



Rural Poverty - Irrigation Nexus in Tamil Nadu

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Introduction

It is only in the second half of twentieth century that the poverty and the poor have come to be matters of our concern and obligation. After a long neglect of the poor during the British rule, the measures adopted after independence signify the recognition of poverty and the social responsibility for alleviating it. How did it happen? What have we done? How far have we succeeded? Before attempting to answer these questions, let us first take up the question of the concept of poverty.

Poverty is a situation that gives rise the discrepancy between what one has and what one "should have"

Poverty Definitions- Three Views

1. In terms of minimum income required for subsistence

At 1993-94 price level, a person in rural area required an income of Rs.229 and in an urban area Rs.264 per month to fulfil his food and other basic requirements (Outlook, February 14, 1996: 26). People in this category are classified as people below poverty line (BPL). In 1999-2000 the planning commission estimate on population BPL is 26.12 per cent or 260 million, with a monthly income as low as Rs.327.56 in rural areas and Rs. 454.11 in urban areas (Agricultural statistics at a glance, 2004). Those numbers were 21.12 per cent and 13 million in the state of Tamil Nadu. In Tamil Nadu the rural poverty stood at 20.55 per cent (8 million) where as the national rural poverty estimates were 27.09 per cent (193.24 million). It should be noted that the poor are not homogeneous group and they can be classified into four sub-groups: the destitute, extremely poor, very poor and the poor.

2. In terms of minimum subsistence level and living standard

This view maintains that poverty has the following main aspects of want of material goods or materialistic possessions: (i) those necessary to avoid physical

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suffering and needed to fulfill the requirements of hunger and shelter that is those needed to survive and (ii) such a are essential to meet human needs of health, that is to get nutrition and to avoid disease.

3. Comparative state of well being of a few and deprivation and destitution of the majority in the society

Poverty Related Studies

Ohja (1970), Bardhan (1973), Tyagi (1982) and Rath (1996) have attempted studies on measurement of poverty. Authors like Sundaram and Tendulkar (1988), Dasgupta (1995) and Parthasarathy (1995) have attempted studies on the factors determining poverty incidence.

The importance of irrigation on the development of agriculture has been brought about both micro and macro levels in India by various authors (Gadgil, 1948; Dhawan, 1988; Rath and Mitra, 1989; Vaidyanathan et al., 1994). Development of irrigation not only increases the use of yield increasing inputs (high yielding varieties seeds, fertilizers, etc.), cropping intensity and productivity of crops but also helps to provide additional employment opportunities and push up wage rates for agricultural labourers (Dhawan, 1991; Ray, 1992; Vaidyanathan, 1994; Reddy, 1995). Impact of irrigation on poverty can be perceived through the following ways.

1. Enhanced local availability of food and the resultant affordability due to lower prices reduces the quantum of poor.
2. Increased labour absorption and consequent rise in wage rates and income make it possible for the poor to cross the poverty line.

Ahluwalia (1978) explained the cross sectional variation in the poverty through agricultural growth where as Sundaram and Tendulkar (1988) explained it through average value of output per hectare. Ghosh (1993, 1996 and 1998) explained about the inverse relationship between agricultural growth and rural poverty.

It is recognized that irrigation is the most influencing explanatory variable in poverty related studies and is a principle causative factor of temporal changes in agricultural growth. Our concern is to bring forth the role of irrigation as an explanatory variable in the poverty nexus. Irrigation as an important explanatory variable in poverty related studies because,

1. Irrigation has a production-augmenting and wage-enhancing effect.
2. All variables in the previous studies are inter-connected one way or the other.

Very few authors with exception of Narayanamorthy (2001) attempted irrigation as an explanatory factor in determining rural poverty. Hence a small attempt has been made in this study to bring out the relationship between the incidence of rural poverty and irrigation development in the state of Tamil Nadu.

