KNOWLEDGE FLAME
E-ISSN: 3049-1541
International Multidisciplinary Research Journal (KF-IMRJ)
(An International Indexed & Peer Reviewed Journal
Impact Factor: 5.292 https://knowledgeflame.in PRGI Reg. No. MAHMUL/2024/89852

Role of Artificial Intelligence in Sustainable Development: A Case Study of Jalna District, Maharashtra

Dr. S.V.Tathe
Research Guide
Sant Ramdas Art's, Commerce and Science College.

Abhijit B.Gujar
Research Student
BAMU Aurangabad

Abstract

Sustainable development in agrarian regions like Jalna District, Maharashtra, faces significant challenges from climate change, water scarcity, and inefficient resource use. Artificial Intelligence (AI) emerges as a transformative tool to address these issues through precision agriculture, predictive analytics, and renewable energy optimization. This paper examines AI's role in enhancing sustainability in Jalna district, drawing on government initiatives like the Maha Agri-AI Policy 2025–2029 and local projects such as the Cropin-ATMA collaboration. By using AI for crop monitoring, pest management, and energy efficiency, Jalna district can achieve higher productivity and resilience. Findings indicate potential yield increases of 20–40% and reduced resource waste,

Keywords: Artificial Intelligence in Agriculture, Sustainable Development in Jalna District,

1.1 Introduction

Sustainable development, as elaborated by the Brundt land Report (1987), entails meeting present needs without compromising future generations' abilities. In India, agriculture supports 68% of rural livelihoods, yet it grapples with climate change, resource depletion, and low productivity. Jalna District in Maharashtra exemplifies these tensions: a drought-prone area in the Marathwada region, it relies heavily on rain-fed crops like wheat, Bajara, Jowar, soybean, cotton, and pulses, which cover over 80% of its cultivable land. Recurrent droughts, erratic rainfall, and soil degradation have led to crop losses exceeding 50 % in severe years, exacerbating farmer distress and migration. Artificial Intelligence offers innovative solutions by leveraging data analytics, machine learning (ML), and Internet of Things (IoT) for real-time decision-making. In Maharashtra, the MahaAgri-AI Policy determine 2025–2029 allocates 500 crore to integrate AI across the agricultural value chain, aiming for climate-resilient farming and SDG alignment. This paper focuses on Jalna, exploring AI's applications in agriculture and irrigation and energy utilization , while addressing implementation barriers. Through secondary data analysis and case studies, it argues that AI can drive equitable, eco-friendly growth in Jalna district district.

1.2 Study Area:

Jalna district is approximately situated at the central part of the Maharashtra state of Republic of India and northern direction of Marathwada region specially district lies between $19^{0}01'$ North to $21^{0}03'$North latitudes and $75^{0}04'$ East to $76^{0}04'$ East Longitude. Jalna district erstwhile a part of Aurangabad district was formed on 1st May, 1981 by carving out Jalna, Bhokardan, Jafrabad and Ambad tahsils of Aurangabad district and Partur tahsil of Parbhani district. The boundaries of Jalna are adjacent to Parbhani and Buldhana on east, Aurangabad

KNOWLEDGE FLAME
E-ISSN: 3049-1541
International Multidisciplinary Research Journal (KF-IMRJ)
(An International Indexed & Peer Reviewed Journal
Impact Factor: 5.292 https://knowledgeflame.in PRGI Reg. No. MAHMUL/2024/89852

