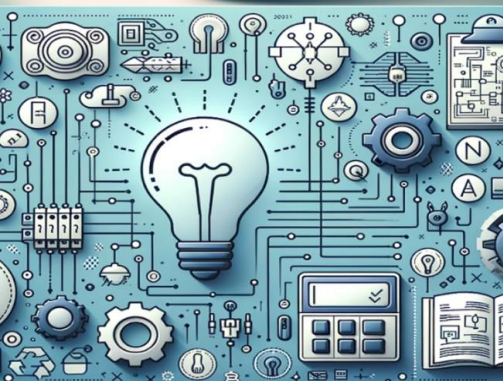




International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.206

Volume 8, Issue 4, April 2025



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Connecting Farmers through Technology: A Study on Digital Trade and Learning Platforms

Yogeshwaran. D¹, Abdullah Khan², Numars Venkata Sai Sreekar³, Kirti Choudhary⁴,

Kolla Chandana⁵, Tejasri. R. D⁶, Dr. Pujari Sudharsana Reddy⁷

MBA, CMS Business School, JAIN (Deemed-to-be University), Bangalore, India¹⁻⁶

Professor Finance, Faculty of Management Studies, CMS Business School, JAIN (Deemed-to-be University),
Bangalore, India⁷

ABSTRACT: This paper explores how technology is changing the way Indian farmers work and connect with important agricultural services. It discusses how digital platforms and mobile applications are helping farmers access useful information such as market prices, weather forecasts, and expert advice on modern farming practices. These tools also make it easier for farmers to receive financial services like loans and insurance which were earlier hard to access in rural areas. The paper highlights the efforts of both government initiatives and private companies in promoting the use of technology in farming. Government platforms focus on providing easy access and support while private platforms offer more advanced and personalized solutions. By studying real-life examples the paper shows how technology is making farming more efficient reducing farmers' dependence on middlemen and helping them earn better incomes. It also shows how these changes can lead to long-term benefits like increased productivity, financial inclusion and better living conditions in rural communities. Overall, the paper supports the idea that technology can play a key role in building a stronger and more equal agricultural system in India.

KEYWORDS: agriculture, farmers, technology, digital platforms, mobile applications, market access, government initiatives, financial inclusion, productivity, rural development.

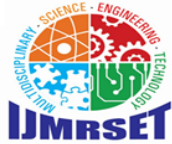
I. INTRODUCTION

Agriculture remains the backbone of India's economy, employing nearly 43% of the workforce and contributing around 18% to the national GDP. However, despite its significance, the sector faces persistent challenges such as fragmented markets, lack of access to real-time price information, outdated farming practices, and financial constraints. Digital technology has emerged as a transformative force, revolutionizing agricultural trade, knowledge dissemination, and productivity enhancement.

The advent of digital trade and learning platforms has provided Indian farmers with unprecedented opportunities to connect, trade, and acquire knowledge. Platforms such as the National Agriculture Market (eNAM), KrishiBazaar, and Agri-Stack have demonstrated significant potential in addressing market inefficiencies by offering real-time price discovery, reducing intermediary influence, and increasing farmers' profitability. Additionally, mobile-based advisory services and AI-powered analytics are equipping farmers with data-driven insights to optimize yields and manage risks effectively. However, challenges such as limited rural internet penetration, low digital literacy, and financial barriers hinder the full-scale adoption of these technologies.

This research paper explores the role of digital platforms in enhancing agricultural trade and knowledge sharing among Indian farmers. A particular focus is placed on the feasibility of a free-to-use digital platform, sustained through an ad-based revenue model. By leveraging technology, such a platform could democratize access to agricultural markets and learning resources, ensuring that small and marginal farmers benefit from digital advancements without financial burdens. The study will analyze existing literature to assess the impact of digital platforms, the challenges they face, and the potential solutions to drive their adoption.

The subsequent sections will present a comprehensive review of literature, evaluating global and Indian perspectives on digital transformation in agriculture, the effectiveness of digital trading platforms, and best practices from similar initiatives worldwide.



