# Assessing the Socio-Economic Impact of IAMWARM on Rural Beneficiaries in Tiruchirappalli District of Tamil Nadu, India

## ABSTRACT

|  |
| --- |
| The Irrigated Agriculture Modernization and Water Bodies Restoration and Management (IAMWARM) project, implemented in Tamil Nadu in 2007, aimed to enhance irrigation services and adopt modern water-saving technologies. This study, conducted in the Ponnaniyar sub-basin of Tiruchirappalli district of Tamil Nadu, evaluates the socio-economic impact of IAMWARM on farmers. An ex-post facto research design was used, with 120 farmers selected from five villages through proportionate random sampling. The study examined various independent variables, including age, education, landholding, farming experience, information utilization, economic motivation, scientific orientation, innovativeness, risk orientation, and training received. The dependent variable focused on the socio-economic impact of IAMWARM. The analysis showed that most farmers were middle-aged, with marginal landholdings, medium farming experience, and moderate levels of information utilization, economic motivation, scientific orientation, and innovativeness. Correlation analysis indicated significant positive relationships between education, information source utilization, economic motivation, risk orientation, and innovativeness with the socio-economic impact, while age, landholding, and farming experience had no significant effect. Key constraints identified by farmers included poor socio-economic status, waterways running through different holdings, inadequate credit facilities, and rising labour costs. Suggestions for improvement included timely subsidy distribution, better communication about subsidy availability, and training for labourers and farmers on innovative technologies. The study highlights the importance of addressing these issues for enhancing the overall effectiveness of IAMWARM in benefiting farmers. |

*Keywords: Socio-economic impact; Irrigation modernization; Farmers' constraints; Rural development.*

**ABBREVIATIONS**

*IAMWARM : Irrigated Agriculture Modernization and Water Bodies Restoration and Management.*

**1. INTRODUCTION**

Water scarcity is a pressing issue in Tamil Nadu, with the state receiving an average annual rainfall of just 925 millimetres and having a per capita water availability of 900 cubic meters—significantly lower than the national average of 2,200 cubic meters. Given that agriculture consumes nearly 75% of the available water, efficient water management is crucial for sustainable agricultural production. Tamil Nadu’s geography includes 17 river basins and 127 sub-basins, many of which are water-stressed, highlighting the need for modernized irrigation infrastructure (Balasubramanian et al., 2012; Singh et al., 2015).

The Irrigated Agriculture Modernization and Water-bodies Restoration and Management (IAMWARM) project was launched in 2007 as a six-year initiative (extended to 2014) to enhance irrigation practices and improve water management for farmers in Tamil Nadu (Paramasivan & Selvarani, 2017). The project aimed to expand the area under irrigated agriculture, increase water use efficiency, and promote sustainable agricultural practices to improve farm productivity and income (Kaviya & Durairaj, 2023). The IAMWARM project, implemented by the Water Resources Organization (WRO), Public Works Department (PWD), and the Tamil Nadu government, was one of the largest integrated water resource management initiatives, covering 63 sub-basins and 6.25 lakh hectares with an outlay of Rs. 2,547 crores. Key interventions included the rehabilitation of tanks and canals, groundwater recharge, and modernization of irrigation systems to enhance overall efficiency (Narayanamoorthy, 2022; Jenkins & Scott, 2007).

The broader scope of the study lies in assessing the impact of such large-scale irrigation modernization programs on farmers’ socio-economic conditions, particularly in regions where water availability is limited. Various studies (Reddy et al., 2020; Kamesh et al., 2023) emphasize that efficient irrigation practices can lead to increased agricultural productivity, but the extent to which farmers benefit depends on their socio-economic background, access to resources, and adoption of modern practices.

