,240	2,082	5,360	4,277	3,587	
1980	5,825	6,599	1,392	4,425	5,173	5,563	8,799	1,565	5,974	2,304	2,537	3,248	1,186	6,275	2,146	5,414	4,370	3,670	
1981	5,993	6,820	1,436	4,681	5,290	5,770	9,173	1,665	5,974	2,420	2,629	3,288	1,205	6,631	1,994	5,463	4,508	3,791	
1982	6,161	6,955	1,490	4,646	5,389	5,977	10,013	1,747	5,974	2,544	2,720	3,328	1,282	6,987	2,067	5,495	4,594	3,915	
1983	6,262	7,043	1,619	4,678	5,488	6,184	10,375	1,818	5,974	2,712	2,820	3,368	1,358	7,343	2,135	5,549	4,680	4,011	
1984	6,364	7,149	1,665	4,817	5,529	6,391	11,000	1,863	5,974	2,834	2,921	3,408	1,396	7,699	2,208	5,613	4,767	4,127	
1985	6,444	7,171	1,721	4,875	5,778	6,598	11,900	1,971	5,974	2,953	3,022	3,447	1,428	8,055	2,282	5,721	4,853	4,261	
1986	6,452	7,162	1,782	5,163	6,027	6,805	12,624	2,054	5,974	3,087	3,122	3,487	1,475	8,410	2,355	5,850	4,940	4,400	
1987	6,564	7,118	1,850	5,096	6,081	7,012	13,624	2,133	5,974	3,325	3,219	3,527	1,512	8,766	2,428	5,905	5,066	4,513	
1988	6,576	7,204	1,918	5,363	6,180	7,220	13,814	2,213	5,989	3,360	3,360	3,567	1,566	9,122	2,653	6,027	5,097	4,651	
1989	6,715	7,166	1,976	5,595	6,261	7,427	14,311	2,281	5,974	3,415	3,477	3,607	1,632	9,478	2,574	6,073	5,099	4,809	
1990	6,743	7,233	2,035	5,506	6,875	7,634	14,581	2,362	5,974	3,451	3,652	3,647	1,666	9,817	2,647	6,133	5,103	4,861	
1991	6,802	7,325	2,098	5,442	7,044	7,841	14,942	2,437	5,974	3,490	3,662	3,687	1,707	10,156	2,846	6,155	5,217	4,935	
1992	6,912	7,420	2,147	5,474	7,179	8,048	15,310	2,515	5,974	3,567	3,761	3,727	1,775	10,475	2,910	6,317	5,253	5,035	
1993	6,968	7,456	2,194	5,507	7,213	8,268	15,678	2,593	5,974	3,584	3,804	3,766	1,775	10,814	2,974	6,324	5,328	5,105	
1994	7,155	7,592	2,241	5,521	7,227	8,489	16,045	2,671	5,974	3,601	3,832	4,048	1,816	11,153	3,038	6,369	5,383	5,221	
1995	7,072	7,533	2,213	5,535	7,236	8,569	16,272	2,662	5,974	3,618	3,832	3,844	1,816	11,153	3,102	6,369	5,437	5,196	

Appendix Table 8 Production growth in Indian agriculture

	Andhra Pradesh	Haryana	MP	Maharashtr	Karnataka	Punjab	Tamil Nadu	UP	Bihar	Gujarat	Assam	HP	Rajasthan	Orissa	J&K	West Bengal	Kerala	All India
1970	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1971	98.34	95.43	102.38	97.22	101.83	107.91	98.68	91.68	95.69	92.82	105.07	145.11	83.46	96.31	100.59	127.16	104.44	99.58
1972	92.18	73.55	92.42	66.97	86.02	106.07	104.12	85.39	99.10	53.47	106.78	112.56	70.71	93.21	101.84	109.71	105.97	92.54
1973	111.93	70.99	90.12	108.88	102.70	114.80	107.60	85.99	75.94	78.62	104.83	107.93	79.73	101.83	100.56	104.69	105.09	97.49
1974	120.05	88.34	100.90	124.72	113.05	143.02	88.82	94.32	76.66	71.93	98.07	112.50	114.35	87.84	102.71	116.42	104.14	101.26
1975	113.59	104.66	108.19	145.06	111.28	142.72	117.48	102.58	86.09	107.43	105.22	129.10	148.96	112.56	116.24	133.14	106.37	113.72
1976	94.59	99.17	88.41	154.20	85.11	141.54	105.87	101.07	83.48	105.87	101.28	130.94	117.92	90.72	117.86	127.60	99.16	104.80
1977	104.99	108.01	108.51	163.55	108.82	160.63	118.26	109.85	87.71	107.35	99.13	127.54	118.81	108.50	132.50	138.52	101.33	114.66
1978	118.29	119.90	105.81	160.60	124.01	163.19	134.07	111.52	90.86	109.60	111.66	125.88	118.67	113.19	173.64	144.85	100.52	119.26
1979	107.69	84.55	72.06	160.32	118.22	176.92	130.45	80.73	76.61	103.59	108.99	111.30	106.04	92.39	155.01	139.18	102.76	104.90
1980	107.03	114.01	108.19	162.92	110.74	180.28	109.42	118.43	92.69	112.54	124.96	150.80	114.88	123.44	180.66	154.36	100.11	119.63
1981	131.73	109.60	110.62	174.95	120.50	209.37	137.13	116.93	89.06	126.40	123.63	129.46	130.01	126.26	190.76	148.26	97.93	126.56
1982	121.53	112.09	109.89	169.10	116.44	213.69	106.08	128.27	92.06	125.09	130.70	121.45	131.27	120.02	188.66	144.81	98.63	125.16
1983	132.75	110.77	127.30	181.41	126.81	215.08	108.26	135.95	107.55	141.10	129.84	123.76	130.78	149.27	181.47	177.27	94.28	135.28
1984	114.07	112.73	113.34	172.87	123.80	228.32	124.29	128.31	109.01	123.82	131.92	116.76	119.37	161.90	193.33	183.16	93.73	131.48
1985	120.58	142.67	125.86	157.64	118.41	238.98	150.37	139.68	122.94	92.17	143.79	149.00	134.54	156.23	220.63	220.79	89.25	140.51
1986	114.41	136.70	115.17	141.72	129.47	228.13	117.51	149.29	114.03	99.19	127.60	142.26	113.98	150.08	220.54	203.49	86.56	133.47
1987	137.63	112.63	128.68	178.54	127.31	239.93	133.31	147.58	108.44	68.29	130.84	119.34	105.51	135.48	201.66	199.46	82.37	135.51
1988	169.03	159.53	133.22	188.31	141.23	242.32	131.40	159.20	121.89	156.55	118.39	155.88	128.37	155.69	223.99	222.96	82.55	151.69
1989	196.91	110.69	128.05	241.82	136.16	263.09	161.23	154.60	119.19	156.60	123.22	191.54	129.37	153.48	241.68	409.13	87.37	167.70
1990	155.93	129.14	143.47	188.22	138.22	262.17	136.44	151.99	123.96	163.81	124.47	183.18	137.32	144.46	264.11	234.08	84.54	151.85
1991	159.94	140.50	132.88	183.97	149.75	262.25	134.86	154.53	117.38	154.26	104.62	172.56	135.82	148.21	259.36	247.72	96.77	151.92
1992	158.43	165.57	136.59	195.60	171.74	246.15	140.33	153.60	101.08	146.80	88.95	165.67	141.24	169.14	269.59	248.13	103.15	153.01
1993	168.83	162.74	146.71	196.32	185.71	262.80	141.06	154.49	117.93	122.81	69.52	152.16	124.95	181.98	306.39	261.28	110.08	156.26
1994	187.86	176.70	147.07	187.16	188.46	289.00	145.42	158.36	141.85	162.09	90.41	144.42	129.91	183.90	329.10	278.70	118.70	164.93
<i>Annual Growth Rate (%)</i>																		
1970-79	1.88	2.04	0.63	5.41	2.42	5.59	3.31	1.22	-1.06	1.02	1.23	2.59	1.92	1.39	6.32	4.20	0.06	1.98
1980-89	7.01	-0.33	1.89	4.49	2.32	4.29	4.40	3.01	2.83	3.74	-0.16	2.69	1.33	2.45	3.29	11.44	-1.50	3.82
1990-94	4.77	8.15	0.62	-0.14	8.06	2.47	1.61	1.03	3.43	-0.26	-7.68	-5.77	-1.38	6.22	5.65	4.46	8.85	2.09
1970-94	2.66	2.40	1.62	2.65	2.68	4.52	1.57	1.93	1.47	2.03	-0.42	1.54	1.10	2.57	5.09	4.36	0.72	2.11

