International Journal of Enhanced Research in Educational Development, IJERED,
ISSN: 2320-8708, Vol. 13 Issue 4, July.-August, 2025

Impact of Irrigation on Cropping Pattern and Agricultural Productivity in Jangaon District, Telangana

Dr. Kaluvala Srinivas

Associate Professor of Economics, B.J.R. Govt. Degree College, Narayanaguda, Hyderabad

INTRODUCTION

Irrigation is the backbone of agricultural transformation, particularly in semi-arid regions like Telangana, where agriculture is vulnerable to erratic rainfall. Jangaon district, primarily dependent on rain-fed farming until the early 2000s, witnessed significant changes in land use and cropping pattern.

This study analyzes the transformative impact of irrigation on cropping patterns and agricultural productivity in Jangaon district, Telangana. Using a combination of primary surveys and secondary data analysis, the research identifies significant shifts in cropping patterns due to irrigation expansion, particularly through the Mission Kakatiya scheme. The study finds that irrigation coverage increased from 32% to 68% of cultivated land between 2010 and 2022, leading to a shift from rain-fed crops such as millets and pulses to water-intensive crops like paddy and sugarcane. Agricultural productivity also increased by an average of 40%, improving farmer incomes but raising concerns about environmental sustainability. Recommendations include promoting water-efficient irrigation technologies and crop diversification to ensure long-term benefits. The findings provide insights into the socio-economic and environmental impacts of irrigation, contributing to policy discussions on sustainable agricultural practices.

Study Area:
Jangaon district, located in central Telangana, has a total geographical area of 2,187 sq. km. Agriculture is the mainstay for over 65% of its population. The district primarily relies on irrigation from Tanks, Bore wells, and Canals. Mission Kakatiya, a flagship program by the Telangana government, has been instrumental in rejuvenating water bodies and expanding irrigation.

Objectives Of The Study:

- To analyze the role of irrigation in transforming cropping patterns in Jangaon district.
- To evaluate the impact of irrigation on agricultural productivity and farmer incomes.
- To assess the socio-economic and environmental implications of increased irrigation coverage..

REVIEW OF THE LITERATURE

A comprehensive review of existing literature helps establish the theoretical foundation for understanding how irrigation affects cropping patterns and agricultural productivity. Scholars and institutions have studied this relationship extensively across different agro-climatic zones in India and globally. The following review highlights key contributions and findings relevant to the present study:

Several researchers have highlighted irrigation as a cornerstone of agricultural development, especially in semi-arid regions like Telangana. According to Bhalla and Singh (2001), irrigation plays a pivotal role in increasing cropping intensity and enabling farmers to adopt high-yielding crop varieties. Their work suggests that assured irrigation not only enhances yields but also encourages the shift from traditional to commercial cropping systems.

Vaidyanathan (1999) emphasized that the expansion of irrigation facilities often results in a cropping shift from coarse cereals and pulses to water-intensive crops such as rice, sugarcane, and cotton. He argues that such transitions, while beneficial in the short term, can increase vulnerability to water stress and monoculture risks.

Joshi et al. (2005) conducted a study in Andhra Pradesh and noted that improved irrigation infrastructure led to the replacement of low-value crops with high-value crops like fruits and vegetables. They also observed a rise in double cropping in areas where water availability was sustained year-round.

Studies by Fan and Hazell (2001) and Sharma et al. (2010) demonstrate a strong positive correlation between irrigation access and agricultural productivity. Fan and Hazell's econometric analysis across Indian districts found that government investments in irrigation had one of the highest returns in terms of poverty reduction and yield growth.

Chand and Kumar (2004) examined the socio-economic impact of irrigation expansion in rural India and found significant improvements in household income, food security, and reduction in seasonal migration. In the context of Telangana, Gadgil and Rao (2018) linked irrigation improvements to rising rural employment and land-use intensification.

While irrigation expansion has brought productivity gains, several researchers warn of its adverse environmental effects. Singh (2013) observed that excessive groundwater use in Telangana has led to falling water tables and reduced long-term agricultural sustainability. Similarly, Narayana moorthy (2007) warned about increasing soil salinity and water logging in command areas due to poor drainage systems and over-irrigation.

In Telangana, Reddy (2017) noted that tank rejuvenation efforts under Mission Kakatiya significantly improved water availability for small and marginal farmers, resulting in a 30–50% increase in paddy yields. The author also found that farmers were able to take up second-season crops due to improved irrigation reliability.

A more recent study by Sujatha and Reddy (2021) focused on Jangaon and neighbouring districts, highlighting the risks associated with the over-dependence on bore wells and paddy cultivation. They recommend promoting water-saving technologies and crop diversification for sustainable resource use.

METHODOLOGY

A mixed-methods approach was used, combining quantitative analysis with qualitative insights from farmer surveys.
Data Collection

Primary Data:

- Surveys conducted with 100 farmers across 20 villages in Jangaon district.
- Interviews with agricultural officers and water resource managers.
  2. Secondary Data:
- District agricultural records (2010–2022).
- Telangana Agriculture Department Reports (2010–2022).
- "Mission Kakatiya Impact Report," Government of Telangana.
- National Remote Sensing Centre (NRSC) reports on land use in Telangana.