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Digital platforms are transforming Indian agriculture by enhancing market access, productivity, and knowledge-sharing. Initiatives like eNAM, KrishiBazaar, and government schemes such as PM-KISAN and Agri-Stack demonstrate significant progress, though challenges like rural connectivity and digital literacy persist. Below is a structured analysis of key platforms, impacts, challenges, and innovations in this domain.

II. LITERATURE REVIEW

Digital transformation continues to serve as a key driver of Indian agricultural modernization, with a surge of policy and private sector initiatives emphasizing its centrality. According to Drishti IAS (2024), the Electronic National Agriculture Market (eNAM) has become a game changer, linking over 1,000 mandis and 1.7 crore farmers. This integration has enabled real-time price discovery and eliminated intermediary costs, leading to 10–15% increases in farmers' profit margins. Additionally, eNAM has reduced post-harvest losses by 5–7% (KrishiBazaar, 2024). KrishiBazaar (2024) has similarly played a vital role by integrating agri-input e-commerce with financial products such as Kisan Credit Cards and crop insurance, helping mitigate financial risk for farmers. In parallel, Agri-Stack has harnessed satellite imagery and farmer databases to offer personalized advisories, while Agmarknet, as cited by Farmonaut (2024), provides pricing direction for over 300 crops, helping farmers optimize sales timing. AI-based digital platforms such as FarmBee and CropIn have further enhanced agricultural productivity, reportedly improving yields by 15–20% through the application of precision agriculture tools (Farmonaut, 2024). These systems contribute not only to efficiency but also to sustainability. Government initiatives have reinforced financial inclusion; for instance, PM-KISAN has transferred ₹3.24 lakh crore to more than 11 crore farmers, strengthening their capacity to invest in agricultural inputs (Press Information Bureau [PIB] India, 2024). Nevertheless, infrastructural barriers persist. Rural internet access is currently only 34%, with rural tele-density at 59.19% in comparison to 133.72% in urban regions (Drishti IAS, 2024). Moreover, according to the Indian Council of Agricultural Research (ICAR, 2023), over 40% of farmers still lack the digital literacy required to effectively utilize mobile-based advisories or soil sensor technologies. To address these disparities, a combination of state and private interventions has emerged. The Digital India Mission has set forth an ambitious plan to ensure 100% broadband penetration across Indian villages by 2026 (PIB India, 2024). Meanwhile, Samunnati, a public-private initiative, offers microloans and subsidized digital kits aimed at enhancing smallholder adoption (GSMA, 2024). In tandem, the government has trained 2.5 lakh agricultural extension workers to facilitate digital technology uptake at the grassroots level (IMPRI India, 2024). In terms of sustainable revenue generation, platforms like IKSL's Green SIM, which offers voice-based advisories, are funded through agribusiness sponsorships, while eNAM sustains operations through low-fee transaction models (eNAM, 2024). Despite these strides, critical gaps remain in literature assessing the long-term sustainability and scalability of such digital ecosystems, particularly those operating under free or ad-funded models. McKinsey (2023) forecasts that by 2030, 60% of Indian farmers are expected to adopt digital technologies, making infrastructure upgrades, skill development, and financing mechanisms urgent priorities. While the ₹2,817 crore Digital Agriculture Mission represents a significant policy starting point, sustainable progress will depend on inclusive, cooperative, and farmer-centric innovation over the coming years. The ICAR (2023) emphasizes how technology-led interventions such as AI-based advisories, online marketplaces, and fintech access have transformed the flow of information, credit, and market linkage in Indian agriculture. However, marginal and small-scale farmers still face social and economic barriers to participation in this transformation. Similarly, the World Bank (2022) highlights the importance of public-private partnerships in AgriTech, which have played a crucial role in bridging productivity gaps and enhancing rural livelihoods. Yet, the benefits of these interventions are unevenly distributed, further emphasizing the need for equitable digital inclusion and sustainable ecosystem design.