This study specifically evaluates the socio-economic impact of IAMWARM in the Ponnaniyar sub-basin of Tiruchirappalli district of Tamil Nadu (Gowthami & Ramesh, 2020). The objective is to analyze the relationship between farmers’ socio-economic characteristics—such as age, education, landholding, farming experience, information utilization, economic motivation, scientific orientation, innovativeness, and risk orientation—and their overall gains from the IAMWARM project (Anbarasan & Elango, 2021; Muthulakshmi et al., 2024). The rationale behind selecting this research topic stems from the need to understand whether large-scale water resource management interventions translate into meaningful benefits for small and marginal farmers and how policy measures can be improved for future agricultural modernization programs (Ravichandran et al., 2015).

By examining key constraints such as poor socio-economic status, lack of credit facilities, and rising labour costs, this study aims to provide policy recommendations to enhance the effectiveness of similar irrigation modernization projects in Tamil Nadu and other water-stressed regions

**2. MATERIALS AND METHODS**

This study assesses the socio-economic impact of the Irrigated Agriculture Modernization and Water-Bodies Restoration and Management (IAMWARM) scheme on rural beneficiaries in Tiruchirappalli district, Tamil Nadu. A descriptive research design with an ex post facto approach was adopted, focusing on understanding the scheme's effects on the socio-economic conditions of the beneficiaries. The study was conducted in 2020 to evaluate the long- term impact of the scheme after its implementation period. Tiruchirappalli district comprises 11 taluks, grouped into four administrative divisions: Tiruchirappalli division, Lalgudi division, Musiri division, and Srirangam division. The district has a total of 41 blocks, out of which 14 are designated as revenue blocks. Among these, one block—Manikandam block—was selected purposively for the study, as it had the maximum number of IAMWARM beneficiaries.

In the selected block, there are 26 villages in total. Out of these, 5 villages were selected based on the maximum number of IAMWARM beneficiaries. The selected villages had a combined population of 11,317. A total of 120 beneficiaries were selected as respondents using a random sampling method. The number of respondents from each village was proportionate to the number of beneficiaries: 30 from Navalur Kuttapattu, 20 from Thayanur, 25 from Pirattaiyur, 25 from K. Kallikudi, and 20 from Poolangudi. The list of IAMWARM beneficiaries was obtained from the Block Development Office, Manikandam, and random sampling was employed to select the respondents.

Both primary and secondary data collection methods were used in the study. Primary data were collected through structured surveys and personal interviews, while secondary data were sourced from government reports and existing literature. The study employed structured personal interviews with IAMWARM project beneficiaries across selected villages in Tiruchirappalli district. A well-designed interview schedule was developed, comprising both closed-ended and open-ended questions. These focused on key areas such as:

* Demographic profile (age, education, landholding size)
* Access to IAMWARM interventions (e.g., irrigation facilities, cropping systems, training received)
* Changes in income, crop yield, and employment
* Perceptions of project benefits and sustainability

Interviews were conducted face-to-face, primarily in the local language (Tamil), ensuring clarity and comfort for the respondents. Each interview lasted approximately 30–40 minutes, and responses were manually recorded with consent. A total of 120 respondents were interviewed using random sampling within the project area to ensure representativeness.

Variables such as income, education, farm size, family structure, and livelihood patterns were operationalized and measured using established scoring procedures. Data analysis included percentage analysis, cumulative frequency, mean scores, and zero-order correlation coefficients to assess the impact of the IAMWARM scheme and identify constraints faced by the beneficiaries. The overall objective of the study was to provide insights into the socio-economic changes experienced by the rural beneficiaries as a result of the IAMWARM scheme and to offer recommendations for enhancing the effectiveness of similar future interventions.

**3. RESULTS AND DISCUSSION**

**3.1 Results**

Assessing the Socio-Economic Impact of IAMWARM on rural beneficiaries**.** The following were the socio-economic impacts reported by the IAMWARM beneficiaries during the survey. The results are displayed in (Table 1).

