

Leveraging Artificial Intelligence (AI) and social media for transforming fisheries and agriculture-allied extension services

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Abstract

The integration of AI and social media in fisheries and agricultural extension services offers transformative potential by enhancing how knowledge and resources are shared with farmers, fishers, and rural communities. Social media platforms act as effective channels for delivering AI-driven insights, such as weather forecasts, pest alerts, and market updates, while also fostering community engagement and peer-to-peer learning. This integration boosts productivity, sustainability, and collaboration, improving resource utilisation, market access, and livelihoods. AI-powered chatbots, virtual communities, and live webinars further enhance knowledge dissemination. Future developments in adaptive e-learning, gamification, and crowdsourced insights will drive localised solutions. Ultimately, AI and social media create resilient, responsive, and sustainable fisheries and agricultural sectors, addressing challenges like climate change, food security, and rural poverty while promoting sustainable practices and modernisation. Artificial intelligence and social media are revolutionising extension services by offering immediate, data-informed assistance and outreach. For instance, AI-driven chatbots are helping farmers through platforms like WhatsApp. This study explores how social media, enhanced by AI, improves fisheries and agricultural extension services. It focuses on the enhancement of knowledge sharing, the provision of real-time advisory support, and the promotion of community involvement while also addressing significant challenges and identifying future opportunities.

Keywords: Agriculture, Artificial Intelligence, Extension Services, Fisheries, Social Media

Highlights

- AI-powered social media enables real-time advice, knowledge sharing, and better market access in fisheries
- Fishers use social media platforms to share practices, local knowledge, and solve problems collectively
- Social media promotes sustainable fishing through awareness and community advocacy

INTRODUCTION

Extension services are dedicated to informing farmers about the latest agricultural technologies, innovative farming methods, and potential market opportunities (Arulmanikandan and Vaishnavi, 2024). Historically, extension systems have been primarily managed by the public sector, utilising direct interactions like field visits, demonstrations, and training sessions for farmers (Khatri *et al.*, 2024). Artificial Intelligence (AI) is a field within computer science focused on enabling machines to replicate human-like intelligent behaviour. It holds significant promise for addressing some of the most pressing social issues globally (Hasas *et al.*, 2024). Contemporary social media platforms, often referred to as social networking sites, encompass Facebook, Twitter, Instagram, and YouTube (Jack and Akpan, 2024). AI plays a crucial role in the operation of these modern social networks. The integration of AI in social media is expanding rapidly and is continuously reshaping

the landscape of social interaction online (Sadiku *et al.*, 2021). Social media is a major factor in influencing various aspects of consumer behaviour, including awareness, information acquisition, opinions, attitudes, purchase behaviour, and post-purchase communication and evaluation (Mangold and Faulds, 2009). AI-powered tools such as the Internet of Things (IoT), Machine Learning (ML), AI-enabled cameras, and advanced algorithms provide effective solutions to minimise human intervention, enhance productivity, monitor fish health, optimise feed usage, and manage water resources efficiently (Geetha and Bhanu, 2018). AI continuously collects and analyses data on user activity across social media platforms. Its applications include text and image analysis, spam detection, social insight generation, targeted advertising, and data aggregation (Sadiku *et al.*, 2021). Conventional extension methods face challenges such as restricted outreach, significant time demands, and limitations in resources, including a lack

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of personnel, which hinder their ability to assist all farmers (Swanson and Rajalahti, 2010). In contrast, artificial intelligence and social media offer solutions to these problems by enabling rapid, extensive, and economical dissemination of information, thereby providing real-time support to farmers (Klerkx and Rose, 2020). For example, Artificial intelligence is transforming the fields of agriculture and fisheries by delivering innovative solutions for both farmers and fishers (Mandal and Ghosh, 2024). AI-enabled chatbots and virtual assistants provide immediate advisory support, assisting users with crop management, pest management, and insights into market trends (Nayak and Sowmya, 2021). Predictive analytics further refines decision-making by leveraging AI-generated weather forecasts, disease predictions, and yield assessments, empowering farmers to proactively address potential challenges (Jhajharia *et al.*, 2023). Moreover, automated image recognition via mobile applications aids in detecting pests, diseases, and nutrient shortages, facilitating prompt action. These AI-based technologies enhance efficiency, sustainability, and profitability within the agricultural industry (Jayasingh *et al.*, 2024).

This article explores how AI and social media transform fisheries, agriculture, and agri-allied extension services by enhancing knowledge dissemination, real-time advisory support, and community engagement. By integrating AI with social media, extension services become more efficient, scalable, and accessible to address challenges like climate change, food security, and resource optimisation. Future advancements in adaptive e-learning, gamification, and crowdsourced insights will further enhance sustainable and resilient agricultural and fisheries sectors. To fully understand this transformation, it is essential to examine social media's role in extension services, AI applications in fisheries, practical implementations, real-world success stories, and the challenges that must be addressed.

