

Global agriculture is undergoing a paradigm shift from conventional sustainability toward regenerative systems capable of delivering measurable environmental, economic, and social gains. The synthesis identifies four major research gaps that currently constrain widespread adoption: fragmented digital ecosystems, limited transferability of AI models across agroecological regions, the absence of standardized sustainability benchmarks, and socio-economic barriers affecting technology accessibility. Furthermore, the review evaluates digitally guided pathways for soil carbon sequestration, biodiversity enhancement, water-use efficiency, greenhouse-gas mitigation, and ecosystem-service restoration, while examining governance, digital equity, data ownership, and policy mechanisms necessary for large-scale implementation. While advances in artificial intelligence (AI), the Internet of Things (IoT), digital twins, and precision agriculture have accelerated agricultural digitalization, current research remains fragmented, with limited integration of these technologies into a unified framework for achieving net-positive farming.