**Table 1. Distribution of beneficiaries according to their socio-economic impact (n=120)**

| **S. No.** | **Particulars** | **Number** | **Per cent & Change** |
| --- | --- | --- | --- |
|  | **Food habits**  |
|  | Expenditure on food items increased  | 105 | 87.50(Increased) |
|  | Quantity of vegetables taken/month  | 105 | 87.50(Increased) |
|  | Frequency of non-vegetarian taken/month  | 14 | 11.67(decreased) |
|  | No. of eggs taken/month/head  | 75 | 62.50(Increased) |
|  | Number of times tea or coffee taken/month/head  | 120 | 100.00(Increased) |
|  | Quantity of milk consumed/day/head | 59 | 49.17(Increased) |
| **Mean percentage** | **66.39** |
|  | **Dressing pattern**  |
|  | Types of dress used | 9 | 7.5 (Increased) |
|  | Readymade dress used  | 10 | 8.33(Increased) |
|  | No. of sets of dresses possessed  | 11 | 9.17(Increased) |
|  | Amount spent on dressing is increased /year | 10 | 8.33(Increased) |
| **Mean percentage** | **8.33**(Increased) |
|  | **Housing**  |
|  | Own house | 115 | 95.83 |
|  | Renovated the house  | 71 | 59.17 |
|  | Rental house | 100 | 83.33 |
|  | Family with household latrine | 120 | 100.00 |
| **Mean percentage** | **84.58** |
|  | **Education to children**  |
|  | Children sent to Government school | 100 | 83.33 |
|  | Children sent to private school outside the village  | 20 | 16.67 |
|  | Children sent to college/Universities | 76 | 63.33 |
| **Mean percentage** | **54.44** |
|  | **Income and savings**  |
|  | Income per month is increased | 40 | 33.33 |
|  | Debts is cleared  | 15 | 12.50 |
|  | Savings is increased | 80 | 66.67 |
| **Mean percentage** | **37.50** |
|  | **Personal changes**  |
|  | Outside contact increased  | 106 | 88.33 |
|  | Gained respect from village members | 20 | 16.67 |
|  | Gained respect from family members | 81 | 67.50 |
|  | Expenditure on ceremonies cost is increased  | 106 | 88.33 |
|  | Expenditure on festivals cost is increased | 120 | 100.00 |
|  | Expenditure on children education cost is increased | 100 | 83.33 |
|  | Expenditure on recreation increased  | 30 | 25.00 |
|  | Frequency of going to temple and tourist places are increased | 40 | 33.33 |
|  | Vehicles purchased  | 25 | 20.83 |
|  | Opened account in bank/post office/co-operative bank | 120 | 100.00 |
|  | Household appliances purchased is increased | 35 | 29.17 |
| **Mean percentage** | **59.31** |
|  | **Contact with development personnel**  |
|  | Block Development Officer | 5 | 4.17 |
|  | KVK | 10 | 8.33 |
|  | Village president  | 120 | 100.00 |
|  | Agricultural Officer | 25 | 20.83 |
|  | PWD officer | 76 | 63.33 |
| **Mean percentage** | **39.33** |
|  | **Social participation**  |
|  | No membership | 100 | 83.33 |
|  | Membership in one organization | 6 | 05.00 |
|  | Membership in more than one organization | 106 | 88.33 |
|  | Office bearer in one organization | 120 | 100.00 |
|  | Office bearer in more than one organization | 120 | 100.00 |
| **Mean percentage** | **75.33** |
|  | **Media participation in agriculture** |
|  | No subscription | 106 | 88.33 |
|  | Subscription to newspaper/Magazines | 0 | 00.00 |
|  | Radio listening | 106 | 88.33 |
|  | TV watching | 120 | 100.00 |
|  | Cable TV Subscription | 120 | 100.00 |
| **Mean percentage** | **75.33** |
|  | **Migration** |
|  | Establishment of IAMWARM helps in preventing you or your family members to migrate to other places for work. | 120 | 100.00 |
| **Mean percentage** | **100.00** |

****

**Fig. 1. Impact of IAMWARM in per cent**

**4. DISCUSSION**

The results of this study indicate a significant socio-economic impact of IAMWARM on rural beneficiaries. The key findings are:

* **Food habits:** Increased expenditure on food items (87.5%) suggests improved economic conditions. Similar trends were reported by *Pingali (2012),* emphasizing dietary diversification with rising incomes.
* **Dressing pattern:** The impact was minimal (8.33%), indicating that clothing is a lower priority compared to other household needs.
* **Housing conditions:** A notable portion of beneficiaries reported owning (95.83%) and renovating (59.17%) their homes, while 100% had access to household latrines. This shows substantial improvement in living conditions, reflecting enhanced quality of life. Studies by Desai et al. (2010) support that rural development programs often positively impact housing infrastructure.
* **Education to children:** A significant number of beneficiaries sent their children to government schools (83.33%) and higher education institutions (63.33%). This suggests increased awareness and prioritization of education, possibly enabled by improved income and awareness, aligning with the findings of Tilak (2015).
* **Income and savings:** Although only 33.33% reported an increase in income, a higher proportion (66.67%) indicated better savings, suggesting improved financial management. Clearing of debts remained low (12.50%), indicating persistent financial challenges.
* **Personal changes:** Increased external contact (88.33%), bank account ownership (100%), and appliance purchases indicate enhanced social mobility and financial inclusion. The rise in ceremonial and educational expenditures also reflects improved financial capacity and social standing.
* **Contact with development personnel:** While village president interactions were high (100%), contact with officers like BDOs, KVKs, and agricultural officers was limited. This indicates a communication gap that needs addressing for better technology transfer and resource utilization.
* **Social participation:** High levels of office bearer roles (100%) show strong community involvement. However, 83.33% had no formal organizational membership, highlighting the need for structured community mobilization and capacity-building.
* **Media participation:** TV and radio were the most accessed media (100% and 88.33% respectively), showing television as a major source of agricultural information, while print media usage was negligible. This calls for more audio-visual-based extension outreach.
* **Migration:** IAMWARM helped prevent 100% of respondents or their family members from migrating for work, a highly significant outcome reflecting the project’s success in enhancing local livelihood options.

**5. CONCLUSION**

The study revealed that the IAMWARM project had a positive socio-economic impact on rural beneficiaries in the Ponnaniyar sub-basin of Tiruchirappalli district. Significant improvements were observed in food habits, housing conditions, education levels, income generation, savings, personal development, and social participation among the beneficiaries. Factors such as education, information utilization, economic motivation, risk orientation, and innovativeness were positively correlated with the socio-economic gains from the project. However, key constraints such as poor socio-economic status, fragmented landholdings, inadequate credit facilities, and rising labor costs continued to challenge the beneficiaries. To maximize the effectiveness of such large-scale interventions, timely distribution of subsidies, enhanced communication about government schemes, and regular training for farmers and laborers on innovative technologies are essential. Overall, the findings underscore the importance of integrated water resource management programs in improving the livelihoods of rural farmers and highlight areas for further policy refinement and support.

**6. SUGGESTIONS**

1. **Enhanced Credit Facilities** – Simplifying the credit process and ensuring timely access to financial assistance can help farmers invest in better farming techniques and reduce their financial burden.
2. **Improved Extension Services** – Strengthening the role of Agricultural Officers and KVKs by increasing their interaction with farmers through training and field visits will enhance knowledge transfer and technology adoption.
3. **Better Subsidy Communication** – Clear and timely information on subsidies and government schemes can improve farmers' participation and utilization of benefits.
4. **Capacity Building Programs** – Organizing regular training sessions on modern irrigation practices, water management, and innovative farming techniques will help farmers maximize the benefits of IAMWARM.
5. **Infrastructure Development** – Improving rural infrastructure, including irrigation facilities, roads, and storage units, will further enhance agricultural productivity and economic stability.
6. **Encouraging Market Linkages** – Strengthening supply chain networks and providing better market access can help farmers get fair prices for their produce and increase profitability.
7. **Women and Youth Involvement** – Special programs targeting women and young farmers will encourage their active participation in agricultural activities and enhance rural livelihoods.

**7. APPLICATION OF THE RESEARCH**

The research can guide targeted outreach and educational efforts for rural beneficiaries of the IAMWARM scheme in Tiruchirappalli district. By developing localized materials and training programs and involving community leaders for dissemination, the scheme can better address gaps in socio-economic development. Feedback mechanisms and regular evaluations will help refine these strategies, ensuring more effective implementation and informed policy adjustments to enhance the impact of the scheme.