Methodology

The methodology section of this paper has been meticulously crafted through an extensive literature review that emphasises the impact of Artificial Intelligence (AI) and social media on the evolution of fisheries and agriculture-related extension services. Initially, a total of 97 relevant articles, research studies, case analyses, and reputable online resources were gathered and thoroughly examined. Essential elements such as the utilisation of AI technologies (including chatbots, predictive analytics, and automated image recognition), the influence of social media platforms (such as Facebook, YouTube, and WhatsApp), real-time

advisory systems, community engagement tactics, and challenges like digital literacy and data privacy were identified and analysed. To ensure a coherent structure, the historical development of extension services was first explored, followed by an analysis of the transformative effects of AI and social media. Practical examples, including Krishi Saathi and Matsya Varta, were presented to demonstrate real-world applications. The research adhered to a 'Systematic Review' methodology, which comprised five key steps: I. Formulating essential research questions to direct the exploration of AI and social media's influence on extension services; II. Identifying and selecting pertinent literature and digital resources that discuss the convergence of AI, social media, and extension systems; III. Evaluating the credibility and relevance of the chosen publications and data sources; IV. Compiling insights into thematic categories such as information dissemination, automation, personalised learning, and community collaboration; and V. Analysing the results to extract implications for future extension practices and digital transformation (Okoli and Schabram, 2010; Snyder, 2019; Debnath *et al.*, 2022).

Social media as a game changer in extension

AI plays a crucial role in the social networks that we engage in daily. It can efficiently manage and create various types of social media content in just a matter of minutes (Senyapar, 2024). Here are several ways in which social media platforms are utilising AI:

Facebook employs a range of AI technologies to enhance user experience, including content recommendations, facial recognition, friend suggestions, and targeted advertising through sophisticated machine learning techniques (Song *et al.*, 2024). Instagram utilises artificial intelligence to identify and recommend visuals and images prominently featured on its Explore page (Kaustubha *et al.*, 2024). Snapchat incorporates AI through computer vision to analyse facial features, enabling the real-time application of filters to users' faces (Alnaser, 2024). LinkedIn harnesses AI to suggest connections, recommend job opportunities, and curate specific posts in users' feeds, enhancing networking and job search experiences (Al-Youbi and Mahnabi, 2024). Pinterest captivates users with its personalised content offerings.

Applications of AI in social media in fisheries extension

Artificial Intelligence (AI) is fundamentally transforming the fisheries sector by improving the mechanisms of monitoring, feeding, and disease management through the deployment of advanced tools

and technologies. Drones that are equipped with sensors are capable of gathering water quality parameters, such as turbidity, temperature, and levels of dissolved oxygen, which can be conveniently accessed through mobile devices. Progressing further, robotic fish, exemplified by 'Shoal,' autonomously navigate aquatic environments and assess pollution levels while engaging in communication with one another via low-frequency acoustic signals. AI-driven mobile applications, such as 'Farm MOJO' developed by India's Aquaconnect, provide critical support to shrimp aquaculturists in evaluating water quality and forecasting potential disease outbreaks. In a similar vein, Indonesia's 'eFishery' has innovated an AI-integrated feed dispensing system that utilises sensors to gauge fish appetite and dispenses precise quantities of feed, thereby achieving a reduction in feed expenses by as much as 21%. Enterprises like 'Observe Technologies' furnish AI frameworks that scrutinize feeding behaviours and furnish data-informed recommendations regarding feed volumes. Collectively, these technological advancements illustrate the capacity of AI to enhance aquaculture practices by facilitating precision-based methodologies, minimising operational costs, and promoting sustainable practices (Chrispin *et al.*, 2020).

Social media has evolved beyond its original purpose of serving as a space for human interaction and connection (Rizki, 2023). Forward-thinking companies leverage social media for various functions, including e-commerce, customer support, marketing, public relations, and beyond (Jussila *et al.*, 2014). The integration of artificial intelligence within social media platforms is extensive. AI applications in this realm encompass text analysis, image analysis, spam detection, social insights, advertising strategies, and data collection (Alshattawi *et al.*, 2024). Several of these applications are explored in the following sections:

Information dissemination: Social media facilitates the rapid and extensive dissemination of agricultural information, encompassing best practices, weather updates, pest management techniques, market trends, and government regulations. This empowers fish farmers to make well-informed choices and embrace modern farming methods (Chhachhar *et al.*, 2013). AI-driven personalised learning suggestions provide users with tailored training videos, articles, or expert insights that match their specific needs. Moreover, AI translation tools help overcome language barriers, enabling farmers and fishers from various areas to exchange knowledge effortlessly. In summary, AI

enhances social media as a more effective, engaging, and accessible platform for sharing information in agriculture and allied sectors, such as fisheries.