Tools and Techniques

- GIS for mapping irrigation coverage.
- Statistical analysis using SPSS to correlate irrigation with productivity.
- Time frame: 2010–2022.

RESULTS AND DISCUSSION

Table-1: Changes in Cropping Pattern (2010 to 2022)

Crop Type	% of Total Cultivated Area (2010)	% of Total Cultivated Area (2022)	Key Observations
Millets	40%	5%	Reduced due to water availability for other crops
Pulses	30%	5%	Decline as farmers shift to high-value crops.
Oilseeds	20%	5%	Reduced in favour of water intensive crops
Paddy	10%	50%	Became the dominant crop due to irrigation.
Cotton	0%	20%	Emerged as a major cash crop
Sugarcane	0%	15%	Introduced due to assured irrigation.
Vegetables	0%	10%	Farmers diversified into herticulture

Table-2: Changes in Crop Productivity (Yield in Tons/Ha)

Crop Type	Average Yield (2010)	Average Yield (2022)	% increase in Yield	Observations
Paddy	2.8%	4.5	60%	Improved due to assured irrigation and inputs
Millets	1.2%	1.5	25%	Slight improvement due to better soil conditions.
Pulses	0.8%	1.1	37.5%	Minimal increase compared to other crops
Cotton	1.2%	2.0	67%	Benefitted from irrigation and hybrid seeds
Sugarcane	60	75	25%	Enhanced yields with hybrid seeds
Vegetables	-	20	-	New category with high returns per hectare.

Table-3: Socio-Economic Impact on Farmers

Indicator	2010	2022	% change	Observations
Average Annual Farmer income(Rs)	Rs. 60,000	Rs. 1,20,000	+100%	Income doubled due to high-yield, high -value crops.
Average Farm Input Cost (Rs/Ha)	Rs. 15000	Rs. 25,000	+67%	Increased due to fertilizers, seeds, and irrigation systems.
Migration to Urban Areas	20% of house holds	10% of households	-50%	Reduced due to year- round agricultural employment.
Employment in Agriculture	75% of population	85% of Population	+10%	Irrigation created more job opportunities locally.
Percentage of Double-cropping Areas	20%	55%	+175%	Enabled by improved irrigation coverage.

Results and Discussions

The findings provide insights into the socio-economic and environmental impacts of irrigation, contributing to policy discussions on sustainable agricultural practices. Following are the important findings;

Irrigation Coverage:

- Pre-Irrigation (2010):
- Irrigated area: 32% of cultivated land.
- Primary sources: Bore wells (60%), tanks (30%), Canals (10%).
- Post-Irrigation (2022):
- Irrigated area: 68% of cultivated land.
- Increase attributed to Mission Kakatiya, which restored 120 tanks in the district.

Shifts in cropping patterns:

- Pre-Irrigation (2010):
- Dominant crops: Millets (40%), Pulses (30%), Oilseeds (20%), Paddy (10%).
- Post-Irrigation (2022):
- Dominant crops: Paddy (50%), Cotton (20%), Sugarcane (15%), Vegetables (10%), Millets (5%).
- Observations:
- Significant shift from rain-fed to water-intensive crops.
- Reduced cultivation of millets and pulses.

Agricultural productivity:

- Average productivity increase across major crops:
- Paddy: From 2.8 tons/ha to 4.5 tons/ha.
- Cotton: From 1.2 tons/ha to 2.0 tons/ha.
- Sugarcane: From 60 tons/ha to 75 tons/ha.
- Farmers' income increased by 50% on average due to higher yields and market demand.

Environmental and socio-economic impacts:

- Environmental Concerns:
- Water logging in low-lying areas.
- Soil salinity affecting 12% of irrigated land.

- Socio-Economic Benefits:
- Increased employment opportunities in agriculture.
- Improved quality of life for small and marginal farmers.

CHALLENGES AND LIMITATIONS

Challenges

- Over-reliance on water-intensive crops like paddy.
- Depleting groundwater levels due to excessive bore well use.
- Inequitable water distribution between upstream and downstream areas.

Limitations

- The study relies on estimated data due to a lack of real-time monitoring systems.
- Long-term environmental impacts require further investigation.

CONCLUSIONS

Irrigation has significantly transformed the agricultural landscape of Jangaon district, Telangana. Over the past 15 years, initiatives such as Mission Kakatiya have restored traditional water resources, expanded irrigation coverage, and enabled the shift from subsistence to commercial farming. The study highlights the following key outcomes:

Transformation of Cropping Patterns:
The introduction of irrigation has resulted in a shift from drought-resistant crops like millets and pulses to water-intensive crops such as paddy and sugarcane. This transition has increased farm incomes but reduced crop diversity, raising concerns about long-term food security.

Boost in Agricultural Productivity:
Assured water availability and access to modern inputs have led to substantial increases in crop yields. Paddy, for instance, saw a productivity increase of over 60%, while cash crops like sugarcane and cotton have also benefited. Improved productivity has enhanced farmer livelihoods and contributed to the region's economic development.