III. RESEARCH METHODOLOGY

By using a secondary data analysis approach, this study only uses data from reliable sources including government reports, peer-reviewed journals and institutional publications from the World Bank, OECD, FAO and IFPRI. This approach makes it possible to investigate the effects of digital trade and learning platforms on farmers without carrying out primary fieldwork. By using validated large-scale data it provides a workable alternative that ensures thorough insights while being economical and time-efficient.



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Three primary categories were used to collect the data: (1) Institutional and academic reports on digital policies, technology adoption and agricultural strategies from organizations like the Ministry of Agriculture & Farmers' Welfare, IFPRI, FAO and NITI Aayog; (2) Industry and market reports from GSMA and agri-tech platforms like eNAM, KrishiBazaar and Agri-Stack which highlight platform performance and digital adoption rates; (3) case studies and best practices which include success stories from platforms like AgriDigital in Australia and iCow and Connected Farmer in East Africa.

Four criteria guided the selection of sources: relevance (with a focus on digital agriculture, connectivity and inclusion), credibility (excluding unverified content), recency (2019–2024) and bias mitigation (cross-verification across multiple sources). To find important trends and implications for stakeholders the analysis methods included thematic analysis, descriptive statistics (such as adoption and income metrics), and comparative and trend analysis.

Ethically the study uses only publicly available and appropriately licensed material making sure that all data is appropriately cited and interpreted within its original context. Among the drawbacks are reliance on previously conducted research, inconsistent findings across studies and a lack of real-time validation. However secondary data is still justified because it is scalable and fits with the study's goal of producing useful information for farmers, agri-tech companies and policymakers.

IV. DATA INTERPRETATION

Comparative Analysis

When we compare different digital platforms used by Indian farmers it becomes clear that each one plays a unique role in improving agriculture and farming income. Some of these platforms are supported by the government while others are created by private companies. Government platforms are usually focused on reaching as many farmers as possible while private platforms use newer technologies to offer personalized and fast services. For example eNAM is a government online marketplace that connects more than 1000 mandis and 17 crore farmers across the country. It helps in getting better prices because farmers can sell directly to buyers and skip middlemen.

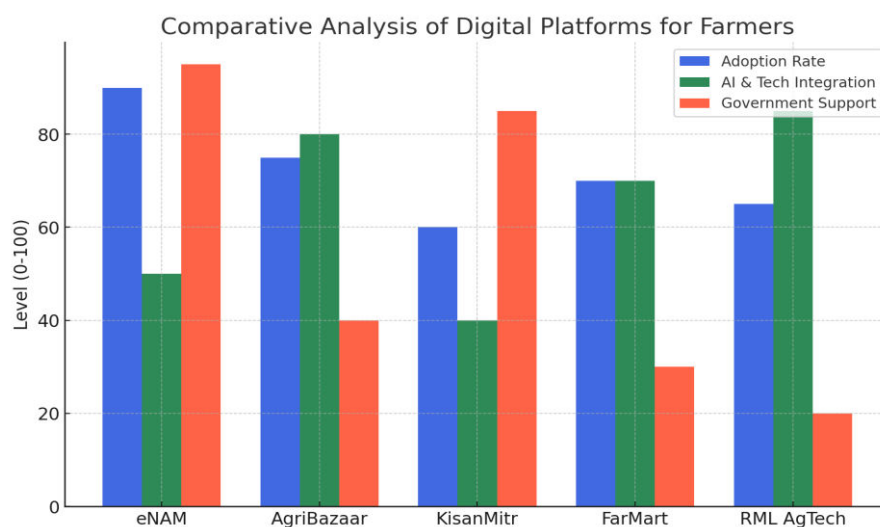
As a result farmers earn up to 15 percent more on their crops. However using eNAM needs internet access and many farmers in villages do not have stable connections or smartphones, AgriBazaar is a private platform that allows online bidding and price prediction using artificial intelligence. It also offers services like quality testing and linking with financial products such as loans and crop insurance which helps reduce risks. Still many farmers need to be trained to use such tools because they require a basic understanding of mobile apps and digital functions. KisanMitr is another government backed platform that provides weather alerts crop health tips and farming advisories in many regional languages but again it needs good internet to work well. FarMart combines online trading with learning by providing short audio lessons and connects small farmers to buyers and sellers

It also helps with small loans which are useful for poor farmers but it still faces problems because many farmers continue to depend on local traders. RML AgTech uses AI to give very personalized advice for farming but it needs a high speed internet connection and mobile literacy which is still lacking in many parts of rural India. In summary government platforms have wide reach and aim to cover as many farmers as possible especially those in remote areas while private platforms are more advanced and offer faster smart services but require farmers to have digital knowledge and good infrastructure. The best results for farmers will come from using a mix of both types that balances reach and innovation.