Appendix Table 9 Total factor productivity growth in Indian agriculture

	Andhra Pradesh	Haryana	MP	Maharashtra	Karnataka	Punjab	Tamil Nadu	UP	Bihar	Gujarat	Assam	HP	Rajasthan	Orissa	J&K	West Bengal	Kerala	All India
1970	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1971	97.96	97.82	102.98	95.25	96.58	105.74	96.37	93.53	97.37	90.10	105.32	136.29	82.93	95.80	100.47	112.94	104.44	99.11
1972	91.90	77.54	91.67	64.78	81.44	100.98	98.70	86.79	103.02	47.81	104.04	106.23	69.53	91.44	101.29	97.11	105.97	91.61
1973	111.76	80.66	88.95	108.25	97.04	105.81	105.71	87.00	80.86	73.83	99.87	105.63	79.14	100.36	98.57	91.95	105.09	97.73
1974	117.62	102.41	103.51	112.16	92.93	129.66	86.34	96.11	93.05	65.26	91.91	119.29	107.09	82.58	99.90	101.76	104.14	99.64
1975	115.16	126.97	110.71	129.51	100.09	132.07	115.58	104.78	104.28	100.24	96.06	139.58	139.59	106.12	112.09	115.42	106.37	113.18
1976	90.99	122.62	89.00	136.50	75.96	127.60	102.18	102.15	100.89	97.47	89.79	141.19	109.81	84.93	112.10	109.99	99.16	103.15
1977	98.91	134.77	107.35	142.24	99.30	140.97	112.84	108.12	105.26	96.34	85.12	137.24	109.49	100.47	124.48	118.41	101.33	111.70
1978	104.46	151.11	102.02	138.02	106.17	139.73	123.93	108.51	107.98	94.60	94.38	134.23	113.13	104.18	160.77	122.13	100.52	113.78
1979	93.19	105.83	68.68	136.29	96.70	146.81	118.56	76.78	90.62	86.65	91.28	117.98	99.43	84.06	148.55	115.30	102.76	98.40
1980	93.03	143.20	103.98	136.84	87.70	146.99	98.50	111.80	112.71	90.20	104.16	157.56	108.18	113.35	170.23	127.71	100.11	112.05
1981	109.75	128.55	103.32	147.55	95.67	167.62	132.44	108.32	103.33	99.44	101.50	134.35	120.67	113.62	169.18	118.38	97.93	116.23
1982	93.48	120.29	99.40	139.07	88.62	167.84	94.21	113.72	94.46	91.84	106.95	123.90	118.62	106.38	165.69	114.75	98.63	110.05
1983	100.13	115.84	113.62	145.34	94.36	166.17	111.59	117.07	115.75	99.68	106.08	124.45	116.07	130.95	158.02	140.28	94.28	117.88
1984	82.22	117.57	99.44	137.05	89.84	174.69	122.98	109.59	122.30	88.36	106.98	115.75	105.04	140.87	167.23	143.73	93.73	113.53
1985	85.45	146.16	107.52	122.38	82.30	180.94	144.28	117.90	145.00	65.24	116.66	145.27	117.64	133.46	188.78	172.75	89.25	120.13
1986	81.14	132.56	94.94	111.16	89.42	170.62	111.55	123.66	139.53	70.68	102.86	136.36	97.21	126.26	186.40	159.35	86.56	113.86
1987	96.18	107.31	100.21	138.80	85.49	177.92	128.26	121.70	131.24	46.06	104.65	113.07	88.62	113.36	170.29	155.08	82.37	113.68
1988	113.41	159.39	105.89	141.37	93.13	179.91	123.91	130.45	144.55	92.13	93.55	147.40	131.11	134.24	195.15	173.10	82.55	129.50
1989	116.40	102.38	96.63	177.65	85.34	194.22	136.69	123.34	141.80	80.52	95.92	177.55	101.29	126.32	206.53	314.91	87.37	133.75
1990	96.87	118.25	108.15	132.32	84.53	192.02	126.01	120.22	147.04	76.99	96.00	168.26	108.88	120.62	218.95	179.18	84.54	120.69
1991	96.22	118.57	96.02	128.86	89.28	188.85	120.86	120.40	138.83	67.26	79.39	155.88	102.59	140.52	222.81	187.92	96.77	118.52
1992	94.51	139.54	97.04	136.99	100.78	175.62	123.32	118.50	119.16	59.41	66.75	148.62	103.10	160.10	228.51	187.47	103.15	117.56
1993	99.32	137.14	103.30	135.68	106.09	192.76	122.14	117.80	138.81	47.27	51.78	135.21	88.02	171.79	257.03	196.86	110.08	118.05
1994	102.38	73.21	98.73	128.66	105.93	215.39	122.82	118.23	165.95	59.39	66.19	112.07	92.34	159.27	273.36	208.03	118.70	117.86
<i>Annual Growth Rate (%)</i>																		
1970-79	0.49	4.69	0.22	3.65	0.67	3.79	2.41	0.91	0.86	-0.62	-0.64	3.33	1.38	0.46	5.42	2.25	0.06	1.44
1980-89	2.52	-3.66	-0.81	2.94	-0.30	3.14	3.71	1.10	2.58	-1.25	-0.91	1.34	-0.73	1.21	2.17	10.55	-1.50	1.99
1990-94	1.39	-11.30	-2.25	-0.70	5.80	2.91	-0.64	-0.42	3.07	-6.28	-8.88	-9.66	-4.04	7.20	5.71	3.80	8.85	-0.59
1970-94	0.10	-1.29	-0.05	1.06	0.24	3.25	0.86	0.70	2.13	-2.15	-1.70	0.48	-0.33	1.96	4.28	3.10	0.72	0.69

Appendix Table 10 Rural employment by state

States	1972-73	1977-78	1983	1987-88	1993-94	Annual growth rate
	(absolute number, thousand)					%
<i>Total Employment</i>						
Andhra Pradesh	22,686	23,292	24,992	22,685	27,594	0.94
Bihar	22,170	23,668	24,675	21,662	25,990	0.76
Gujarat	10,648	10,626	12,020	10,633	11,692	0.45
Haryana	4,090	3,671	3,776	3,368	3,460	-0.79
Karnataka	13,569	14,559	14,095	12,792	14,836	0.43
Kerala	7,681	8,809	7,202	6,724	7,052	-0.41
Madhya Pradesh	21,724	20,361	23,716	21,029	23,411	0.36
Maharashtra	21,191	21,778	23,738	21,328	23,926	0.58
Orissa	10,683	10,266	10,938	9,908	10,977	0.13
Punjab	5,148	4,499	4,488	4,349	4,549	-0.59
Rajasthan	14,728	13,206	14,600	13,911	15,128	0.13
Tamil Nadu	17,811	17,426	18,132	17,117	18,864	0.27
Uttar Pradesh	35,689	35,045	37,364	35,645	38,628	0.38
West Bengal	13,246	14,704	15,357	14,410	16,544	1.06
All India	221,064	221,910	235,094	215,563	242,649	0.44
<i>Agricultural Employment</i>						
Andhra Pradesh	17,831	18,704	18,594	16,810	20,861	0.75
Bihar	18,224	19,668	20,061	17,330	21,311	0.75
Gujarat	8,933	8,969	9,483	7,294	8,313	-0.34
Haryana	3,276	2,845	2,726	2,388	2,107	-2.08
Karnataka	11,561	12,113	11,501	10,183	11,691	0.05
Kerala	4,278	5,215	4,163	3,645	3,752	-0.62
Madhya Pradesh	19,638	18,162	20,680	17,937	20,415	0.18
Maharashtra	17,461	17,509	18,896	16,167	18,016	0.15
Orissa	8,717	8,715	8,553	7,421	8,639	-0.04
Punjab	4,087	3,500	3,479	2,992	3,098	-1.31
Rajasthan	12,431	10,895	11,826	9,070	10,529	-0.79
Tamil Nadu	13,430	12,878	12,493	11,160	12,073	-0.51
Uttar Pradesh	29,229	28,106	29,405	28,124	29,473	0.04
West Bengal	10,319	11,425	11,226	10,404	10,704	0.17
All India	179,417	178,704	183,087	160,925	180,981	0.04
<i>Non Agricultural Employment</i>						
Andhra Pradesh	4,855	4,589	6,398	5,875	6,733	1.57
Bihar	3,946	4,000	4,614	4,332	4,678	0.81
Gujarat	1,714	1,658	2,536	3,339	3,379	3.28
Haryana	814	826	1,050	980	1,353	2.45
Karnataka	2,008	2,446	2,593	2,610	3,145	2.16
Kerala	3,403	3,594	3,039	3,080	3,300	-0.15
Madhya Pradesh	2,085	2,199	3,036	3,091	2,997	1.74
Maharashtra	3,730	4,268	4,843	5,161	5,910	2.22
Orissa	1,966	1,550	2,384	2,487	2,338	0.83
Punjab	1,060	999	1,010	1,357	1,451	1.50
Rajasthan	2,298	2,311	2,774	4,841	4,599	3.36
Tamil Nadu	4,382	4,548	5,639	5,957	6,791	2.11
Uttar Pradesh	6,460	6,939	7,959	7,521	9,155	1.67
West Bengal	2,927	3,279	4,131	4,006	5,840	3.34
All India	41,648	43,206	52,006	54,638	61,669	1.89

