

IMPACT OF IRRIGATION ON AGRICULTURAL GROWTH AND POVERTY ALLEVIATION: MACRO LEVEL ANALYSES IN INDIA

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Abstract

Though the positive impact of irrigation on agricultural intensification and increased crop yield has been very well documented, the marginal returns of irrigation compared to other factor inputs such as farm technology and other rural infrastructure development are still a controversial issue. Improved information and understanding of the scale of incremental benefit of irrigation and other factor inputs to agricultural growth and development and to poverty alleviation have large public policy implications on rural development policy. This is particularly more relevant in setting irrigation and agricultural investment and financing policies. Total factor productivity is also called productivity of all inputs taken together, and it is different from conventionally understood productivity measures like crops yield, water productivity, or labour productivity. The overall growth and technical change in the agricultural sector has large implications on expanding the economic base and poverty alleviation in a region.. Though most of the previous studies have unequivocally demonstrated that agricultural productivity growth has a positive impact on reducing poverty in India, the existing literature on rural poverty has failed to examine the incremental impact of each of the factor inputs on agricultural productivity growth as well as their marginal impact on poverty alleviation, and rural income enhancement. It appears to be a strong inverse relationship between incidence of rural poverty and percentage of gross area irrigated. The trend in variation in irrigation and the various measures of poverty and how they have changed over time is illustrated. The negative sign for time trend in poverty model, which shows change in trend of poverty rate over time, suggests that poverty level in Irrigation has even a larger marginal impact on reducing poverty than the impact of rural literacy. Unlike productivity growth, road infrastructure does not play any positive and favorable role in explaining the variation in rural poverty in India during the time period selected for this study.

Keywords : Irrigation, agriculture, poverty, rural livelihood, India

INTRODUCTION

Agriculture is an important sector in economic development, considering its function and role in providing food for the population, industrial raw materials, food and energy sources, and rural people's livelihoods. This sector has a significant contribution to the formation of Gross Domestic Product, increased foreign exchange, and increased welfare of farmers so that agricultural development can be the driving force and support for the national economy. The agricultural sector's performance is related to Though various studies have very well documented the positive impact of irrigation on agricultural intensification and increased crop yield. Improved information and understanding of the scale of incremental benefit of irrigation and other factor-inputs to agricultural growth and development and the poverty alleviation process have massive public policy implications for setting rural development policy in a region. This has particularly more relevant in setting irrigation and agricultural investment and financing policies irrigation management. Its infrastructure as a form of management of exploitation and distribution of irrigation water, especially in dry or impoverished areas, has a water scarcity period to increase agricultural crop production. Irrigation infrastructure and facilities are important factors in the farming process in the agricultural sector Irrigation infrastructure determines the distribution of irrigation water, which impacts the quantity of water available for crops, especially rice. A good irrigation network system will contribute to the optimization of national food production. Irrigation networks are channels, buildings, and complementary structures that area unit needed for the provision, distribution, use, and disposal of irrigation water .

OBJECTIVES OF THE STUDY

The objective of this paper is to contribute to resolving the debate on development and management of water resources by clarifying the linkages between irrigation and poverty and by offering an objective review of recent research on the subject.:

- what is the role of irrigation development and management in poverty alleviation?
- what are the linkages and pathways through which irrigation contributes to poverty

- reduction?
- (c) what is the magnitude of poverty impacts of irrigation?
- (d) what are the key determinants of poverty impacts of irrigation or what are the conditions for enhancing the poverty impacts of irrigation?

RESEARCH METHODOLOGY

Research outcomes as the outcomes of basic research in general and agricultural irrigational research in particular are largely uncertain, basing the analysis on a specific probability of success is risky. One option is to use a few, specific, past experimental results for their illustrative value. Another, and a more rigorous, option is to approximate outcomes of research / inventions as a stochastic process, conditioned on a measure of basic agricultural irrigational research, among others. A poisson regression model could be employed to examine this relationship. Incorporating predicted values of inventions in a production-function type of specification, along with other variables such as factors of production, climate, soil quality, rural infrastructure, and farmer knowledge and skills, the economic impact of inventions could be assessed. But the feasibility of this procedure will depend essentially on how rich are the data on experimental results.

However, much of the focus of our exercise, as also of the empirical literature, is on impact assessment of applied / adaptive research (synonymous with agricultural research and extension), controlling for the effects of household, community, and regional characteristics. There are at least two reasons for this. One is that the links between productivity and applied / adaptive research are of considerable interest in themselves from a policy perspective. Another reason is that the complexity of technological choice, given a shelf of technologies, requires a detailed and careful treatment. For the present purpose, therefore, we shall use the salient features of a “reduced” form estimation linking outputs to inputs including a measure of applied / adaptive research.

