Harnessing Artificial Intelligence Across Agricultural Value Chain: A Systematic Review and Future Prospects

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Abstract: *The rapid advancement of Artificial Intelligence (AI) technologies has significantly influenced agricultural transformation, particularly in the domains of productivity, sustainability, and resilience. Adopting the guidelines of Systematic Literature Review, based on contemporary studies from Scopus, this study explores the evolving role of AI in agriculture. The review identifies six critical and interlinked themes to propose a conceptual framework of AI integrated with agricultural value chain that maps different levels of value chain integrated with AI along a data-flow and functionality continuum - from diagnostics to intervention & strategic decision-making. Findings reveal that these levels become mutually reinforcing after AI integration, with improvements in one level enhancing the performance and precision of others. Furthermore, decision support systems emerge as a pivotal construct that synthesizes upstream insights to enable real-time, localized guidance for farmers.The study contributes both theoretically and practically by integrating AI systems into a unified model and highlighting the value of cross-functional feedback loops, system interoperability, and farmer-centric design.*

Keywords: Artificial Intelligence, Sustainable Agriculture, Smart Irrigation, Agricultural Value Chain