Appendix Table 11 Changes in rural wages by state

	Andhra Pradesh	Bihar	Gujarat	Haryana	Karnataka	Kerala	MP	Maharashtra	Orissa	Punjab	Rajasthan	Tamil Nadu	UP	West Bengal
	Rupees/day, 1960/61 prices													
1970	1.74	1.21	1.77	3.42	1.24	2.05	1.05	1.45	1.00	3.55	2.13	1.47	1.38	1.45
1971	1.49	1.18	2.00	3.32	1.28	2.33	1.08	1.00	1.01	3.34	2.21	1.53	1.36	1.57
1972	1.39	1.08	1.66	2.97	1.22	2.22	1.01	1.07	0.97	3.00	2.00	1.43	1.29	1.68
1973	1.31	1.16	1.41	2.71	1.19	2.14	0.95	1.14	0.93	2.74	1.87	1.35	1.25	1.77
1974	1.16	1.05	1.17	2.55	0.99	1.78	0.81	0.95	0.76	2.60	1.52	1.08	1.11	1.56
1975	1.38	1.46	1.62	2.79	1.23	2.03	1.09	0.98	0.91	2.97	1.93	1.35	1.78	1.93
1976	1.53	1.78	2.20	2.87	1.51	2.33	1.26	1.10	1.26	3.28	2.52	1.33	1.88	2.00
1977	1.51	1.53	2.02	3.14	1.67	2.40	1.19	1.15	1.20	3.13	2.43	1.31	1.49	2.17
1978	1.78	1.53	2.14	3.32	1.70	2.45	1.25	1.30	1.24	3.19	2.39	1.47	1.63	2.20
1979	1.76	1.43	1.99	3.18	1.59	2.58	1.13	1.27	1.12	3.05	2.27	1.56	1.54	2.11
1980	1.71	1.37	1.90	2.84	1.42	2.83	1.08	1.16	1.09	2.80	2.24	1.52	1.36	2.02
1981	1.99	1.61	2.16	3.27	1.52	3.26	1.30	1.34	1.23	2.96	2.46	1.63	1.54	2.14
1982	2.27	1.85	2.43	3.69	1.61	3.69	1.53	1.53	1.37	3.12	2.68	1.74	1.72	2.25
1983	1.15	0.90	1.36	2.17	0.95	1.36	0.80	0.81	0.72	2.09	1.61	0.83	1.02	1.38
1984	2.29	1.87	2.69	3.42	1.35	2.83	1.57	1.82	1.45	3.21	2.41	1.72	1.96	2.04
1985	2.51	2.02	2.89	3.38	1.47	3.11	1.61	2.45	1.47	3.35	2.86	1.91	1.97	2.79
1986	2.79	2.07	2.78	3.66	1.62	3.05	1.84	2.59	1.43	3.65	3.47	1.86	2.18	2.91
1987	2.60	2.02	2.39	3.48	1.80	3.28	1.77	2.64	1.35	2.99	3.27	1.75	1.96	2.98
1988	2.52	2.05	2.56	3.35	2.05	3.74	1.74	2.51	1.57	3.76	3.77	1.90	1.96	3.22
1989	3.00	2.08	2.48	3.76	2.27	3.87	1.84	2.43	1.80	3.83	3.52	1.98	2.41	3.23
1990	2.89	2.21	2.29	4.00	2.36	3.75	2.00	2.53	1.82	3.94	3.52	2.23	2.45	3.16
1991	2.45	1.96	2.10	4.17	1.72	3.82	1.88	2.07	1.78	4.02	3.42	2.39	2.32	3.01
1992	2.50	1.90	2.31	4.34	1.53	4.27	2.11	2.32	1.97	4.38	3.31	2.64	2.65	3.40
1993	2.56	2.07	2.21	4.16	1.92	4.18	3.10	2.66	2.04	4.22	2.73	2.83	2.35	3.24
<i>Annual Growth Rate (%)</i>														
1970-79	0.17	1.83	1.30	-0.82	2.81	2.58	0.79	-1.42	1.29	-1.67	0.69	0.63	1.28	4.26
1980-89	6.45	4.73	3.01	3.16	5.34	3.54	6.15	8.63	5.76	3.55	5.14	2.97	6.57	5.34
1990-93	-4.01	-2.13	-1.20	1.35	-6.68	3.68	15.78	1.68	3.88	2.30	-8.10	8.26	-1.27	0.77
1970-93	1.70	2.35	0.97	0.86	1.92	3.14	4.82	2.67	3.15	0.75	1.09	2.89	2.36	3.56

Appendix Table 12 Poverty changes by state, head-count ratio

	Andhra Pradesh	Assam	Bihar	Gujarat	Haryana	HP	J&K	Karnataka	Kerala	MP	Maharashtra	Orissa	Punjab	Rajasthan	Tamil Nadu	UP	West Bengal	All India
	(million 1960/61 rupees)																	
1951	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	47
1952	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	46
1953	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	58
1954	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	64
1955	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	50
1956	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	59
1957	64	37	65	n.a.	33	n.a.	n.a.	49	67	63	n.a.	65	33	51	73	55	53	59
1958	67	39	66	65	28	n.a.	n.a.	54	69	56	71	56	28	49	66	51	48	53
1959	64	43	62	56	33	n.a.	n.a.	58	71	52	58	62	33	40	71	38	50	51
1960	64	32	47	50	32	n.a.	37	47	69	51	60	62	32	57	65	41	32	45
1961	59	43	57	57	31	n.a.	40	45	59	48	58	47	31	56	57	34	50	47
1962	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	48
1963	60	36	55	60	34	n.a.	35	58	63	45	58	58	34	50	54	49	56	49
1964	55	35	60	69	36	n.a.	37	63	69	50	72	61	36	56	65	57	57	54
1965	62	45	68	68	38	n.a.	33	73	80	57	71	60	38	55	67	51	64	58
1966	63	62	80	69	39	n.a.	42	68	77	68	76	63	39	63	71	59	68	64
1967	63	55	77	65	44	n.a.	30	67	74	71	72	63	44	60	66	65	76	64
1968	61	63	68	58	32	n.a.	24	60	74	66	69	70	32	67	68	50	70	59
1969	57	49	66	66	36	n.a.	27	46	78	64	69	66	36	69	70	54	60	59
1970	57	51	67	61	31	n.a.	21	59	73	62	62	65	32	65	63	45	63	55
1971	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	55
1972	64	58	69	61	26	n.a.	34	57	67	65	81	67	25	63	59	56	61	55
1973	56	56	70	58	34	27	52	61	62	66	65	59	35	59	59	56	63	56
1974	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1975	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1976	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1977	48	64	66	55	28	33	43	54	53	65	79	63	25	54	58	45	56	51
1978	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1979	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1980	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1981	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1982	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1983	38	46	70	39	21	17	28	45	44	53	55	57	22	49	55	45	49	45
1984	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1985	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1986	34	44	56	43	25	n.a.	31	46	40	54	54	45	23	46	45	36	34	39
1987	34	43	59	43	16	16	31	43	35	48	52	48	20	50	48	41	35	39
1988	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	39
1989	32	42	59	37	16	n.a.	21	54	39	45	46	39	14	40	42	31	26	34
1990	37	42	58	43	21	n.a.	43	43	34	48	43	27	19	39	42	37	39	36



Appendix Table 12 (continued)

1991	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	37
1992	42	57	67	47	20	n.a.	n.a.	57	34	56	61	37	18	51	47	47	28	43	
1993	29	49	64	47	28	30	30	41	31	45	48	40	25	48	37	42	27	37	
<i>Annual Growth Rate (%)</i>																			
1957-93	-2.18	0.76	-0.08	-0.96	-0.49	0.51	-10.45	-0.48	-2.11	-0.90	-1.11	-1.32	-0.78	-0.18	-1.88	-0.77	-1.82	-1.30	

Notes: Growth rates for Gujarat, HP, J&K, and Maharashtra are calculated between the first year when the data are available and 1993.

Appendix Table 13 Population under poverty line by state

	Andhra Pradesh	Assam	Bihar	Gujarat	Haryana	HP	J&K	Karnataka	Kerala	MP	Maharashtra	Orissa	Punjab	Rajasthan	Tamil Nadu	UP	West Bengal	All India
1960	18,921	3,660	20,135	7,649	2,011	n.a.	1,160	8,687	9,851	14,126	17,031	10,147	2,742	9,698	16,082	26,586	8,539	177,022
1961	17,696	4,958	24,613	8,948	2,025	n.a.	1,279	8,324	8,684	13,660	16,901	7,861	2,738	9,650	14,342	22,811	13,560	178,050
1962	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1963	18,668	4,375	24,495	9,823	2,314	n.a.	1,155	11,199	9,694	13,482	17,401	10,119	3,074	9,027	13,911	33,726	15,761	198,224
1964	17,511	4,291	27,285	11,538	2,532	n.a.	1,235	12,432	10,875	15,248	22,107	10,910	3,336	10,319	16,973	39,353	16,383	222,327
1965	20,070	5,582	31,355	11,596	2,769	n.a.	1,141	14,619	12,776	17,782	22,169	10,875	3,616	10,433	17,762	35,708	19,097	237,350
1966	20,713	7,897	37,863	12,149	2,862	n.a.	1,478	13,883	12,669	21,510	24,194	11,623	3,705	12,224	19,163	42,318	20,602	264,853
1967	21,192	7,131	37,083	11,649	3,366	n.a.	1,078	13,989	12,408	23,069	23,679	11,955	4,320	11,892	17,990	46,941	23,574	271,314
1968	20,856	8,286	33,065	10,688	2,533	n.a.	867	12,741	12,621	21,798	23,093	13,516	3,223	13,631	18,855	37,040	22,156	254,968
1969	19,829	6,615	32,900	12,355	2,860	n.a.	1,011	10,061	13,669	21,701	23,337	12,982	3,608	14,285	19,734	40,171	19,593	254,713
1970	20,065	6,937	34,128	11,785	2,559	n.a.	819	13,022	12,990	21,718	21,499	12,953	3,279	13,855	18,205	34,300	20,864	248,977
1971	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1972	23,385	8,280	36,493	12,274	2,249	n.a.	1,377	13,010	12,310	23,509	29,117	13,889	2,722	14,157	17,469	43,775	20,971	274,988
1973	20,868	8,106	37,504	11,909	3,020	n.a.	2,146	14,023	11,638	24,413	23,638	12,369	3,822	13,622	17,729	44,788	22,405	272,001
1974	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1975	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1976	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1977	19,044	10,004	39,040	12,473	2,691	n.a.	1,921	13,821	10,582	25,991	31,123	14,128	2,994	13,799	18,398	39,577	21,762	277,347
1978	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1979	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1980	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1981	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1982	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1983	16,538	7,934	45,924	9,676	2,229	n.a.	1,444	12,510	9,148	23,647	23,611	13,976	2,764	14,334	18,627	43,647	21,217	267,226
1984	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1985	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1986	15,651	8,276	39,704	11,028	2,929	n.a.	1,705	13,619	8,401	25,930	24,720	11,701	3,079	14,419	15,831	37,865	15,766	250,626
1987	15,946	8,205	42,043	11,267	1,925	n.a.	1,752	13,047	7,370	23,268	24,400	12,665	2,759	16,269	17,308	44,129	16,460	258,812
1988	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1989	15,442	8,321	43,791	9,974	1,945	n.a.	1,255	16,873	8,320	22,671	21,972	10,798	2,018	13,690	15,412	34,605	12,886	239,973
1990	18,196	8,591	44,479	11,811	2,601	n.a.	2,617	13,460	7,260	24,780	21,133	7,546	2,687	13,475	15,617	41,827	19,645	255,725
1991	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1992	21,320	11,941	53,473	13,180	2,650	n.a.	2,500	18,525	7,387	30,187	30,799	10,508	2,714	18,422	17,778	55,131	14,738	311,252
1993	15,003	10,539	51,551	13,365	3,762	n.a.	2,002	13,548	6,744	24,898	24,729	11,764	3,836	17,584	14,175	50,132	14,570	278,203
<i>Annual Growth Rate (%)</i>																		
1960-93	-0.70	3.26	2.89	1.71	1.92	n.a.	1.67	1.36	-1.14	1.73	1.14	0.45	1.02	1.82	-0.38	1.94	1.63	1.38