IMPLICATIONS OF THE STUDY

Despite controversies in the incremental impact analysis of factor inputs and their individual contribution to agricultural growth and rural development (WCD, 2000), this study has successfully separated the incremental marginal impact of these factor inputs in agricultural and rural development. The results demonstrate that improvement in irrigation and rural literacy rate are the two most important critical factors for the recent growth as well as the overall development of the agricultural sector in India. Considering the important role of agricultural growth on poverty reduction in the region as established by the previous literature Improvement in irrigation and rural literacy rate are the two most important critical factors for the recent growth as well as the overall development of the agricultural sector in India. The large impact of the rural literacy rate clearly illustrates the important role of human capital development in the growth of agricultural productivity.

The larger impact of rural literacy on interstate variations in agricultural productivity clearly illustrates the important role of human capital development in the growth of agricultural sector productivity and enhanced farm income. The findings suggest that the future strategy of poverty reduction in rural India will largely depend on how efficiently the irrigation sector is managed and how effectively irrigation access is provided to a large number of farmers in the regions that have still not benefited from the green revolution of the 1970s and 1980s. In addition, the lowest income quintile of population would gain more from the irrigation development than the other upper income quintiles of the population just below the poverty line due to increased employment (wage rate increase as well employment security) and other feedback effects generated in the rural economy. Thus, increasing access to irrigation is in fact a pro-poor strategy to alleviate the severity and gravity of poverty in a region.

IWMI-TATA WATER POLICY PROGRAM

The IWMI-Tata Water Policy Program was launched in 2000 with the support of Sir Ratan Tata Trust, Mumbai. The program presents new perspectives and practical solutions derived from the wealth of research done in India on water resource management. Its objective is to help policy makers at the central, state and local levels address their water challenges – in areas such as sustainable groundwater management, water scarcity, and rural poverty – by translating research findings into practical policy recommendations. Through this program, IWMI collaborates with a range of partners across India to identify analyses and document relevant water-management approaches and current practices. These practices are assessed and synthesized for maximum policy impact in the series on Water Policy Research Highlights and IWMI-Tata Comments.

The policy program’s website promotes the exchange of knowledge on water-resources management, within the research community and between researchers and policy makers in India.

EMPIRICAL EVIDENCE

In this part, we provide a synthesis of empirical evidence on the impacts of irrigation on poverty. While the focus is on large and medium-scale irrigation systems, reference is also made to small-scale irrigation. An enormous amount of literature exists that is directly or indirectly related to our subject. No attempt is made in this paper to review all the available literature, but rather we focus on more relevant recent material, covering mainly topical Asian studies. The literature on the impacts of irrigation on poverty alleviation can be classified into three broad categories: (1) systematic empirical research measuring impacts with rigorous methods using primary or secondary data and information, focusing on specific locations; (2) general articles and papers based on common perceptions and logic; and (3) appraisals, evaluations, and assessments of projects, mostly undertaken by the funding agencies. Our review focuses on the first category, i.e. empirical research studies. Impact studies differ in terms of geographic coverage, scale of analyses, and approach adopted in measuring impacts. The scale of analyses varies in studies, ranging from household to village, region, national to international levels. The approaches adopted in various studies can be classified into three major categories: (1) “before and after” comparisons; (2) “with and without” comparisons; and (3) “more and less” comparisons—with econometric methods applied in most studies in all three categories. It should be noted that studies documenting concrete linkages between irrigation and poverty are rare, and more so in case of studies documenting indirect linkages between irrigation and poverty. Simultaneity and the concurrent nature of interventions and multiplicity of linkages pose methodological problems in assessing and separating impacts of irrigation interventions.

For brevity, we present here a synthesis of key findings and conclusions emerging from the review of the studies. For a more detailed review of empirical evidence on the impacts of irrigation on poverty reduction, based on (1) “with” and “without” comparisons of intermediate poverty-reducing indicators/variables cropping intensity, crop productivity, and employment generation; (2) “with” and “without” comparisons of poverty-related indicators—employment, incomes, income inequality, and incidence of poverty; (3) econometric evidence on the nature, direction and magnitude of impacts of irrigation on poverty; and (4) evidence from earlier reviews and synthesis papers, see Hussain and Hanjra (2003). As mentioned earlier, micro-level impacts are realized at farm, household, and local level, and these affect intermediate variables of poverty including cropping intensity, land and water productivity of crops, labor employment, and household income. A number of studies conducted in various settings and countries show that cropping intensity, crop productivity (principally rice, as per these studies) and per hectare employment are higher in irrigated than in rainfed settings.

