Chapter 7
Climate-Resistant Smart Agriculture for Healthy Food Production

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ABSTRACT

The integration of Artificial Intelligence (AI) in agriculture is reshaping how farmers adapt to climate change through Climate Smart Agriculture (CSA). CSA emphasizes resilience, environmental sustainability, and productivity. AI enhances these goals via real-time data collection, predictive modeling, and decision support systems. This chapter highlights AI's applications in precision farming, climate risk assessment, and resource management. Examples include AI-driven weather forecasting, smart irrigation, pest

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control, and livestock monitoring. These innovations significantly boost farming system resilience. However, challenges such as data accessibility, high costs, and ethical concerns persist. The chapter outlines strategies to scale AI in CSA, stressing the importance of robust data infrastructure, inclusive policies, and public-private partnerships. Ensuring affordable access to AI for smallholder farmers is crucial to achieving sustainable and climate-resilient agriculture globally.

1. INTRODUCTION TO TECHNOLOGY DRIVEN AGRICULTURE

Climate change poses one of the greatest threats to agricultural activities around the world. Hotter temperatures, unpredictable rainfall, rise in frequency of extreme weather like drought, floods and storms, pose too much threat of food security and livelihoods of people all over the globe. Such alterations do not only affect yields but also overload water use, deteriorate soil conditions, and promote the growth of pests and diseases (Aker et al., 2016; Goyal & Mishra, 2016). There are no larger needs related to the necessity to introduce new, flexible, sustainable farming. Climate Smart Agriculture (CSA) has become the key concept that helps to help tackle these difficulties (Azadi et al., 2021; Bhattacharyya et al., 2021). CSA aims at strengthening the resistance of agriculture systems, lowering the agricultural impact on the environment, and maintaining or raising productivity at a sustainable level (Gryshova et al., 2024). Nonetheless, fulfilling these goals will not only demand conventional farming methods, but it also needs to tap the use of emerging technologies capable of delivering real-time information, predictive analytics, and resource utilization plans (Cole and Sharma, 2017; Saravanan, 2012). This is where Artificial Intelligence (AI) makes a change. AI can transform CSA due to its capability to make accurate monitoring, as well as modelling and predictive modelling using data to make data-driven decisions (Balasundram, 2023; Palanisamy and Bharadwaj, 2017). AI offers such farmers an opportunity to make informed decisions, use resources efficiently, and reduce risks to their agriculture because of climate variability through the application of machine learning algorithms, computer vision, and advanced data analytics.

The Cross-Border Influence of Climate Change on the Current Reality of Environmental Risks in Spain

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