Appendix Table 14 Poor population concentration by state

	Andhra Pradesh	Assam	Bihar	Gujarat	Haryana	HP	J&K	Karnataka	Kerala	MP	Maharashtra	Orissa	Punjab	Rajasthan	Tamil Nadu	UP	West Bengal	All India
1960	10.7	2.1	11.4	4.3	1.1	0.0	0.7	4.9	5.6	8.0	9.6	5.7	1.5	5.5	9.1	15.0	4.8	100
1961	9.9	2.8	13.8	5.0	1.1	0.0	0.7	4.7	4.9	7.7	9.5	4.4	1.5	5.4	8.1	12.8	7.6	100
1962	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1963	9.4	2.2	12.4	5.0	1.2	0.0	0.6	5.6	4.9	6.8	8.8	5.1	1.6	4.6	7.0	17.0	8.0	100
1964	7.9	1.9	12.3	5.2	1.1	0.0	0.6	5.6	4.9	6.9	9.9	4.9	1.5	4.6	7.6	17.7	7.4	100
1965	8.5	2.4	13.2	4.9	1.2	0.0	0.5	6.2	5.4	7.5	9.3	4.6	1.5	4.4	7.5	15.0	8.0	100
1966	7.8	3.0	14.3	4.6	1.1	0.0	0.6	5.2	4.8	8.1	9.1	4.4	1.4	4.6	7.2	16.0	7.8	100
1967	7.8	2.6	13.7	4.3	1.2	0.0	0.4	5.2	4.6	8.5	8.7	4.4	1.6	4.4	6.6	17.3	8.7	100
1968	8.2	3.2	13.0	4.2	1.0	0.0	0.3	5.0	4.9	8.5	9.1	5.3	1.3	5.3	7.4	14.5	8.7	100
1969	7.8	2.6	12.9	4.9	1.1	0.0	0.4	4.0	5.4	8.5	9.2	5.1	1.4	5.6	7.7	15.8	7.7	100
1970	8.1	2.8	13.7	4.7	1.0	0.0	0.3	5.2	5.2	8.7	8.6	5.2	1.3	5.6	7.3	13.8	8.4	100
1971	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1972	8.5	3.0	13.3	4.5	0.8	0.0	0.5	4.7	4.5	8.5	10.6	5.1	1.0	5.1	6.4	15.9	7.6	100
1973	7.7	3.0	13.8	4.4	1.1	0.0	0.8	5.2	4.3	9.0	8.7	4.5	1.4	5.0	6.5	16.5	8.2	100
1974	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1975	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1976	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1977	6.9	3.6	14.1	4.5	1.0	0.0	0.7	5.0	3.8	9.4	11.2	5.1	1.1	5.0	6.6	14.3	7.8	100
1978	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1979	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1980	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1981	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1982	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1983	6.2	3.0	17.2	3.6	0.8	0.0	0.5	4.7	3.4	8.8	8.8	5.2	1.0	5.4	7.0	16.3	7.9	100
1984	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1985	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1986	6.2	3.3	15.8	4.4	1.2	0.0	0.7	5.4	3.4	10.3	9.9	4.7	1.2	5.8	6.3	15.1	6.3	100
1987	6.2	3.2	16.2	4.4	0.7	0.0	0.7	5.0	2.8	9.0	9.4	4.9	1.1	6.3	6.7	17.1	6.4	100
1988	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1989	6.4	3.5	18.2	4.2	0.8	0.0	0.5	7.0	3.5	9.4	9.2	4.5	0.8	5.7	6.4	14.4	5.4	100
1990	7.1	3.4	17.4	4.6	1.0	0.0	1.0	5.3	2.8	9.7	8.3	3.0	1.1	5.3	6.1	16.4	7.7	100
1991	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1992	6.8	3.8	17.2	4.2	0.9	0.0	0.8	6.0	2.4	9.7	9.9	3.4	0.9	5.9	5.7	17.7	4.7	100
1993	5.4	3.8	18.5	4.8	1.4	0.0	0.7	4.9	2.4	8.9	8.9	4.2	1.4	6.3	5.1	18.0	5.2	100
<i>Annual Growth Rate (%)</i>																		
1960-93	-2.05	1.85	1.49	0.32	0.53	n.a.	0.29	-0.02	-2.49	0.35	-0.24	-0.92	-0.35	0.43	-1.74	0.55	0.25	0.00

Figure 1 Changes of poverty in India

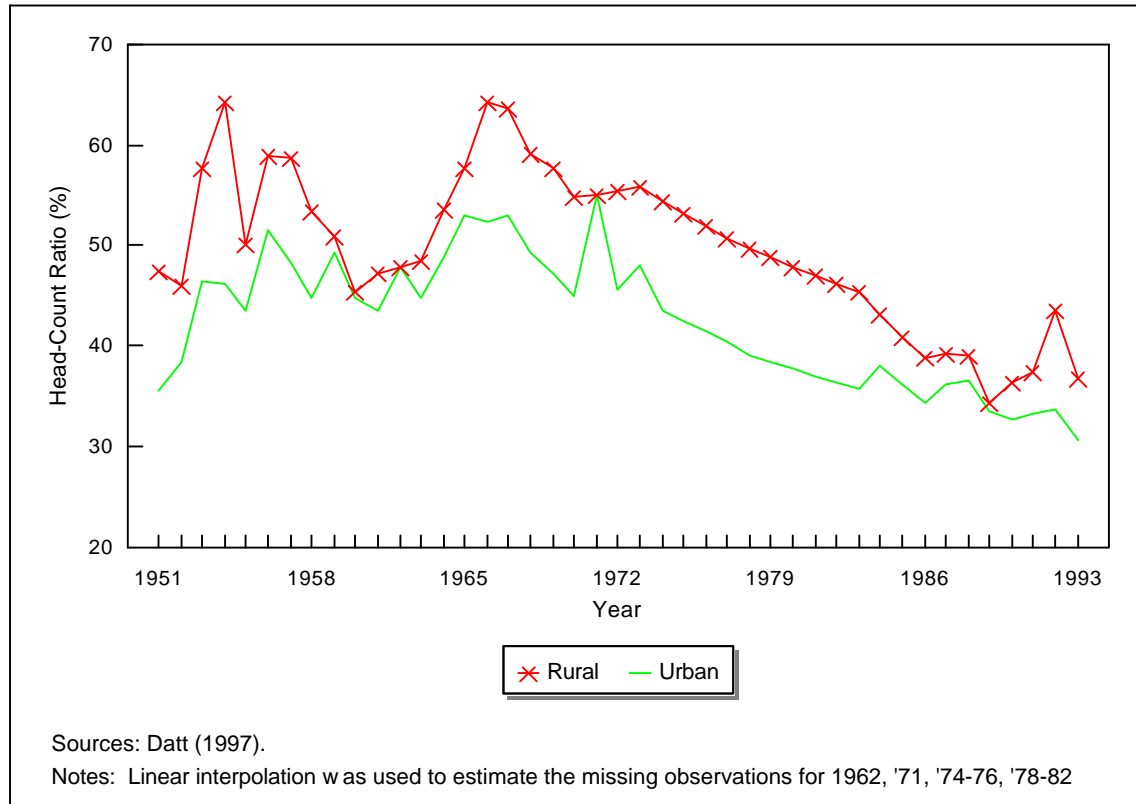


Figure 2 Composition of government expenditure in India

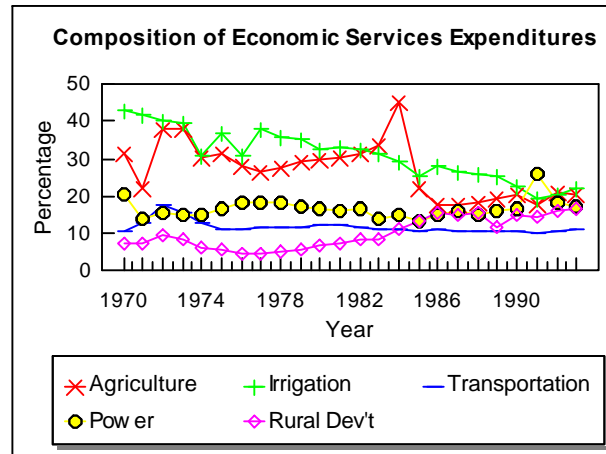
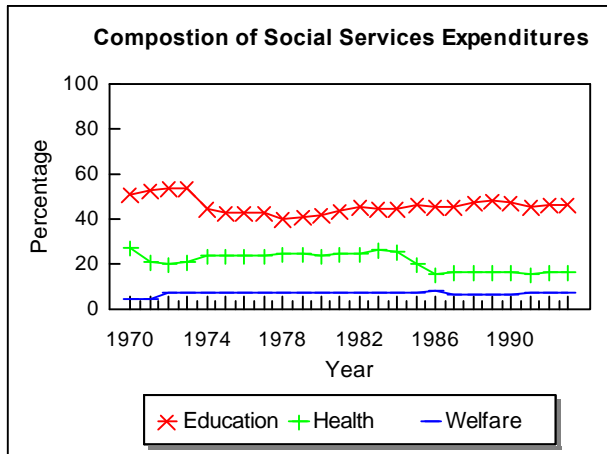
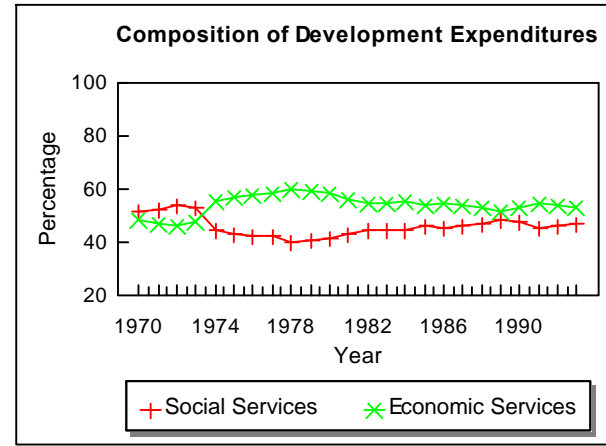
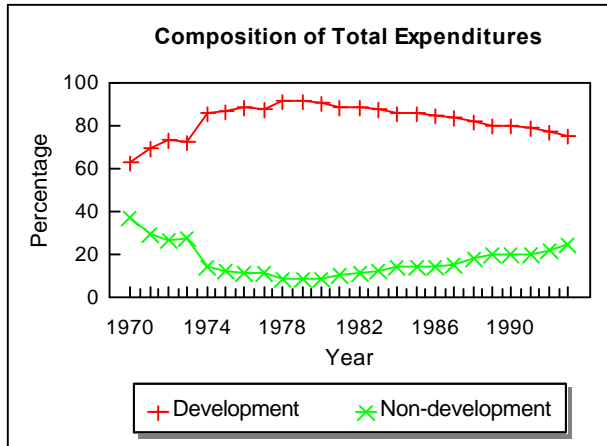