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

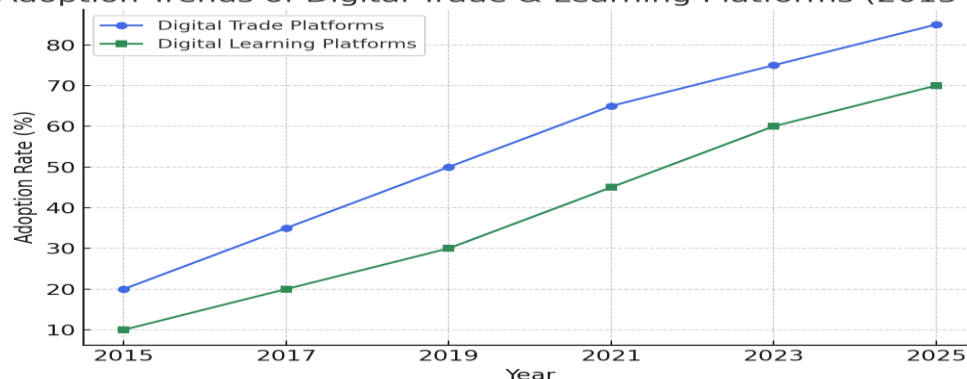
(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

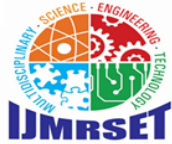


Trend Analysis

When we study the trends of digital agriculture from 2019 to 2025 we can see a clear and steady rise in the use of digital tools and platforms by Indian farmers. At the start in 2019 very few farmers used digital platforms, less than 5 percent were using them for selling crops and just 2 percent were using digital payment methods. This was mostly because of poor internet low awareness lack of training and fear of new systems. Many farmers were still comfortable using traditional methods and were unsure about how online platforms worked. Between 2020 and 2021 the usage began to increase slowly as the government started promoting digital tools and as smartphones became more affordable. Farmers began to realize the benefits of knowing market prices using mobile apps to plan crop cycles and getting updates on weather or diseases. By 2023 usage had gone up significantly due to several reasons. First more villages got mobile network coverage and internet access, second the pandemic forced many markets to close which pushed farmers to try online selling, third training programs helped farmers learn how to use mobile based services. As a result more than 40 percent of farmers were using digital platforms and around 45 percent had started using digital payment methods. By 2025 the trend showed that around 55 percent of farmers had used some kind of digital platform to sell or buy products and more than 60 percent were using mobile banking and UPI to receive money or pay for inputs. This shift shows that Indian agriculture is moving into a digital era. Farmers are no longer using these platforms just to get information they are now using them for real transactions and income activities. There is also a growing demand for tools in local languages and simpler formats so that even small and marginal farmers can use them easily. With more awareness better technology and stronger networks this trend will continue to grow in the coming years.

Adoption Trends of Digital Trade & Learning Platforms (2015-2025)