SUMMARY, CONCLUSIONS AND IMPLICATIONS

The extensive review suggests that there are strong linkages between irrigation and poverty alleviation. These linkages are both direct and indirect. Direct linkages operate via localized and household-level effects, and indirect linkages operate via aggregate or national level impacts. Irrigation benefits the poor through higher production, higher yields, lower risk of crop failure, and higher and year-round farm and nonfarm employment. The poor and landless are the main beneficiaries of low food prices as they are net buyers of food. The indirect linkages operate via regional, national, and economy-wide effects. Irrigation investments act as production and supply shifters, and have strong positive effects on economic growth, benefiting the poor in the long run. The magnitude of indirect economy-wide benefits could be even more than the direct and local and household-level benefits. Recent advances in irrigation technologies, such as micro-irrigation systems, have strong poverty potential. A comparative review of quantitative evidence gleaned from empirical studies on the poverty-irrigation nexus, leads us to conclude that cropping intensity, crop productivity, labor productivity and employment, and household income are all higher in irrigated than rainfed settings. We contend that the impact of irrigation on poverty will vary by agroclimatic conditions and institutional settings, and the magnitude of the impact of any irrigation intervention on poverty will depend on: (a) (in)equity in land distribution; (b) irrigation infrastructure condition/management; (c) irrigation water management/allocation, and distribution policies, procedures and practices; (d) quality of irrigation water; (e) production/cultivation technologies; cropping patterns, extent of crop diversification; (f) type of irrigation technology and (g) support measures. The poverty impacts of irrigation can be intensified by creating conditions or enabling environments that could achieve functional inclusion of the poor. These include: equitable access to land; integrated water resource management; access to and adequacy of good quality surface and groundwater; modern production technology; shift to high-value market-oriented production; and (6) opportunities for the sale of farm outputs at low transaction costs. In short, it is the “package” that matters for effective poverty alleviation, and not the mere supply of irrigation water. The benefits of irrigation to the poor can be enhanced by affecting broader-level and targeted interventions simultaneously. The interventions should focus on reaching out to the poor through improved economic, policy, institutional, and governance measures in irrigation and other sectors.

REFERANCE

- [1] The research covered by this IWMI-Tata Research Highlight was carried out with generous support from Sir Ratan Tata Trust, Mumbai under IWMI-Tata Water Policy Programme. Part of the funding was also provided by IWMI through a grant from the Government of Netherlands. The research paper can be downloaded from the IWMI-Tata website .
- [2] Fan S., Hazel P, and Sukhadeo T., 1999. Linkages between Government Spending, Growth, and Poverty in Rural India. Research Report No 110. International Food Policy Research Institute: Washington D.C., USA., Washington DC.
- [3] Mellor, J. W. 2001. Irrigation agriculture and poverty reduction: General relationships and specific needs. In Hussain I and E. Biltonen (eds), 2002. Managing water for Poor: Workshop proceeding. International Water Management Institute, Colombo, Sri Lanka, August 9-10, 2001.
- [4] Desai, B. M., 2002. Policy Framework for Reorienting Agricultural Development. Presidential Address. Indian Journal of Agricultural Economics. 57 (1), 1-21.
- [5] World Commission on Dams, 2000. Dams and Development: A New Framework for Decision-Making, Earthscan Publishers, London, UK.
- [6] Chambers, Robert. 1998. Managing Canal Irrigation: Practical Analysis from South Asia. Oxford & IBH Publishing Company, New Delhi, India.
- [7] Narayanamoorthy, A., 2001. Irrigation and Rural Poverty Nexus: A State-wise Analysis. Indian Journal of Agricultural Economics. 56, 40-56.
- [8] Shah T. and O. P. Singh, 2002. Irrigation Development and Rural Poverty in Gujarat: A Disaggregate Analysis. Research Paper (in progress) of IWMI-Tata Program. International Water Management Institute: Colombo, Sri Lanka.
- [9] Bhattarai M., Sakthivadivel R., and Hussain I., 2002. Irrigation Impact on Income Inequality and Poverty Alleviation: Policy Issues and Options for Improved Management of Irrigation Systems. International Water Management Institute: Colombo, Sri Lanka
- [10] Evenson, R., C. Pray, M. Rosegrant, 1999. Agricultural Research and Productivity Growth in India. Research Report No. 109. International Food Policy Research Institute: Washington D.C., USA
- [11] Ravallion, M., G. Datt. 1995. Growth and Poverty in Rural India. Background paper for World Development Report, 1995. Policy Research Working Paper 1405. The World Bank. Washington D.C. USA
- [12] Desai, B. M., 2002. Policy Framework for Reorienting Agricultural Development. Presidential Address. Indian Journal of Agricultural Economics. 57 (1), 1-21.