Figure 3 Current vs. capital expenditure (1960/61 constant million rupees)

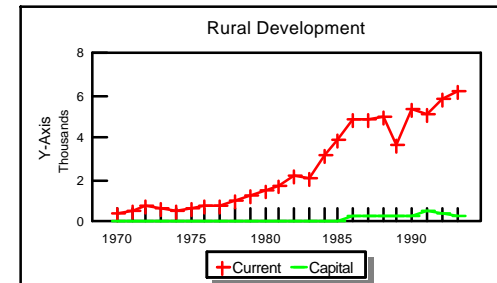
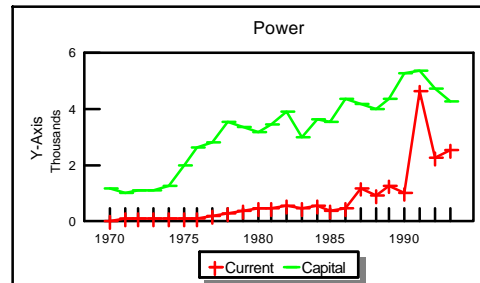
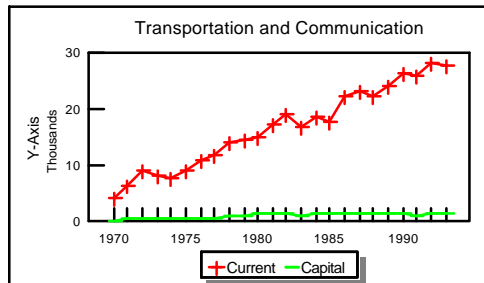
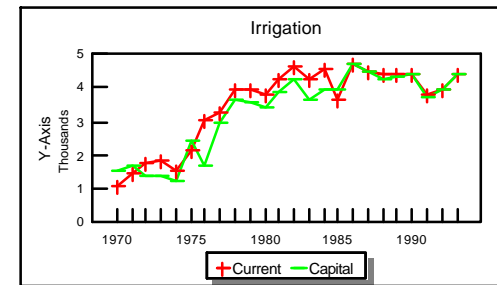
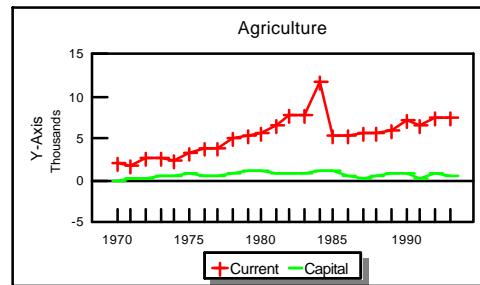
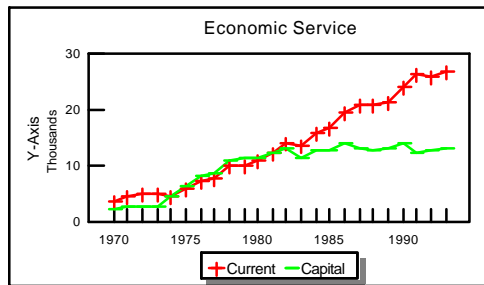
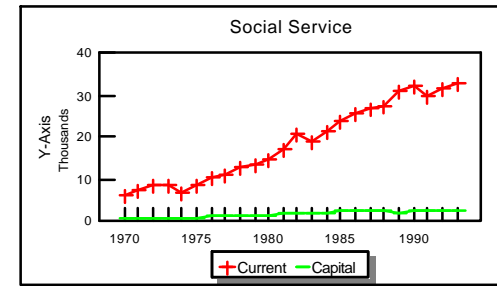
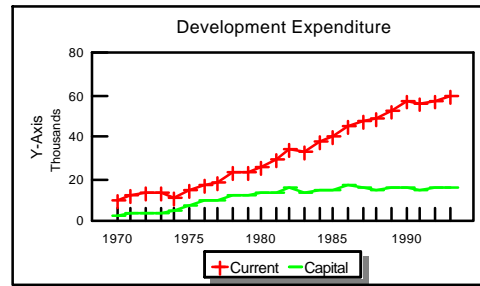
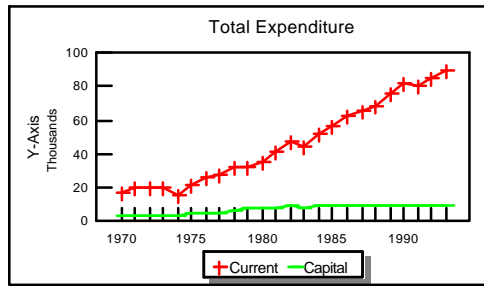


Figure 4 Technology, infrastructure, production and productivity

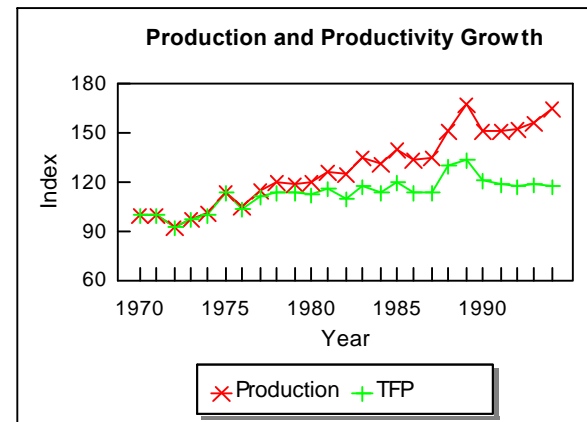
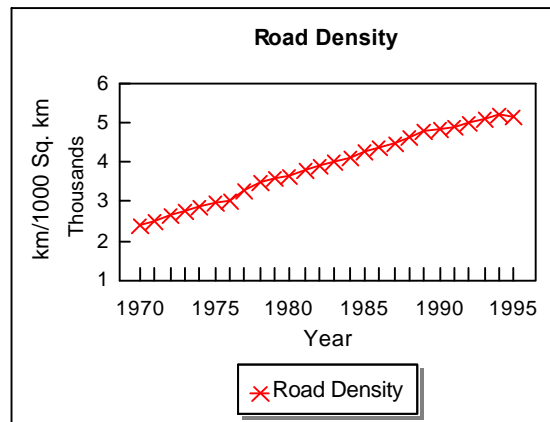
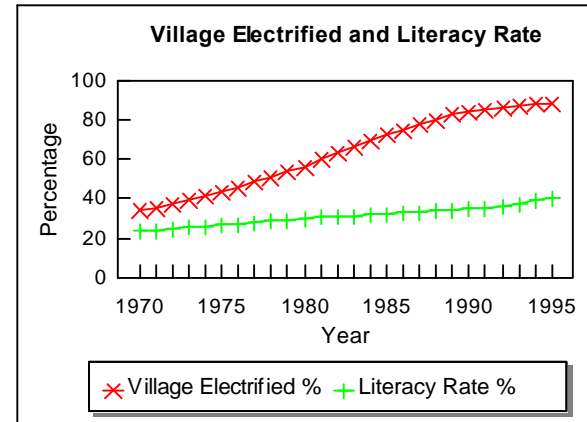
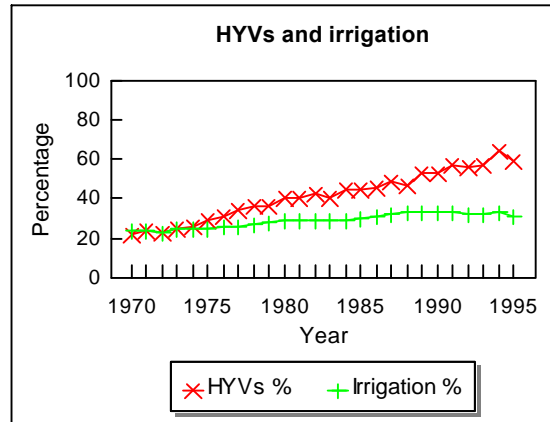
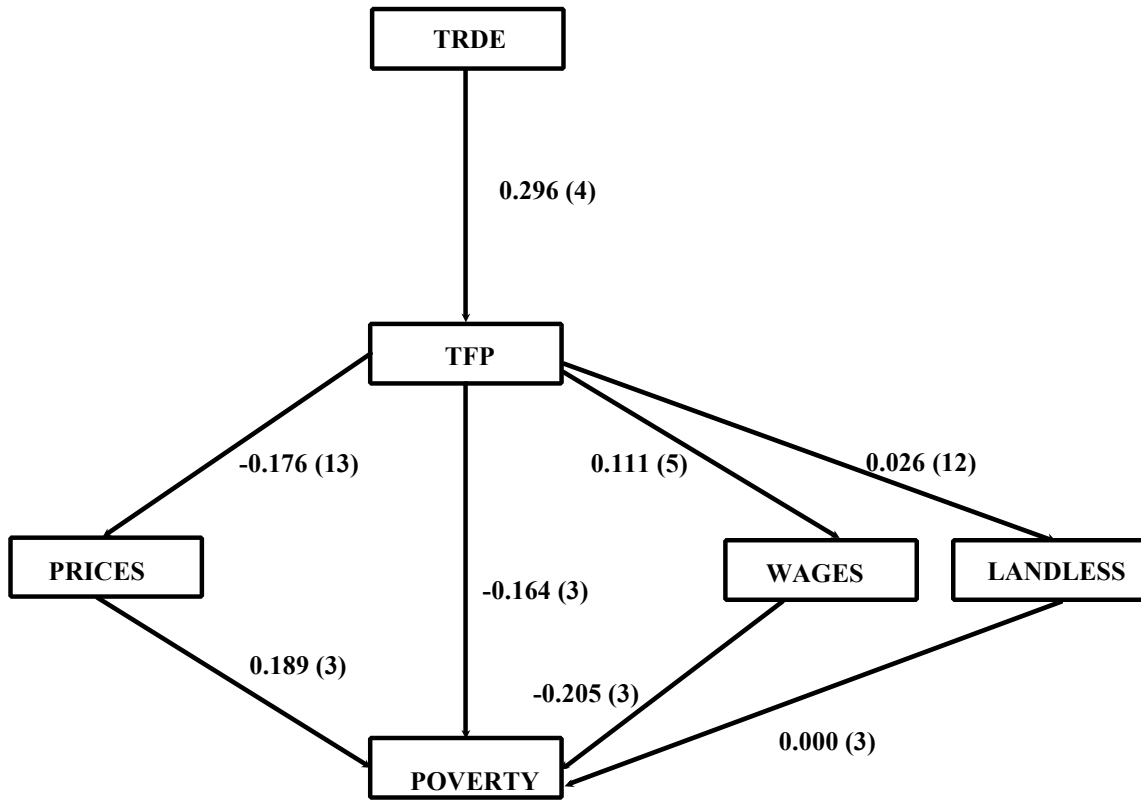


