



## Chapter 2

# Climate Smart Agriculture and Resilience

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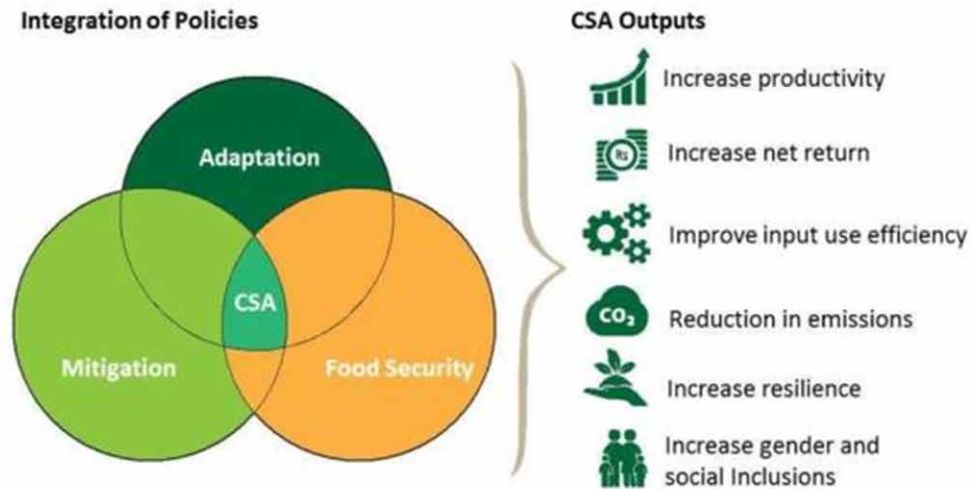
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### ABSTRACT

*Climate change poses significant challenges to global agriculture, necessitating sustainable practices to ensure food security and mitigate environmental impacts. Climate-smart agriculture (CSA) is a technique that aims to boost agricultural productivity, improve adaptive ability, and reduce greenhouse gas emissions. It includes practices like crop management, sustainable farming, agroforestry, precision farming, and climate-resilient crop varieties. CSA improves soil health, water use efficiency, erosion, carbon sequestration, biodiversity conservation, and resource utilization. Precision agriculture tools like remote sensing and data analytics enable site-specific management decisions. Climate-resilient crop types, such as drought-tolerant, heat-tolerant, and disease-resistant, are crucial for food production under changing climatic conditions. Encouraging laws, institutional frameworks, and financial incentives are essential for CSA implementation. However, more research and collaboration are needed to promote widespread adoption of CSA practices.*

DOI: 10.4018/979-8-3693-4864-2.ch002

*Figure 1. Conceptual framework for climate-smart agriculture and expected outputs (Khatri et al., 2017).*



## 1. INTRODUCTION

### 1.1. Climate Smart Agriculture

Climate-smart agriculture (CSA) is a strategy aimed at enhancing sustainable food production by addressing food security and climate change. It boosts agricultural productivity and incomes by improving resource efficiency, reducing post-harvest losses, and minimizing losses. CSA also helps farmers adapt to climate change by minimizing losses and ensuring food security. It reduces greenhouse gas emissions through improved manure management and fertilizer use. CSA is a locally adapted approach to managing the agricultural system, considering interactions between crops, livestock, soil, water, and climate. (Matteoli et al., 2021). It involves farmers and stakeholders in decision-making to ensure culturally appropriate, economically viable, and technically feasible practices. CSA practices include crop diversification, agroforestry, integrated pest management, water-saving irrigation techniques, and improved livestock management. They aim to reduce crop failure, improve soil fertility, reduce greenhouse gas emissions, conserve water, and improve animal health. Overall, Figure 1 highlights the potential of CSA practices to contribute to sustainable agriculture and positive environmental and social impacts. (Khatri et al., 2017).

### 1.2. Overview of the Impact of Climate Change on Agriculture

Climate change is significantly affecting agriculture worldwide, posing significant challenges to food security (Lipper et al., 2014) and rural livelihoods (Acharyya, 2022). Climate change is posing significant challenges to agriculture worldwide, including increased temperatures, reduced crop yields, heat stress on livestock, changes in precipitation patterns, droughts, floods, extreme weather events, sea level rise, salinization of agricultural land, loss of coastal agricultural land, changes in pests and diseases, and the

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