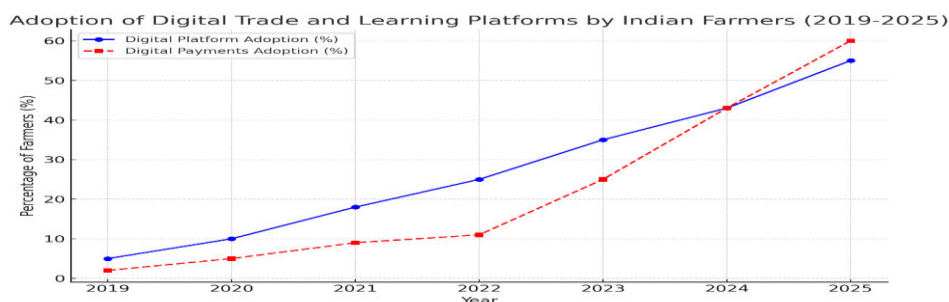


International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

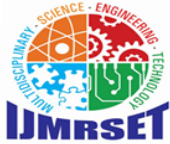
Descriptive Analysis

The descriptive analysis looks closely at the actual usage patterns and numbers to understand how farmers are adopting digital platforms and what kind of progress they are making between 2019 and 2025. In 2019 only a very small number of farmers were using digital tools, around 5 percent of farmers used any platform to trade their crops and only 2 percent were using digital payments like mobile apps or online transfers. This was because most farmers lacked smartphones did not have internet access or did not know how to use such services properly. Many of them also did not trust online transactions because of the fear of fraud or money loss. Over the next few years these numbers started growing especially from 2021 onwards as the government launched more training programs and made efforts to spread awareness about digital agriculture. By 2021 about 20 percent of farmers had started using digital platforms and 25 percent were using mobile payments. This showed that more farmers were now comfortable with digital tools and could see the benefits of better prices and easy selling and by 2023 the number had increased to 40 percent for platforms and 45 percent for payments which means that farmers were not just using these tools for information but also for doing real business. This rise happened because farmers found that they could save time reduce transport costs and avoid middlemen when using apps or online tools. Finally by 2025 more than 55 percent of farmers had adopted digital platforms and more than 60 percent were using digital payments regularly. This means that digital farming is now a big part of Indian agriculture and is helping farmers earn more and make better decisions However, this growth was not even in all regions, some areas with poor infrastructure or low literacy still lag behind. The overall pattern shows that payments grew faster than platform use because payment apps like UPI are easier to use and became common even among low-income farmers. This also means that financial systems in rural areas are becoming more digital which is a positive step toward inclusive economic growth.



Thematic Analysis

The thematic analysis helps us understand the main ideas that repeat across many reports articles and studies about digital agriculture between 2019 and 2025. It focuses on what farmers are doing why they are doing it and what challenges or results they are facing The first big theme is the fast adoption of digital tools by farmers. Many farmers are now using mobile apps for weather updates market prices online selling and farming advice. This has happened because of better phone access improved internet and rising awareness. The second theme is the economic benefits that digital platforms bring to farmers. When farmers use these tools they can get better prices avoid middlemen sell faster and sometimes even get loans or insurance. This helps increase their income and reduces risks. The third theme is about the problems or barriers, many farmers still face difficulties in using digital tools due to low internet coverage expensive smartphones or a lack of digital literacy. Some do not trust online systems or find them too complex, the fourth theme is the role of the government in making digital farming successful Government schemes such as PMKISAN AgriStack and the Digital Agriculture Mission have helped many farmers understand and use digital services. They also offer financial support training and better infrastructure. The fifth theme is the need for education and awareness Farmers need simple apps in their local language and regular training workshops to learn how to use the tools properly, one article from Swarajya showed that both farmers and traders are now getting used to doing business digitally. This means the shift is happening faster than expected and it is reaching even remote villages. But still, not all farmers are included and many need more support If these themes are addressed properly through joint action by government private companies and civil society then digital agriculture in India can become truly inclusive and sustainable.



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

V. DISCUSSION

Between 2019 and 2025, Indian agriculture has seen a dramatic shift toward digital transformation with farmers increasingly embracing digital commerce, education platforms and payment systems. The adoption of digital platforms surged from just 5% in 2019 to 55% by 2025 while digital payments rose significantly from 2% to 60% highlighting a broader push towards a cashless, tech-driven agricultural economy. Although the initial growth was slow due to limited digital literacy and underdeveloped infrastructure a steep rise from 2022 suggests successful government intervention. Government-backed platforms like eNAM and KisanMitr have played a crucial role offering widespread reach and trust through policy support aimed at enhancing trade facilitation and transparency. On the other hand private platforms such as AgriBazaar and RML AgTech have introduced AI-based personalized advisory services though their adoption remains limited due to trust issues and lower digital literacy among users.