**8. POLICY RECOMMENDATIONS**

* Strengthen extension linkages by increasing direct interaction between farmers and development personnel.
* Provide targeted financial literacy and debt management programs.
* Ensure timely delivery and communication of subsidies and support schemes.
* Introduce community-level awareness drives to increase participation in rural organizations.
* Enhance usage of ICT and media to improve access to agricultural innovations.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

I hereby declare that generative AI technologies, such as Large Language Models (e.g., ChatGPT) and text-to-image generators, have not been used during the writing or editing of this manuscript.

**Competing interests**

Authors have declared that no competing interests exist.

**REFERENCES**

Anbarasan, P., & Elango, D. (2021). A case study analysis on E-agriculture (e-velanmai): An ICT-based farm advisory service in Tamil Nadu. *International Journal of Current Microbiology and Applied Sciences*, 10(1), 434-438.

Balasubramanian, V., Vashisht, D., Cletus, J., & Sakthivel, N. (2012). Plant β-1, 3-glucanases: their biological functions and transgenic expression against phytopathogenic fungi. Biotechnology letters, 34, 1983-1990.

Gowthami, N., & Ramesh, S. (2020). Impact of knowledge on TN-IAMP black gram growers in Madurai District of Tamil Nadu. *Indian Journal of Pure & Applied Biosciences*, 8(5), 335–338.

Jenkins, M. W., & Scott, B. (2007). Behavioural indicators of household decision-making and demand for sanitation and potential gains from social marketing in Ghana. *Social Science & Medicine*, 64(12), 2427–2442.

Kamesh, T.M., et al. (2023). Study on Irrigation water Productivity under different environments of Tamil Nadu. *Journal of Experimental Agriculture International*, 45(9), 108–116.

Kaviya, P., & S. Durairaj. (2023). A Study on Profile beneficiaries of IAMWARM farmers in Tiruchirappalli District of Tamil Nadu. “New Era Agriculture Magazine”. E-ISSN: 2583-5173, 2(1). Pp: 77-82.

Muthulakshmi, K., Ponnarasi, T., & Gangadharan, S. (2024). Impact of Tamil Nadu Irrigated Agriculture Modernization Project Melur Farmer Producer Organization Company Ltd., - A socio-economic analysis. *Economic Affairs*, 69(1), 751–754.

Narayanamoorthy, A. (2022). The Irrigation Future of India: Overview and Synthesis. The Irrigation Future of India: Development, Resource and Policy, 1-23.

Paramasivan, M & A. Selvarani. (2017). Productivity, water use efficiency and economics of system of rice intensification (SRI) in Nichabanadhi sub basin of southern Tamil Nadu. *“Applied and Natural Science Foundation. 9(1), 286-290*. DOI: <https://doi.org/10.31018/jans.v9i1.1185>

Pingali, P. (2012). Green revolution: Impacts, limits, and the path ahead. *Proceedings of the National Academy of Sciences (PNAS)*, 109(31), 12302–12308.

Ravichandran, V.K., et al. (2015). Socio-economic impact of SRI and traditional rice cultivation in Villupuram District of Tamil Nadu: Experiences from TN-IAMWARM project. *International Journal of Agricultural Sciences, 11(1)*, 166–171.

Reddy, P. K., Reddy, B. S., Reddy, A. M., Kumari, C. R., & Reddy, B. R. (2020). Irrigation management in Pigeonpea under rainfed Alfisols. Journal of Pharmacognosy and Phytochemistry, 9(6), 136-139.

Singh, R., Shedbalkar, U. U., Wadhwani, S. A., & Chopade, B. A. (2015). Bacteriagenic silver nanoparticles: synthesis, mechanism, and applications. Applied microbiology and biotechnology, 99, 4579-4593.

**Disclaimer/Publisher’s Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher and/or the editor(s). This publisher and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_