Farmer-to-farmer knowledge exchange: Social media has become an essential resource for the exchange of knowledge among fishers in India, facilitating quick and economical sharing of fisheries-related information. Platforms such as WhatsApp, Facebook, and YouTube enable fishers to exchange best practices, address challenges, and seek guidance on sustainable fishing methods, aquaculture management, disease prevention, and market dynamics. This peer-to-peer learning promotes the spread of localised knowledge, allowing fishers to adapt and apply strategies tailored to their unique aquatic settings (Lahiri *et al.*, 2024a). Digital communities play a crucial role in enhancing traditional fishing knowledge, encouraging environment-friendly practices, and closing the information gap, particularly for small-scale and artisanal fishers (Thakur and Chander, 2018).

Crowdsourcing solutions: Social media platforms facilitate collaborative problem-solving by linking fish farmers with fellow producers, specialists, and extension agents. Various stakeholders, such as fish farmers, extension workers, and input suppliers, leverage platforms like YouTube and WhatsApp for a range of agricultural and allied activities, promoting joint solutions to immediate challenges (Chowdary *et al.*, 2024).

Social media advertising: AI enables targeted advertising in the fisheries sector, ensuring the reach to niche group of consumers like seafood enthusiasts, recreational and competitive fishers, and health-conscious consumers (Sangma *et al.*, 2025) or eco-conscious consumers such as sustainable seafood supporters, ocean protectors, local and ethical buyers, students, researchers, academicians, etc. (Wing and Woodward, 2024). By analysing user behaviour, it optimises ad-placements to drive a better return on investment. Automated bidding strategies adjust to maximise ad-visibility based on real-time performance (Sadiku *et al.*, 2021).

Marketing: AI-driven tools personalise marketing content, tailoring promotions to each user's preferences based on past interactions. In fisheries, this can mean highlighting sustainable fishing practices or promoting seasonal catches (Wing and Woodward, 2024). AI helps to create dynamic advertisements and content that engage users more effectively, boosting brand recognition (Jayasingh *et al.*, 2024).

Social insights: AI analyses user-generated data, like comments and posts, to uncover trends and consumer sentiments around fisheries products. It provides valuable insights into consumer behaviour and interests, guiding product development or marketing strategies (Rizki, 2023). This helps fishers understand public perception and adapt quickly to market demands (Sadiku *et al.*, 2021).

Automation: AI automates repetitive tasks such as content posting and data analysis for fisheries businesses, saving time and resources (Lloyd *et al.*, 2020). For example, AI tools can automatically schedule posts about products or sustainability initiatives. This automation allows companies to focus on creative and strategic aspects of their social media presence (Jayasingh *et al.*, 2024).

Social listening: For fisheries, this means they can monitor conversations around their brand or industry to identify opportunities and address concerns. It helps businesses stay proactive and responsive to customer needs and trends (Sadiku *et al.*, 2021).

Chatbots: AI-powered chatbots in the fisheries industry provide quick customer support on social media platforms like Facebook Messenger (Uzoka *et al.*, 2024). These bots can answer inquiries about product availability, delivery times, or the sustainability of fishing methods. They offer round-the-clock assistance, improving customer engagement and satisfaction (Jayasingh *et al.*, 2024).

Usage of AI-integrated social media in fisheries

Knowledge sharing: AI in social media helps in sharing educational videos, infographics, and real-life success stories about sustainable fishing and best practices on Facebook, YouTube, and Instagram, using local languages to reach more fish farmers (Vidyashree *et al.*, 2021).

Community engagement: AI enables the creation of online groups or forums where fish farmers can interact, ask questions, and learn from experts about topics like aquaculture techniques and market access (Oyinbo *et al.*, 2020).

Interactive sessions: The hosting of live question and answer sessions with fisheries experts on breeding, feeding strategies, and industry connections provides real-time advice and insights to fishers (Meena *et al.*, 2019).

Customised content: AI can be used to analyse user's behaviour and interests on social media, delivering

personalised content about fishing techniques or market trends tailored to specific regions and preferences.

Notification systems: AI can be used to set up automated notifications via social media to inform fish farmers about critical weather conditions, disease outbreaks, or market changes that may affect their operations (Das, 2020).

Online learning platforms: Integration of AI-powered adaptive learning tools with social media offers personalised online courses and training programmes for fish farmers on topics like sustainable practices and fish health (Vidyashree *et al.*, 2021). For example, FAO e-Learning Academy helps provide AI-enhanced fisheries training with multilingual support.