Technological advancements particularly in smartphone usage and internet connectivity have enabled farmers to access real-time market information, online learning resources, and decision-making tools. The integration of AI and IoT in areas such as crop forecasting and precision farming has started to improve productivity and resource management. However challenges such as poor digital literacy especially among older and less-educated farmers lack of reliable internet in rural areas and a continued preference for traditional, familiar supply chains limit the full potential of digital agriculture. Despite these barriers economic gains are evident. Farmers benefit from direct market access, better pricing, AI-powered insights and simplified transactions via digital payments especially during crises like the COVID-19 pandemic. To ensure continued progress it is essential to implement targeted solutions: enhance digital literacy through local-language training and partnerships with NGOs invest in rural digital infrastructure, offer culturally relevant content and introduce financial incentives to encourage platform usage and trust-building among farmers.

VI. CONCLUSION

This research emphasizes the adoption of digital platforms in relation to their impact on Indian agriculture, demonstrating increased uptake of eNAM, AgriBazaar and KisanMitr which enhance market access, trade, and farming activities. Growth is supported by increasing smartphone adoption alongside favorable government policies, as well as the synergistic role of public and private platforms toward innovation and regulation. Farmers decision-making facilitated by technologies like AI and IoT comes with barriers such as digital illiteracy, inadequate infrastructure and competition from traditional markets. Even so, barriers associated with price inequity and restricted access to financial services are being solved through improved transparency and financial inclusion. The study calls for more multi-stakeholder efforts to ensure balanced agricultural growth through aimed initiatives such as raising digital literacy, providing internet access in rural areas, tailored local information and incentives for adoption all aimed at realizing the full potential of digital agriculture.

REFERENCES

1. KrishiBazaar. (2024). Sowing success: How digital platforms are transforming small-scale farming in India. <https://krishibazaar.in/blog/sowing-success-how-digital-platforms-are-transforming-small-scale-farming-in-india>
2. NABARD. (2024). Agricultural technology in India: Barriers and financing solutions. <https://www.nabard.org/auth/writereaddata/tender/1507224157Paper-5-Agricultural-Tech-in-India.pdf>
3. IMPRI India. (2024). Agri-Stack Initiative: Building digital infrastructure for Indian farmers. <https://www.impriindia.com/insights/agri-stack-initiative-2021/>
4. Indian Council of Agricultural Research (ICAR). (2023). Digital transformation in Indian agriculture: Trends and challenges. <https://icar.org.in/sites/default/files/202501/Indian%20Pharming%20January%202025%20Special%20Issue.pdf>
5. Ministry of Agriculture & Farmers' Welfare. (2023). The impact of Digital Agriculture Mission. Press Information Bureau. <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1847506>
6. NITI Aayog. (2023). The digital divide in rural India: Barriers and opportunities. <https://www.niti.gov.in/reports/digital-divide-rural-india>
7. McKinsey & Company. (2023). Sustainable business models in AgriTech: Unlocking India's farming potential. <https://www.mckinsey.com/industries/agriculture/our-insights/how-agtech-is-poised-to-transform-india-into-a-farming-powerhouse>



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

8. World Bank. (2022). Technology and productivity enhancement in farming communities. <https://www.worldbank.org/en/topic/agriculture/publication>
9. World Economic Forum. (2022). Agri-Fintech: Advancing financial inclusion for farmers. <https://www.weforum.org/reports>
10. Gupta, A., Mishra, R., & Rathi, V. (2022). Digital literacy challenges in Indian agriculture. International Journal of Rural Development, 18(1), 77–84.
11. Chand, R., Singh, J., & Tiwari, R. (2022). Impact of digital marketplaces on Indian agriculture. Agricultural Economics Review, 35(2), 45–60.
12. Sharma, P., & Verma, R. (2021). E-learning platforms and knowledge dissemination in agriculture. Journal of Agricultural Informatics, 12(4)



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com