Figure 6 Poverty effects of governmental expenditures in agricultural R&amp;D



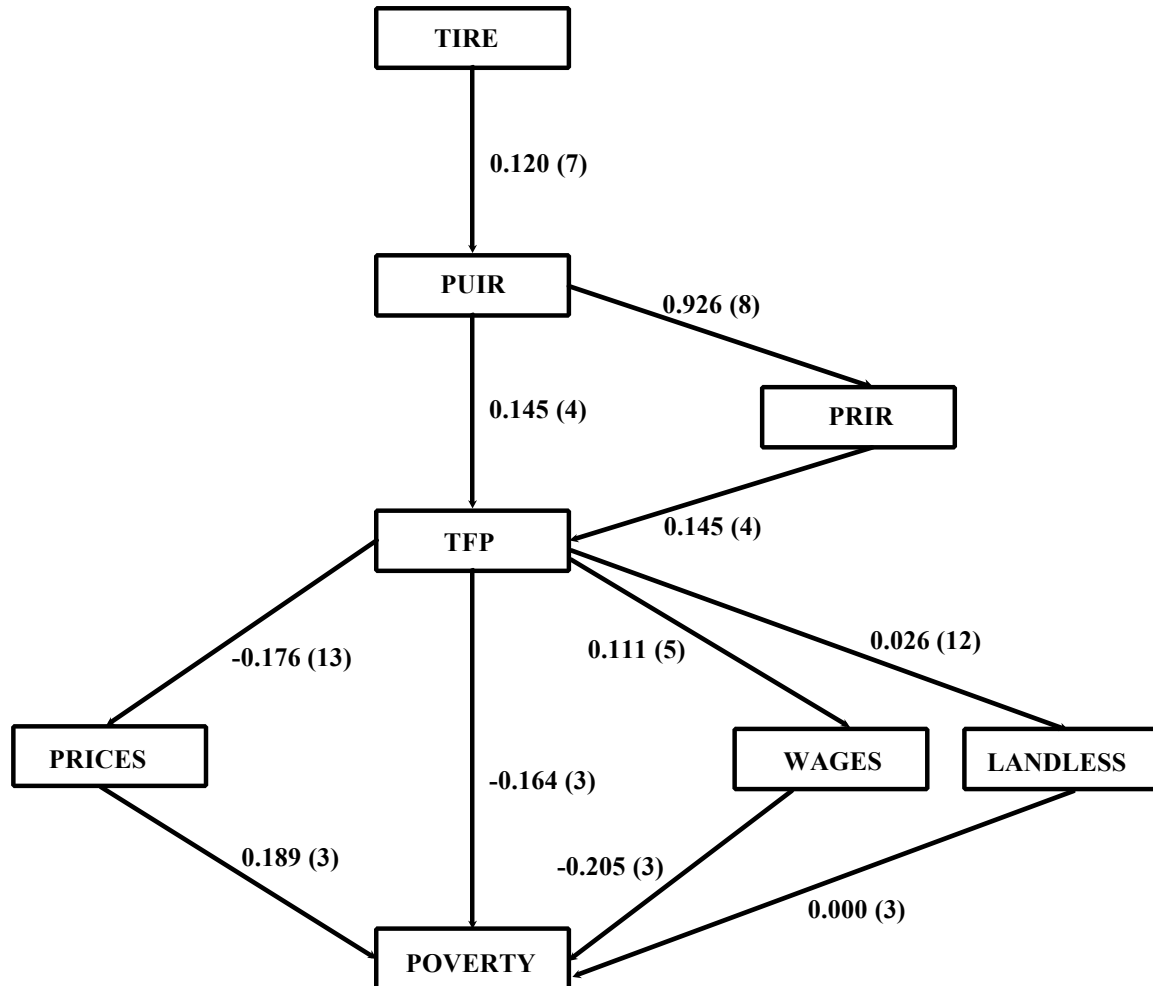
$$\text{Total poverty effects } \frac{dP}{dTRDE} = -0.065$$

Effects on poverty (%) per billion rupees = -0.48

Note: Numbers in parentheses correspond to equation numbers in table 5.



Figure 7 Poverty effects of governmental expenditures in irrigation

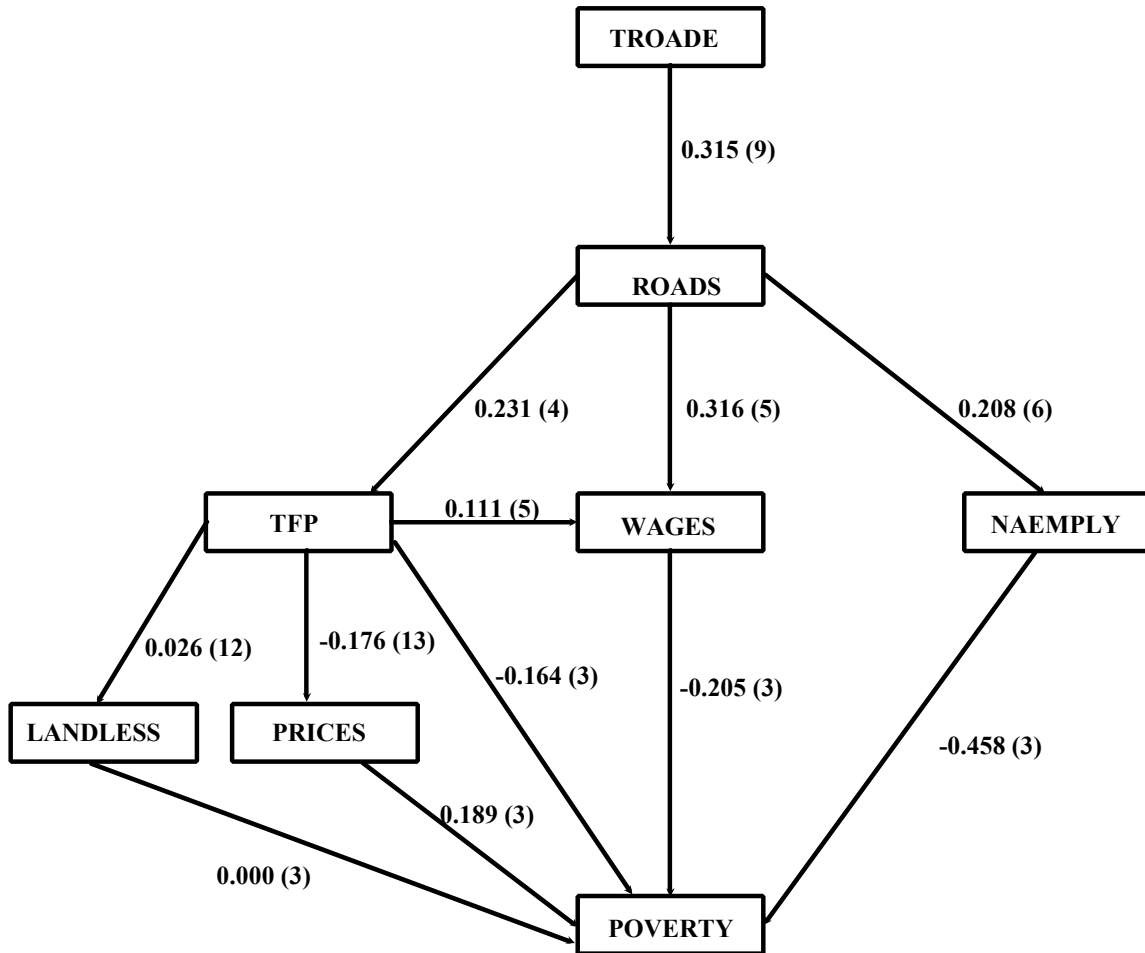


$$\text{Total poverty effects } \frac{dP}{dTIRE} = -0.007$$

Effects on poverty (%) per billion rupees = -0.04

Note: Numbers in parentheses correspond to equation numbers in table 5.