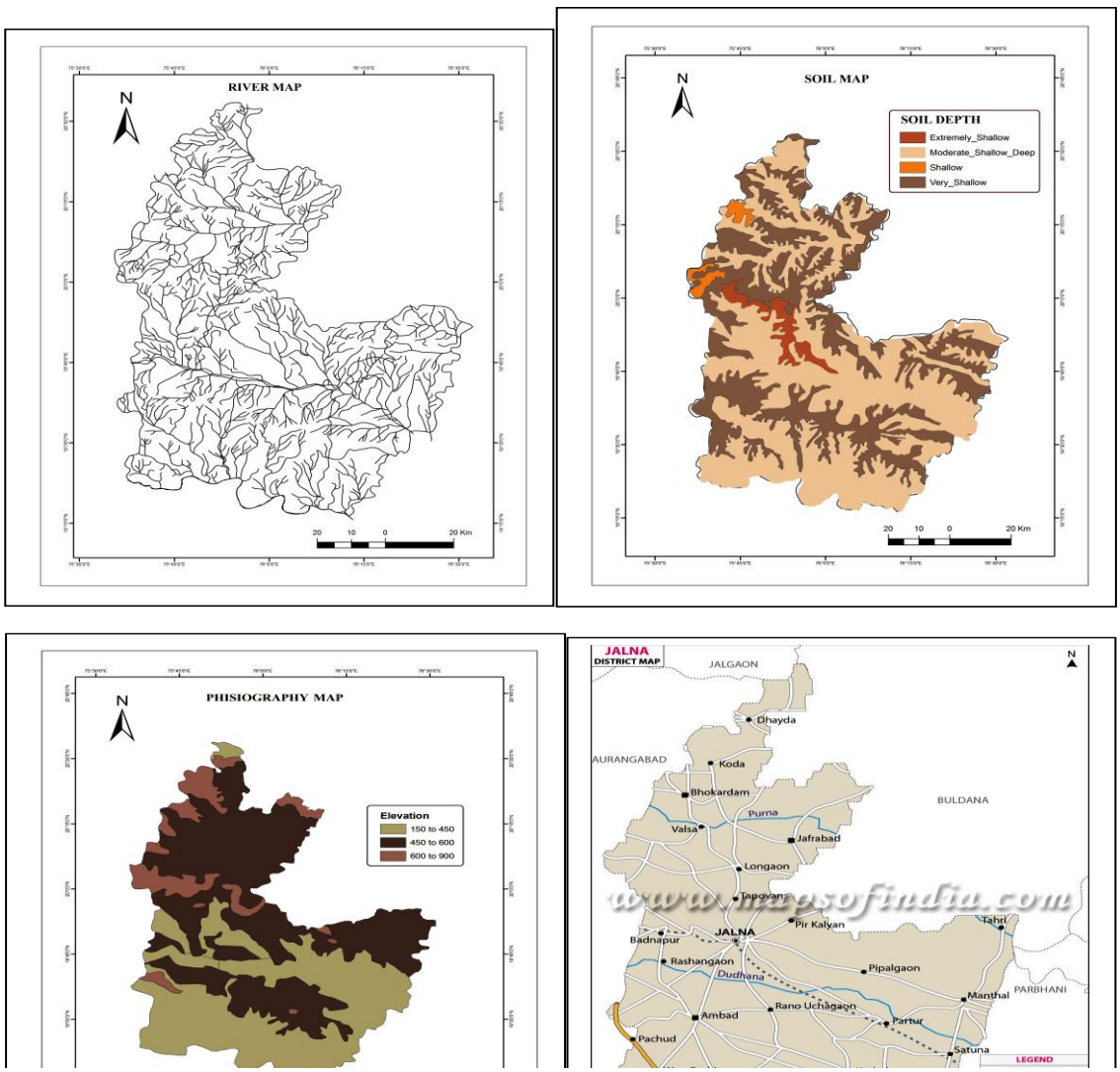
on west, Jalgaon on north and Beed on South. Jalna district covers an area of 7,612 sq.km which is 2.47 percent of the total state area of Maharashtra, and it has population of 16.12 lakh as per 2001 census. Recently Jalna district is divided into eight tahsil for administrations these are Jalna, Ambad, Bhokardan, Jafrabad, Badnapur, Partur, Mantha and Ghansawangi.