Objectives and Data

The main objectives of the study are:

1. To demonstrate the importance of irrigation as an impacting policy intervention on other variables used in earlier poverty studies
2. To analyze the relationship between level of rural poverty and irrigation in Tamil Nadu

Rural poverty was related to several variables viz irrigated area, percentage of cross irrigated area to gross cropped area, food grain production per thousand rural population, food grain productivity, and cropping intensity. These data were collected for the state Tamil Nadu for 37 years from 1964 to 2000 from various issues of *Season and crop Reports and Economic Appraisals* of Tamil Nadu and world bank reports and also from some of the recent published materials.

Results

Irrigation and rural poverty related variables

A simple linear regression model is done to capture the effect of irrigation on incidence of poverty. The regression results give both strength of association and its magnitude. The results of regression computed treating irrigated area as an independent variable and food grain production, food grain productivity, cropping intensity as dependant variables. The regression results using the two variables food grain production, food grain productivity as independent variables show that there is a significant positive relationship between these two and the dependant variable irrigated area. The values of regression coefficients turn out to be 2.56 and 5.42 respectively (Table 1). The result confirms several other previous studies showing an inverse relationship between rural poverty and food grain productivity. But the regression coefficient of irrigated area was not much significant on cropping intensity implying that cropping intensity does not determined mainly by irrigated area alone. There is a remarkable increase in the utilisation of wastelands under cultivation and the dry land agriculture is more and more increasing in the state. Increase in the cultivation of dry land, rain fed and wasteland agriculture cause significant growth in cropping intensity in the state rather than the irrigated area.

Irrigation and poverty

It is understood from the earlier sections that irrigation plays a crucial role in determining the variables that are used to study the incidence of rural poverty in the state. Our objective in this section is to demonstrate the role of irrigation in determining the rural poverty in Tamil Nadu. We have performed two kind of analysis to explain the nexus between irrigation development and the rural poverty. First, we try to establish the independent relationship between irrigation and the rural poverty separately without considering any other determining variables. That is, we try to measure the independent strength of irrigation in determining the rural poverty. Second, we study the relative role of irrigation in determining the rural poverty,

wherein irrigation is used as one of the variables along with other poverty determining variables.

First let us analyse the independent strength of irrigation in determining the rural poverty. For this, simple linear regression is computed using ordinary least squares method involving irrigated area IAPTRP as an explanatory variable and the percentage rural poverty as dependent variable. The estimated regression equation is:

$$RP = \alpha + \beta_1 \text{IAPTRP} \dots \dots \dots (1)$$

Where, RP = Rural Poverty in percent population

IAPTRP = Irrigated Area per Thousand Rural Population (ha)

We are aware that the rural poverty is determined by many factors. Since we try to find out the independent strength of irrigation in determining rural poverty, we have deliberately excluded other determining variables here. The results presented in Table 3 clearly show that there is an evidence of significant inverse relationship between the rural poverty and the density of irrigated area. Regression results indicate that an increase of one hectare in irrigated area reduces about 0.49 percent of rural poverty from the mean. Our study clearly suggests that there is a significant inverse relationship between irrigation and rural poverty.

Besides irrigation, many other factors determine the incidence of rural poverty Table 2 presents correlation matrix of the irrigation variables associated with the rural poverty. As expected all five variables have shown a negative relationship with the percentage of population below poverty line. Therefore, to understand the role of irrigation in determining poverty, multiple regression (OLS method) is computed by including other variables, which are considered to be important in explaining the variation in rural poverty. The estimated multiple regression model is:

$$PRP = \alpha + \beta_1 \text{IAPTRP} + \beta_2 \text{GIA/GCA} + \beta_3 \text{FGPPTRP} + \beta_4 \text{FGPDVY} + \beta_5 \text{CI} \dots \dots \dots (2)$$

Where, RP = Rural Poverty in percent population

IAPTRP = Irrigated Area per Thousand Rural Population (ha)

GIA/GCA = Percentage of Gross Irrigated area to Gross Cropped Area

FGPPTRP = Food grain Production per Thousand Rural Population

FGPDVY = Food Grain Productivity

CI = Cropping Intensity

Of the five variables included in the model, two variables namely IAPTRP and GIA/GCA are related to irrigation and the other three variables are food grain productivity (FGPDVY), production of food grains per thousand rural population (FGPPTRP) and cropping intensity (CI). Since our aim is to find out the role of irrigation in determining rural poverty, we have introduced IAPTRP along with other

irrigation variable GIA/GCA as one of the explanatory variables. The estimated regression results of equation (2) are presented in Table 4.