Figure 8 Poverty effects of governmental expenditures in roads

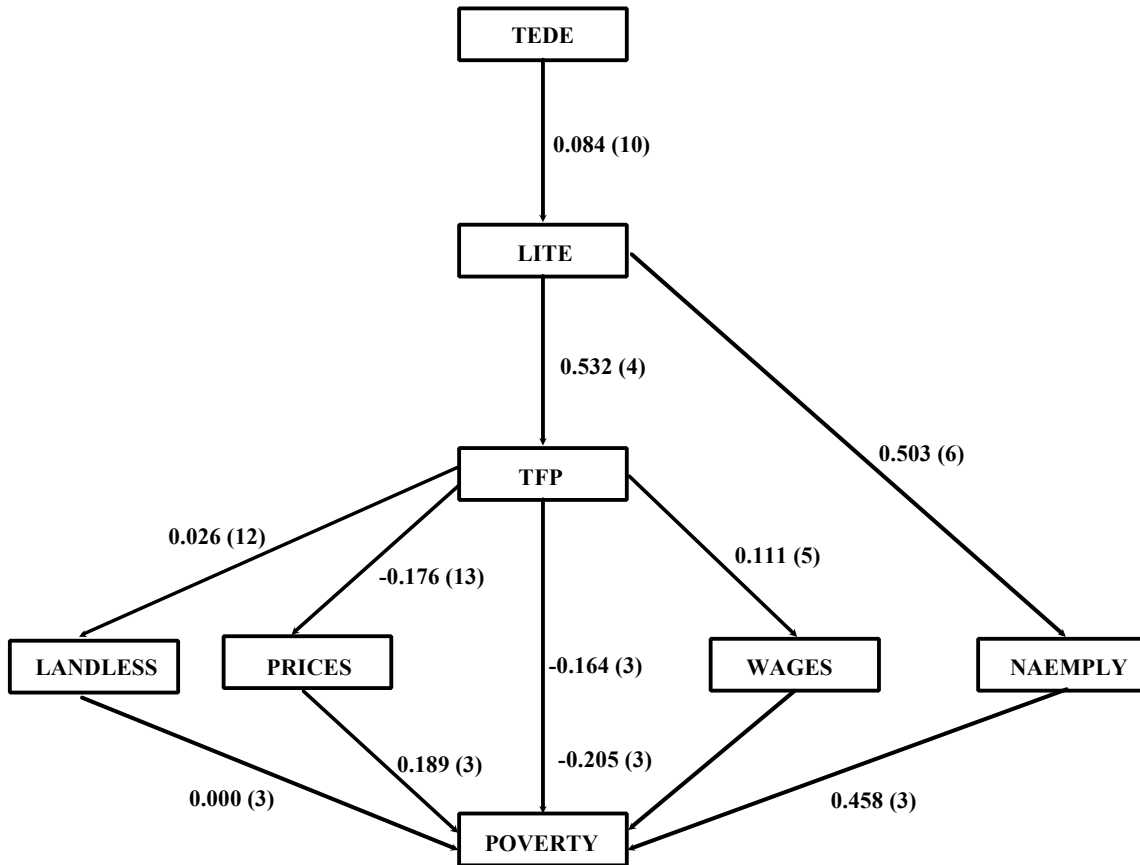


$$\text{Total poverty effects } \frac{dP}{dTROADE} = -0.066$$

Effects on poverty (%) per billion rupees = -0.87

Note: Numbers in parentheses correspond to equation numbers in table 5.

Figure 9 Poverty effects of governmental expenditures in education

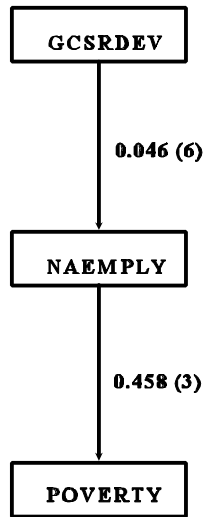


$$\text{Total poverty effects } \frac{dP}{dTEDE} = -0.054$$

Effects on poverty (%) per billion rupees = -0.17

Note: Numbers in parentheses correspond to equation numbers in table 5.

**Figure 10 Poverty effects of governmental expenditures in rural and community development**

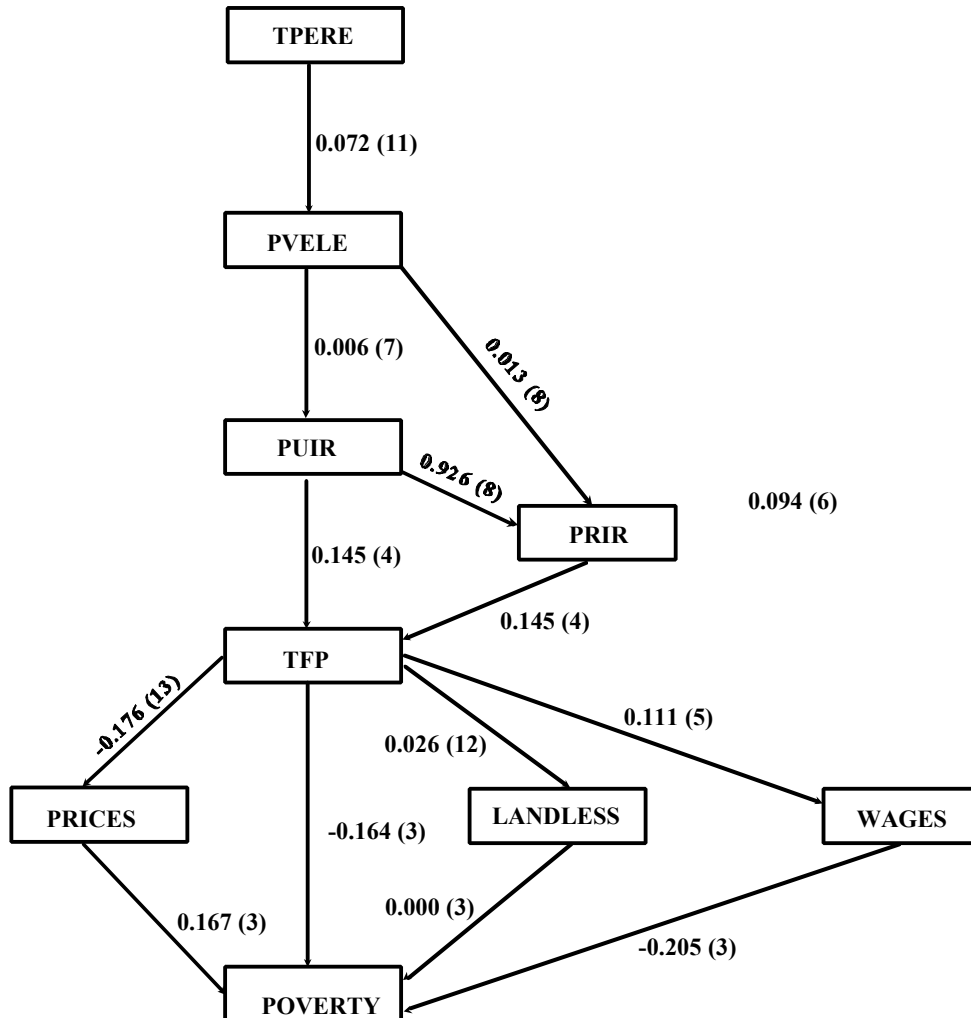


$$\text{Total poverty effects } \frac{dP}{dGCSRDEV} = -0.021$$

**Effects on poverty (%) per billion rupees = -0.15**

**Note: Numbers in parentheses corresponding to equation numbers in table 5.**

Figure 11 Poverty effects of governmental expenditures in power

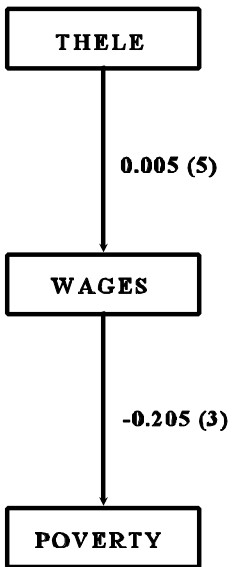


$$\text{Total poverty effects } \frac{dP}{dTPERE} = -0.002$$

Effects on poverty (%) per billion rupees = -0.15

Note: Numbers in parentheses correspond to equation numbers in table 5.

Figure 12 Poverty effects of governmental expenditures in health

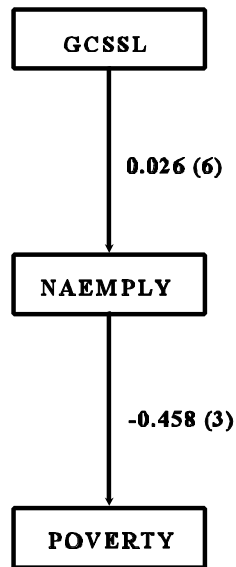


$$\text{Total poverty effects } \frac{dP}{d\text{THELE}} = -0.001$$

Effects on poverty (%) per billion rupees = -0.02

Note: Numbers in parentheses correspond to equation numbers in table 5.

Figure 13 Poverty effects of governmental expenditures in soil and water conservation



$$\text{Total poverty effects } \frac{dP}{dGCSSL} = -0.004$$

Effects on poverty (%) per billion rupees = -0.035

Note: Numbers in parentheses correspond to equation numbers in table 5.