Socio-Economic Benefits:
Increased incomes have allowed farmers to invest in better infrastructure, education, and healthcare. Employment opportunities in agriculture have also grown due to the adoption of double-cropping systems.

Environmental Challenges:
Despite the benefits, the environmental impact of irrigation expansion cannot be ignored. Groundwater depletion, soil salinity, and waterlogging are emerging issues that threaten the sustainability of these gains. Over-reliance on water-intensive crops like paddy has further exacerbated water stress in some regions.

This study concludes that while irrigation has had a transformative impact on the agricultural and socio-economic fabric of Jangaon district, its long-term sustainability depends on adopting more balanced and efficient water-use practices. The future of irrigation-driven agriculture lies in aligning productivity gains with ecological preservation.

RECOMMENDATIONS

To ensure that the benefits of irrigation are sustained while addressing emerging challenges, the following recommendations are proposed:

Promote Crop Diversification:
Encourage Low-Water Crops: Policies should incentivize farmers to grow less water-intensive crops like millets, pulses, and oilseeds alongside paddy. These crops are not only water-efficient but also enhance soil health and nutritional security.

Support High-Value Crops: Promote vegetables, horticultural crops, and floriculture as alternatives to paddy, offering higher returns with lower water usage.

Improve Water-Use Efficiency:
Drip and Sprinkler Irrigation: Expand the adoption of micro-irrigation systems to reduce water wastage and improve irrigation efficiency. Subsidies and training programs can support farmers in transitioning to these technologies.

Water-Saving Techniques: Encourage practices like alternate wetting and drying (AWD) for paddy cultivation to reduce water consumption without affecting yields.

Strengthen Community-Based Water Management:
Water User Associations (WUAs): Strengthen and empower WUAs to ensure equitable water distribution and collective decision-making on water usage.

Tank Management Committees: Involve local communities in the maintenance and monitoring of irrigation tanks to sustain their functionality over time.

Address Environmental Challenges:
Soil Health Management: Introduce crop rotation and green manuring to restore soil fertility and reduce salinity.

Prevent Groundwater Overexploitation: Regulate borewell usage through groundwater recharge programs and legal frameworks. Promote rainwater harvesting to replenish groundwater resources.

Mitigate Water logging: Develop drainage systems in low-lying irrigated areas to prevent water logging and its adverse effects on crop yields.

Strengthen Policy Support and Awareness:
Market Linkages and Support: Provide market access and price stability for crops grown under diversified farming systems to encourage adoption.

Farmer Awareness Programs: Conduct awareness campaigns and training sessions on sustainable farming practices, including efficient water use, crop diversification, and modern technologies.

The case of Jangaon district demonstrates the transformative potential of irrigation in improving agricultural productivity and farmer livelihoods. However, the environmental challenges it brings demand immediate attention. A balanced approach that integrates modern irrigation technologies, crop diversification, and sustainable water management practices can ensure that irrigation-driven growth is both equitable and ecologically viable. The lessons from this study can serve as a blueprint for similar semi-arid regions across India, fostering a harmonious balance between economic growth and environmental sustainability .

REFERENCES

[1] Bhalla, G.S., & Singh, G. (2001). Indian Agriculture: Four Decades of Development. Sage Publications.
[2] Vaidyanathan, A. (1999). Water Resource Management: Institutions and Irrigation Development in India. Oxford University Press.
[3] Joshi, P.K., Jha, A.K., & Mohanty, S. (2005). Changing Cropping Pattern in South India: Implications for Food Security. Indian Journal of Agricultural Economics, 60(3), 259–273.
[4] Fan, S., & Hazell, P. (2001). Returns to Public Investments in the Less-favored Areas of India and China. IFPRI Research Report No. 118.
[5] Sharma, H.R., Kumar, R., & Sharma, R.K. (2010). Irrigation and Agricultural Productivity in India: An Empirical Analysis. Agricultural Economics Research Review, 23(1), 67–74.
[6] Reddy, A.A. (2017). Impact of Mission Kakatiya on Tank Irrigation and Agricultural Productivity in Telangana. Economic and Political Weekly, 52(39), 23–26.
[7] Chand, R., & Kumar, P. (2004). Impact of Agricultural Infrastructure on Production and Productivity: Case Study of Indian States. NCAP Working Paper.
[8] Gadgil, M., & Rao, P. (2018). Irrigation Development and Rural Transformation in Telangana. Journal of Rural Development, 37(2), 145–160.
[9] Singh, R.B. (2013). Water Resource Sustainability in India: Challenges and Opportunities. Current Science, 104(10), 1230–1236.
[10] Narayanamoorthy, A. (2007). Efficiency of Irrigation and Impact on Agricultural Productivity: A Comparative Study of India and China. Journal of Asian Economics, 18(4), 465–478.
[11] Sujatha, D., & Reddy, K.R. (2021). Irrigation, Cropping Patterns and Water Sustainability in Telangana: Evidence from Jangaon District. Telangana Economic Review, 5(2), 91–103