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Green Skills Development in Agricultural TVET For Climate-Resilient Agriculture: A Scoping Review of Training Approaches and Youth Engagement

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Abstract

Climate change is reshaping global agricultural systems and increasing the demand for green skills that support sustainability and climate resilient farming. This scoping review mapped current evidence on green skills required for sustainable agriculture and climate change adaptation. Guided by the PRISMA ScR framework, systematic searches were conducted across Scopus, Web of Science, ScienceDirect, and ERIC for studies published between 2018 and 2025, resulting in 75 eligible publications that met the inclusion criteria. The review identified four major categories of green skills critical for advancing sustainable agricultural systems: environmental sustainability skills, climate adaptation competencies, digital and precision agriculture capabilities, and agripreneurship or green business skills. Across the selected studies, experiential learning, work integrated learning, and community based training were the most frequently employed approaches to develop these competencies, reflecting a shift toward practice oriented and context relevant pedagogy. Youth engagement and institutional support were found to be critical enablers of green skills development. Despite growing research attention, the findings highlight persistent gaps, including the absence of a standardized and sector specific definition of green skills for agriculture and limited evidence on their integration into formal agricultural training curriculum. The review contributes insights to inform curriculum development, workforce capacity building strategies, and policy interventions aimed at strengthening green skills development and supporting the transition toward sustainable and climate adaptive agricultural systems.

Keywords: Adaptation; Agricultural Education; Climate Change; Sustainable Agriculture; Digital Agriculture