

# Human-Centered AI in Smart Farming': Toward Agriculture 5.0

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**Abstract:** *This paper delineates the contemporary landscape, challenges, and prospective developments in human-centred artificial intelligence (AI) within the ambit of smart farming, a pivotal element of the emergent Agriculture 5.0, supplanting Agriculture 4.0. Analogous to Industry 4.0, agriculture has witnessed a trend towards comprehensive automation, often margin alizing human involvement. However, this approach has encountered limitations in agricultural contexts for various reasons. While AI's capacity to assume human tasks is acknowledged, the inclusion of human expertise and experiential knowledge (human-in the-loop) often proves indispensable, corroborated by the Moravec's Paradox: tasks simple for humans are complex for AI. Furthermore, social, ethical, and legal imperatives necessitate human oversight of AI, a stance strongly reflected in the European Union's regulatory framework. Consequently, this paper explores the advancements in human- centred AI focusing on their application in agricultural processes. These technological strides aim to enhance crop yields, minimize labor and resource wastage, and optimize the farm-to-consumer supply chain. The potential of AI to augment human decision-making, thereby fostering a sustainable, efficient, and resilient agri- food sector, is a focal point of this discussion- motivated by the current worldwide extreme weather events. Finally, a framework for Agriculture 5.0 is presented, which balances technological prowess with the needs, capabilities, and contexts of human stakeholders. Such an approach, emphasizing accessible, intuitive AI systems that meaningfully complement human activities, is crucial for the successful realization of future Agriculture 5.0..*

**Keywords:** Human-Centered AI, Agriculture 5.0, AI in Agriculture, Human-AI Collaboration, Precision Agriculture, IoT-based Farming, Sustainable Agriculture, Explainable AI (XAI), Farmer-Centric Technology