1.3 Objective –

To examine the development level of awareness of Artificial Intelligence technologies in various sectors of Jalna district **such as agriculture, irrigation, energy and rural development.**

To assess how AI-based tools and applications can contribute to sustainable agricultural practices in Jalna district**.**

Location map of Study area



Sustainability indices (SLSI), revealing Jalna's low ecological scores (0.45/1.0) but potential for AI-driven improvements in soil and water metrics.

KNOWLEDGE FLAME
E-ISSN: 3049-1541
International Multidisciplinary Research Journal (KF-IMRJ)
(An International Indexed & Peer Reviewed Journal
Impact Factor: 5.292 https://knowledgeflame.in PRGI Reg. No. MAHMUL/2024/89852

Table No.1.1 AI Application in Jalna District

Sr.No.	AI Application	Key Feature in Jalna district	Expected impact
1.	Pest Surveillance (CROPSAP)	Real Time Advisers via Mahavistar App	20-30% crop failure reduction
2.	Yield Prediction (MAHAAGRI.AI)	Satellite + ML for Soyabeen/Cotton Forecast	30 % income increase
3.	Water Management	Io T fir Drip Irrigation Optimization	20 % water savings

Source-Renewable Energy and Climate Resilience

Maharashtra's Digital Twin initiative, launched in 2025, uses AI to model solar grids, enhancing rural electrification in Jalna district(Kusum Yojana by State Govt.) .By simulating renewable integration, it reduces pollution and supports off-grid solar pumps, aligning with SDG 7 (Affordable Energy).

1.6 Broader Ecosystem Integration

The MahaAgri-AI Policy funds startups for AI in supply chains, including Jalna's pulse exports, minimizing post-harvest losses (currently 15–20%). Voice-based chatbots like Kisan e-Mitra provide Marathi advisories, bridging digital divides.

1.7. Discussion

following conclusion has come out through AI's integration yields tangible benefits: In similar Maharashtra pilots, yields rose 40% for sugarcane, adaptable to Jalna's crops. Environmentally, reduced inputs lower emissions by 15–20%, aiding SDG 13 (Climate Action). Economically, it empowers 50,000+ Jalna farmers via apps, cutting costs by 30%.Challenges include low digital literacy (only 40% smartphone penetration in rural Jalna), data biases favoring large farms, and infrastructure deficits. Ethical AI deployment, as per MahaAgri guidelines, is crucial to avoid exacerbating inequalities.

1.8. Conclusion

AI plays vital role for Jalna district sustainable development, transforming vulnerabilities into opportunities through targeted interventions. The MahaAgri-AI Policy and local pilots like Cropin-ATMA provide a blueprint for replication, potentially elevating Jalna's Sustainability Index by 25% by 2030. Government should prioritize training, subsidies for IoT devices, and inclusive data ecosystems. Future research could quantify long-term ROI via longitudinal studies. Ultimately, AI not only sustains Jalna's agrarian heritage but fosters a resilient, equitable tomorrow.

References

1. Government of Maharashtra. (2025). Maha Agri-AI Policy 2015 –2029. Krishi Maharashtra Portal.
2. Census of India (1951 to 2001) Jalna district Series 16, Maharashtra, part XIII A & B.
3. Socio-Economic report of Jalna district.

KNOWLEDGE FLAME
E-ISSN: 3049-1541
International Multidisciplinary Research Journal (KF-IMRJ)
(An International Indexed & Peer Reviewed Journal
Impact Factor: 5.292 https://knowledgeflame.in PRGI Reg. No. MAHMUL/2024/89852

4. Crop In. (2025). Sustainable Agriculture Development in Maharashtra with ATMA Jalna.
5. TERI. (2020). Drought in Jalna. The Energy and Resources Institute.
6. Additional sources from web searches (2024–2025) and X posts (e.g., ICAR-NBSS&LUP MoU, 2025).
7. www.maharashtra.gov.in.
8. www.jalna.nic.in