Chapter 6
Artificial Intelligence in the Agri-Business Sector:
Prioritizing the Barriers Through Application of Analytical Hierarchy Process (AHP)

Sarita Kumari Singh
KIIT University, India

Puspalata Mahapatra
KIIT University, India

ABSTRACT

The agri-business sector stands at the nexus of global food production, supply chain management, and rural development, yet it grapples with multifaceted challenges. In response, artificial intelligence (AI) emerges as a transformative force; however, the adoption of AI in agriculture faces significant barriers, particularly in countries like India. This study systematically identifies and prioritizes these barriers using the Analytical Hierarchy Process (AHP) methodology. The results highlight the paramount importance of technological infrastructure, data accessibility, and skill development. Ethical considerations around safety and transparency, economic constraints, and social-cultural acceptance also emerge as critical factors. The study offers insights into the relative significance of each barrier, facilitating informed decision-making and targeted interventions. Ultimately, by addressing these barriers, stakeholders can unlock new opportunities for growth, sustainability, and food security, ensuring prosperity for agricultural communities in the digital age.

INTRODUCTION

The agri-business sector plays a vital role in global food production, supply chain management, and rural development (Varchenko, 2019; Kireyenka, 2021; Tsoulfas et al., 2021). However, it faces numerous challenges, including climate change, resource scarcity, labor shortages, market volatility, and evolving consumer preferences (Ray et al., 2021; Migunov et al., 2023). In this context, AI offers promising

DOI: 10.4018/979-8-3693-3583-3.ch006

solutions by enabling data-driven decision-making, automation, predictive analytics, and optimization across the agricultural value chain (Smith, 2020; Ganeshkumar et al., 2021; Shadrin et al., 2020).

Artificial Intelligence (AI) has emerged as a transformative force across various industries, revolutionizing traditional practices and unlocking unprecedented opportunities for innovation and efficiency (Dwivedi et al., 2019). At its core, AI involves the development of computer systems capable of performing tasks that typically require human intelligence, such as learning from data, recognizing patterns, making predictions, and adapting to changing environment (Saba & Rehman, 2013). Machine learning, a subset of AI, focuses on building algorithms that can learn from data and improve performance over time without being explicitly programmed (Riihijärvi, & Mähönen, 2018; Jordan, & Mitchell, 2015) . Deep learning, a more advanced form of machine learning, employs neural networks with multiple layers to extract intricate patterns from vast datasets (Cockburn et al., 2018; Shrestha & Mahmood, 2019). In recent years, the agri-business sector has increasingly embraced AI technologies across the world to address challenges, enhance productivity, and ensure sustainable agricultural practices (Spanaki et al., 2021; Elbasi et al., 2023).

In agri-business, AI applications span a wide range of domains, including precision agriculture, crop management, livestock monitoring, supply chain optimization, market forecasting, and risk management (Sharma et al., 2021; Elbasi et al., 2023). Precision agriculture, in particular, has emerged as a prominent area where AI technologies are revolutionizing traditional farming practices (Shafi, 2019; Zhang et al., 2002). By leveraging data from sensors, satellites, drones, and other sources, AI-driven systems enable farmers to monitor and manage crops with unprecedented precision, optimizing resource usage, minimizing environmental impact, and maximizing yields (Nyéki & Nemény, 2022).

In the realm of agri-business, AI holds immense promise for transformation by enabling data-driven decision-making, automation, and optimization across the agricultural value chain. By harnessing the power of AI technologies, farmers and agri-businesses can overcome challenges, enhance productivity, and ensure sustainable agricultural practices for future generations (Sáiz-Rubio et al., 2020). However, India has yet to fully embrace AI in agriculture due to a myriad of challenges that must be surmounted to unlock its vast potential. These hurdles encompass concerns regarding data reliability and accessibility, the compatibility of different systems, affordability of adoption, as well as anxieties surrounding privacy, security, and regulatory adherence (Sundari, 2018; Hota & Verma, 2022). Furthermore, the digital gap between large and small-scale farmers presents a significant barrier (Dhillon & Moncur, 2023).

In addition to these practical obstacles, there are profound ethical considerations associated with the integration of AI in agriculture. These include the risk of displacing rural livelihoods, the consolidation of power within agri-tech corporations, and the unforeseen consequences of algorithmic decision-making (Dara et al., 2022; Sparrow & Howard, 2020). Effectively tackling these complex challenges is crucial for fully realizing the benefits of AI in propelling agricultural practices forward in India. Thus, the focus of this study is on prioritizing and ranking the barriers hindering the adoption of AI in agriculture.

LITERATURE REVIEW

In the contemporary agricultural landscape, the integration of artificial intelligence (AI) stands as a transformative force, fundamentally reshaping traditional farming practices (Fountas, 2020; Sharma, 2021, Phadnis, 2023). While conventional technologies have facilitated the transition from manual to digital processes in agriculture, AI introduces a paradigm shift, offering unparalleled capabilities to