Gamification: Develop gamified learning modules with AI to make training on fish farming practices more interactive, rewarding, and accessible for a broader audience (Singh *et al.*, 2020).

Crowdsourced data: Social media platforms help indirectly collecting the data from fish farmers, allowing them to share challenges, solutions, and innovations in the field of fisheries (Borah *et al.*, 2022). The growing usage of AI-integrated social media in fisheries is best illustrated through practical applications and success stories, such as the innovative initiative *Krishi Saathi*.

Krishi Saathi: Krishi Saathi is an AI-driven platform aimed at supporting Indian farmers by delivering prompt and precise agricultural insights (Samuel, 2024). It utilises social media platforms to share valuable information, empowering farmers to make well-informed choices. Additionally, the platform promotes interactive communication, enabling farmers to exchange their experiences and solutions, which cultivates a collaborative learning atmosphere (Choudhary *et al.*, 2024).

Matsya Varta: Matsya Varta is a digital platform aimed at assisting fishers and aquaculture farmers by offering real-time advisory services, market insights, and technical expertise. This initiative utilises artificial intelligence and social media to share essential information regarding sustainable fishing methods, disease control, water quality assessment, and relevant government regulations. Matsya Varta empowers fishers to stay updated and make informed choices by employing AI-driven chatbots, automated alerts, and multilingual educational materials (Lahiri *et al.*, 2024b).

Impact of digital initiatives

Digital initiatives such as Kisan Call Centers, eNAM, and AI-driven agricultural advisory tools have revolutionised the agricultural landscape in India (Lahiri *et al.*, 2024a). KCC delivers immediate expert guidance, eNAM improves market accessibility and pricing strategies, and AI tools provide tailored farming suggestions. These advancements enable farmers to make informed decisions, increase productivity, and adopt sustainable practices (Manjeet and Kumar, 2019).

Challenges

AI has the potential to address some of the most pressing social issues globally; however, it is not a panacea. Despite the considerable social impact of AI, specific challenges need to be addressed to unlock its full potential (Tomašev *et al.*, 2020). It is essential to establish guiding principles for the use of AI tools, as there is a risk of misuse. Additionally, other critical challenges must be considered:

Digital literacy

Rural communities frequently encounter obstacles in accessing and utilising digital technologies, primarily due to inadequate internet connectivity, the unavailability of affordable smart devices, and low levels of digital literacy (Tahmasebi, 2023). As a result, many fishers may lack familiarity with AI-driven tools and social media platforms, which hinders their capacity to effectively utilise online extension services (Jayasingh *et al.*, 2024).

Resistant to technology adoption

Farmers might be reluctant to embrace AI-driven recommendations because of doubts or a lack of confidence in digital advisory services (Lahiri *et al.*, 2024a). Extension officers need to integrate AI-generated insights with conventional knowledge to foster acceptance among farmers (Klerkx *et al.*, 2019; Nirmalkar *et al.*, 2022).

Data privacy

The extensive adoption of social media in fisheries extension poses several risks, including potential data privacy violations and the dissemination of false information (Monkman *et al.*, 2018). Farmers and fishers could encounter deceptive guidance, fraudulent product advertisements, or phishing attempts (Fox *et al.*, 2018). It is essential to prioritise data protection and to advocate for verified, reliable sources to uphold trust and ensure effectiveness (Sadiku *et al.*, 2021).

Conclusion

The combination of AI and social media is transforming fisheries and agricultural extension services by speeding up knowledge-sharing, improving efficiency, and making information more accessible. Tools powered by AI, such as chatbots, predictive analytics, automated image recognition, and tailored learning suggestions, help farmers and fishers make timely, informed decisions. Platforms like Facebook, Whats App, and You Tube act as online centres where fishers and farmers can share best practices, seek expert guidance, and stay informed about market trends, disease outbreaks, and weather updates. Moreover, AI-driven crowdsourcing fosters collaborative problem-solving to tackle industry challenges. However, despite many benefits, challenges are there, including digital literacy, reluctance to adopt new technologies, and concerns about data privacy. It is essential to implement training programmes to enhance the digital skills of farmers and fishers, while policies must be incorporated to ensure proper AI use and protect personal information.

The integration of artificial intelligence and social media in agricultural and fisheries extension is set to transform how knowledge is shared, how farmers engage, and how decisions are made. AI-powered chatbots, image recognition technology, and predictive analytics will offer immediate solutions for managing pests, identifying diseases, and analysing market trends. Social media platforms will facilitate collaboration among farmers, fishers, and specialists, providing quick access to research, best practices, and training resources. This integration will enhance the efficiency, accessibility, and data-driven nature of extension services, leading to increased productivity, sustainability, and resilience in the agriculture and fisheries sector.

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