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“Reconcile land system changes  
with planetary health”

## Agricultural mechanisation: A key strategy to mitigate climate change effects on farm production

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### Abstract

Climate change has emerged as one of the most significant threats to global agricultural production, exacerbating unpredictable weather patterns, soil degradation, water scarcity, and reduced crop yields. Addressing these challenges requires innovative and sustainable solutions to enhance agricultural productivity and resilience. Agricultural mechanisation presents a viable alternative to mitigate the adverse effects of climate change by improving efficiency, optimising resource use, and promoting climate-smart farming practices. This paper explores the role of mechanisation in adapting to and combating climate change in agricultural production. It highlights the integration of advanced machinery, precision agriculture, and automation to enhance soil management, water conservation, and crop protection. Mechanized systems such as conservation tillage, precision irrigation, climate-smart harvesting, and automated planting not only increase productivity but also reduce greenhouse gas emissions and soil erosion. Additionally, the adoption of renewable energy-powered mechanisation solutions, like solar-powered irrigation systems and biofuel-driven machinery, further supports sustainable agricultural development. The study also examines the socio-economic and policy dimensions influencing the adoption of mechanised solutions, particularly in developing regions where smallholder farmers face financial and technical constraints. It discusses potential strategies for overcoming these barriers through public-private partnerships, capacity-building programs, and financial incentives. By integrating modern mechanisation with sustainable agricultural practices, farmers can improve their resilience to climate change while ensuring food security and economic viability. This paper underscores the urgent need for investment in climate-smart agricultural mechanisation and policies that support their widespread adoption. The findings provide valuable insights for policymakers, researchers, and stakeholders in the agricultural sector seeking to enhance climate adaptation strategies through mechanisation.

**Keywords:** Agricultural mechanisation, climate change adaptation, climate-smart technologies, precision agriculture, Sustainable farming practices