## REFERENCES

- Ahluwalia, Montek S. 1978. Rural poverty and agricultural performance in India. *Journal of Development Studies* 14 (3) (April): 298-323.
- Ahluwalia, Montek S. 1985. Rural poverty, agricultural production, and prices: A reexamination. In *Agricultural change and rural poverty*, ed. J. Mellor and G. Desai. Baltimore, Md., U.S.A.: Johns Hopkins University Press.
- Alston, J., G. Norton, and P. Pardey. 1985. *Science under scarcity*. Ithaca, N.Y.: Cornell University Press.
- Bardhan, K. Pranab. 1973. On the incidence of poverty in rural India in the sixties. *Economic and Political Weekly* 4, 5 and 6 (February).
- Bell, Clive and Robert Rich. 1994. Rural poverty and aggregate agricultural performance in post-independence India. *Oxford Bulletin of Economics and Statistics* 56 (2) (May): 111-133.
- Bhagwati, Jagdish. 1988. Poverty and Public Policy. *World Development* 16 (5): 539-555.
- Bhalla, Sheila. 1997. The rise and fall of workforce diversification process in rural India. In *Growth employment and poverty change and continuity in rural India*, ed. G. K. Chadha and Alakh N. Sharma. Delhi, India: Indian Society of Labour Economics.
- Binswanger, Hans, S. Khandker, and M. Rosenzweig, M. 1989. How infrastructure and financial institutions affect agricultural output and investment in India. World Bank Working Paper No. 163. Washington, D.C.: World Bank.
- Dantwala, M. L. 1993. Rural employment: Facts and issues. In *Labour, employment and industrial relations in India*, ed. T. S. Papola et al. Delhi, India: Indian Society of Labour Economics.
- Datt, Gaurav and Martin Ravallion. 1997. Why have some Indian states performed better than others at reducing rural poverty? FCND Discussion Paper No. 26. Washington, D.C.: International Food Policy Research Institute.
- Desai, Gunvant M. 1985. Trends in rural poverty in India: An interpretation of Dharam Narain. In *Agricultural change and rural poverty*, ed. John Mellor and Gunvant Desai. Baltimore, Md., U.S.A.: Johns Hopkins University Press.
- Dev, S. Mahendra. 1988. Poverty of agricultural labour households in India: A state level analysis. *Indian Journal of Agricultural Economics* 43 (1) (January - March).



- Dutta, Bhaskar. 1996. Economic reform and the poor. In *Poverty and unemployment*, ed. K. Raghav and Leena Sekhar. India: New Age International Ltd. Publishers.
- Fan, Shenggen. 1997. Production and productivity growth in Chinese agriculture: New measurement and evidence. *Food Policy* 22 (3): 213-228.
- Fan, Shenggen, and Philip Pardey. 1997. Government spending on Asian agriculture: Trends and production consequence. Resource paper presented in the study meeting on *Agricultural Public Finance Policy* organized by Asian Productivity Organization, Taipei, June 4-12.
- Gaiha, Raghav. 1987. Impoverishment Technology and growth in rural India. *Journal of Economics* 11: 23-46.
- Gaiha, Raghav. 1987. Poverty, agricultural growth and prices in rural India - A critique and an extension. *Development and Change* 18: 557-594.
- Gaiha, Raghav. 1989. Poverty, agricultural production and price fluctuations in rural India - A reformulation. *Cambridge Journal of Economics* 13 (2): 333-352.
- Gaiha, Raghav and Anil Delaliker. 1993. Persistent, expected and innate poverty: Estimated for semi-arid rural south India. *Journal of Economics* 17: 409-421.
- Ghose, Ajit Kumar. 1989. Rural poverty and relative prices in India. *Journal of Economics* 13: 307-331.
- Ghose, Madhusudhan. 1994. Rural poverty, foodgrains productivity and some related aspects in India. *Agricultural Situation* (May).
- Griffin, Keith and Ajit Kumar Ghose. 1979. Growth and impoverishment in the rural areas of Asia. *World Development* 7 (4/5): 361-384.
- Hazell, Peter B. R. and S. Fan. 1998. Balancing regional development priorities to achieve sustainable and equitable agricultural growth. Paper prepared for the American Agricultural Economics Association International Conference on Agricultural Intensification, Economic Development and the Environment, July 31 - August 1, 1998, Salt Lake City, Ut., U.S.A.
- Hazell, P. B. R. and S. Haggblade. 1991. Rural-urban growth linkages in India. *Indian Journal of Agricultural Economics* 46 (4): 515-29.
- India, Planning Commission. 1993. Report of the expert group on estimation of proportion and number of poor. Planning Commission, Joidh Bhavan, Delhi, India.

- India, Press Information Bureau. 1997. Estimate of Poverty.
- Jain, L. R. and Suresh D. Tendulkar. 1990. Role of growth and distribution in the observed change in head-count ration measure of poverty: A decomposition exercise for India. *Indian Economic Review* 25 (2).
- Jain, L. R. et al. 1988. Dimensions of rural poverty: An inter-regional profile. *Economic and Political Weekly* (November).
- Jose, A. V. 1974. Trends in real wage rates of agricultural labourers. *Economic and Political Weekly* 9 (March 30): A25-A30.
- Kakwani, N. and K. Subbarao. 1990. Poverty and its alleviation in India. *Economic and Political Weekly* 13 (March 31).
- Kanwaldeep, Singh. 1996. New methodology doubles poverty figures. *Times of India* (November 8).
- Lakdawala, D. T. 1993. Growth, unemployment and poverty. In *Labour, employment and industrial relations in India*, ed. T. S. Papola et al. Delhi, India: Indian Society of Labour Economics.
- Lal, Deepak. 1976. Agricultural growth, real wages and the rural poor in India. *Economic and Political Weekly* (June 26).
- Mellor, N. John and Gunvant M. Desai. 1986. *Agricultural change and rural poverty*. Baltimore, Md., U.S.A.: Johns Hopkins University Press.
- Minhas, B. S. and Grace Majumdar. 1987. Unemployment and casual labour in India: An analysis of recent NSS data. *Indian Journal of Industrial Relating* 22 (3) (January).
- Misra, V. N., and Peter B. R. Hazell. 1996. Terms of trade, rural poverty, technology and investment: The Indian experience, 1952-53 to 1990-91. *Economic and Political Weekly* 31 (13): A2-A13.
- Mukherjee, Anindita. 1996. Poverty and unemployment in urban India: Trends, issues and perspectives. In *Poverty and unemployment*, ed. K. Raghav and Leena Sekhar. India: New Age International Ltd. Publishers.
- Ninan, K. N. 1994. Poverty and income distribution in India. *Economic and Political Weekly* 29 (25) (June 18).
- Ninan, K. N. 1995. Reforms and the poor - failure of the safety net. *The Business Line* (The Hindu) (May 29): 8.

- Otsuka, Keijiro, Hiroyuki Chuma and Yujiro Hayami. 1993. Permanent labour and land tenancy contracts in agrarian economics: An integrated analysis. *Economica* 60 (237): 57-77.
- Pardey, P.G. and B. Craig. 1989. Casual relationships between public sector agricultural research expenditures and output. *American Journal of Agricultural Economics* (February): 9-19.
- Parthasarathy, G. 1987. Changes in the incidence of rural poverty and recent trends in some aspects of agrarian economy. *Indian Journal of Agricultural Economics* 42 (1) (January - March): 1-21.
- Raj, K. N. 1976. Trends in rural unemployment in India an analysis with reference to conceptual and measurement problems. *Economic and Political Weekly* (August).
- Rao, Hanumantha C. H. 1977. Agricultural growth and rural poverty: Some lessons from past experience. *Economic and Political Weekly* (August).
- Rao, Hanumantha C. H. 1986. Changes in rural poverty in India: Implications for agricultural growth. *Mainstream* (January 11).
- Rao, G. M. and Tapassen. 1993. Government expenditure in India level growth and composition. National Institute of Public Finance and Policy, Delhi, India.
- Ravallion, Martin and Gaurav Datt. 1995. Growth and poverty in rural India, World Bank Policy Research Working Paper. Washington, D.C.: World Bank.
- Ravishankar, V. J. 1990. Public spending and investment in Indian agriculture: Composition, trends, and key issues. World Bank, Washington, D.C. Mimeo.
- Saith, Ashwani. 1981. Production, prices and poverty in rural India. *Journal of Development Studies* 19 (2): 196-214.
- Sen, Abhijit. 1997. Agricultural Growth and Rural Poverty. In *Growth employment and poverty change and continuity in rural India*, ed. G. K. Chadha and Alakh N. Sharma. Delhi, India: Indian Society of Labour Economics.
- Shergill, H. S. 1989. Agrarian structure as a factor in rural poverty: Some cross-section evidence. *Economic and Political Weekly* (March 25).
- Singh, R. P. and P. B. R. Hazell. 1993. Rural poverty in the semi-arid tropics of India: identification, determinants and policy intervention. *Economic and Political Weekly* (March 20-27).

- Srinivasan, T. N. 1985. Agricultural production, relative prices, entitlements, and poverty. In *Agricultural change and rural poverty*, ed. J. Mellor and G. Desai. Baltimore, Md., U.S.A.: Johns Hopkins University Press.
- Tendulkar, Suresh D. et. al. 1990. Poverty in India, 1970/71 - 1988/89, Working Paper ARTEP, International Labour Organisation, New Delhi, India.
- Tendulkar, Suresh D. and L. R. Jain. 1995. Economic reforms and poverty. *Economic and Political Weekly* (June 10).
- Thorat, Sukhadeo. 1993. Land ownership structure and non-farm employment of rural household in India. *Indian Journal of Labour Economics* 36 (3) (July - September).
- Vaidyathan, A. 1974. Some aspects of inequalities in living standards in rural India. *Indian Journal of Statistics* 36 (Series C).
- van de Walle, D. 1985. Population growth and poverty: Another Look at the Indian time series data. *Journal of Development Studies* 21 (3): 429-439.
- Visaria, Pravin. 1983. Poverty and unemployment in India. *Indian Journal of Agricultural Economics* 25 (3) (July - September).
- Visaria, Pravin and Rakesh Basant. 1994. Non-agricultural employment in India: Trends and prospects. Indian Society of Agricultural Economics, Bombay, India. Mimeo.
- Vyas, V. S. and Pradeep Bhargav. 1995. Public interventions for poverty alleviation - An overview. *Economic and Political Weekly* (October 14-21).
- World Bank. 1997. India: Achievements, and challenges in reducing poverty. Report No. 16483-IN, Washington, D.C.