Chapter 1
Climate-Smart Agricultural Practices

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ABSTRACT

Agriculture is an industry of great importance that plays a vital role in addressing global food security. However, it faces significant risks due to climate change, such as extreme weather events, water scarcity, soil degradation, which can lead to reduced crop yields. By 2050, it is projected that the need for food security will double, which will require increased reliance on mechanization, chemicals, freshwater, and energy. These changes may have an impact on ecosystem health. To address these challenges, it is important to consider shifting from traditional farming systems to ecological farming systems that employ holistic approaches for sustainable food production. This transition suggests the need for climate-smart agriculture, which involves integrating economic, environmental, and social principles. It includes employing practices such as no-till farming, crop diversity, and precision irrigation to enhance soil health and ecosystem services. Embracing this proactive approach is crucial for adapting agriculture to climate change and meeting future food demands sustainably.

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BACKGROUND

Agriculture is a high-risk industry, but it is also a crucial one. With the global population continuing to grow, urbanization persisting, disposable income rising, consumption habits changing, and the amount of fertile soil remaining limited, it is imperative to move beyond traditional farming (Mehrabi et al, 2022).

A number of socio-economic factors exert an influence on agricultural practices in Ukraine. These include land ownership reforms, government policies such as subsidies and regulations, the challenges of technological adoption, market access, and infrastructure limitations, the availability of labour and the skills of the workforce, the impacts of climate change, global market dynamics, financial constraints, and the role of education and extension services (Skydan et al, 2023; Pyvovar et al, 2024). These factors collectively influence the productivity, sustainability, and economic viability of Ukraine's export-oriented agricultural sector.

The term "food security" is defined by the FAO (2003) as the "physical and economic access to sufficient food to meet dietary needs for a productive and healthy life". The most urgent challenge facing society is the necessity to enhance the production of food and raw materials through the intensification of agricultural practices. Providentially, digital technologies offer powerful tools to improve operations and promote social and environmental sustainability.

Ukraine's productive lands can play a crucial role in doubling global food security by 2050. With sustainable management practices, these lands can produce food crops for export and support the world's growing population. It is imperative to transition towards more sustainable and responsible farming practices to ensure long-term food security and environmental health. However, current industrial farming practices, despite their high yields and profits, are causing increased ecosystem disservice. The intensification of farming practices will have long-term detrimental effects on ecosystem services.

Traditional agricultural practices in Ukraine heavily rely on deep plowing, inefficient irrigation, mono-cropping, and burning of crop residues. These practices are associated with increased agroecosystem disservices. Both irrigated and rainfed lands are impacted by the loss of soil organic matter (SOM), accelerated erosion, drought, secondary salinization, compaction, intermittent flooding, and increased pest and disease pressures. These factors inevitably result in poor soil health and reduced crop productivity.

Conventional agricultural practices in Ukraine routinely neglect environmental sustainability (Zhovtonog O.I., 2015 a). In the regions, where irrigation is crucial, these practices have led to a widespread deterioration in soil-water-plant-air relationships. It is important to adopt sustainable agricultural practices to ensure the long-term health of the environment and the success of the agricultural industry.