The value of adjusted R^2 estimated from equation (2) was 0.87 which indicates that the variables included in the model explain about 87 percent of the variation in rural poverty and the variables included in the model are appropriate. Out of five variables included in the equation (2), the coefficients of three variables namely IAPTRP, FGPTHTRP and FGPDVY turned to be negative and significant. While the variable GIA/GCA turned out to be positive and significant. The coefficient of IAPTRP implies that the rural poverty can be reduced by 1.54 percent through an increase of one hectare of groundwater irrigation for every thousand rural population. Similar to IAPTRP, one unit increase of FGPDVY also reduces the poverty significantly. On the whole, the above analysis clearly suggests that irrigation is one of the crucial factors in explaining the incidence of rural poverty in Tamil Nadu.

CONCLUSIONS AND POLICY SUGGESTIONS

While analysing the independent relationship between groundwater irrigation and the rural poverty, the results of the study had shown that there is a significant inverse relationship between the incidence of rural poverty and groundwater irrigated area.

Rath (1996) while recommending policies for alleviating rural poverty has indicated, "the first and most task would be to extend irrigation in farming areas that would have the most significant impact on productive employment. In most states where today the incidence of poverty is high, irrigation is on the low side, with significant potentiality for its extension". Therefore the development of irrigation not only increases the production and productivity of agricultural commodities but also helps to reduce the level of poverty. A long-term policy should be formulated to utilize the untapped irrigation potential of the state.

TABLES

Table 1 Linear regression results: Impact of irrigation on other related variables
Independent variable: IAPTRP

Dependant variable	Constant	Slope	R^2	Adjusted R^2	N	t	p
FGPTHTRP	65.8435	2.556732 ^a	0.77	0.76	37	9.071851	2.2E-09
FGPDVY	648.8769	5.415097 ^a	0.30	0.30	37	3.292734	0.002958
CI	96.05099	0.009347 ^{ns}	0.01	-0.032	37	0.449405	0.657012

Note: Superscripts a, b and c denote significant levels at 1, 5 and 10 per cent respectively, Superscript ns denotes non significant.

Table 2 Correlation values: RP with other associated variables

	RP	IAPTRP	GIA/GCA	FGPTHTRP	FGPDVY	CI
RP	1					

IAPTRP	-0.87389	1				
GIA/GCA	-0.840953	0.97749	1			
FGPTHRP	-0.80619	0.875788	0.8153	1		
FGPDVY	-0.53068	0.549996	0.46417	0.841906	1	
CI	-0.198135	0.08952	0.20501	0.22909	0.54543	1

Table 3 Impact of irrigation IAPTRP on rural poverty

Independent variable	IAPTRP
Dependent variable	RP
Constant	26436.05
Slope	-0.4887 ^a
R²	0.76369
Adjusted R²	0.75
N	37
t	-8.9885
p	2.64E-09

Note: Superscript a denotes significant levels at 1per cent

Table 4 Factors determining rural poverty

Dependant variable: RP	
Variables	Coefficients
Intercept	-19296.1 ^c (-1.47)
IAPTRP	-1.5422 ^a (-6.00)
GIA/GCA	1.5400 ^a (-3.82)
FGPTHRP	-6.77495 ^b (-1.91)
FGPDVY	-2.930316 ^b (-2.51)
CI	296.4958 ^a (5.01)
N	37
Adjusted R ²	0.87

Note: Superscript a, b and c denotes significant levels at 1, 5 and 10 per cent respectively
Figures in parentheses are 't' values.

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