

Chapter 7

Protected Agriculture: A Climate Change Adaptation for Food and Nutrition Security

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ABSTRACT

This chapter provides an overview of the changing environment and the increased pest pressure that are projected to occur due to climate change and variability. Protected agriculture is introduced as an adaptation strategy to address these conditions and assist with food and nutrition security targets. The scope of the technology and the benefits of producing crops using protected systems as well as the use of protected systems in SIDS, with some emphasis on the Caribbean region, are outlined. The chapter outlines: (1) the specific features of the technology that assist with reducing the impacts of climate change and (2) some possible considerations for the successful development of a sustainable protected agriculture industry under climate change and variability.

INTRODUCTION

Climate change is widely recognized as one of the greatest challenges of the 21st century. If left unchecked, climate change will significantly impact the economies, societies and eco-systems around the world, especially that of Small Island Developing States (SIDS). Agriculture is an important sector in most SIDS, responsible not only for food production but also employment, foreign exchange earnings, rural development and poverty alleviation. In addition, the agricultural sector provides significant inputs into important sectors such as tourism and manufacturing and is therefore a major driver for economic development of SIDS. Climate change will affect the productivity of the agricultural sector in several

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ways, including: (i) shorter and more intense periods of rainfall which can lead to an increased probability of soil erosion on sloping lands and floods on flat lands, (ii) longer and more pronounced periods of drought with possible increased threat of fires, (iii) more intense hydro- meteorological events, (iv) warmer temperatures and decreases in diurnal temperatures and (v) increased pest populations (i.e. insects, nematodes, bacteria, fungi, viruses, phytoplasma, weeds) which can lead to a reduction in crop productivity. Without the implementation of adaptation measures especially in SIDS, food production systems, livelihoods and rural development will be significantly impacted.

A climate-smart approach to agriculture is required to achieve sustainable productivity, strengthen farmers' resilience, reduce agriculture's greenhouse gas emissions and increase carbon sequestration. Climate-smart agriculture includes many traditional farming techniques such as mulching, intercropping, crop rotation, integrated crop-livestock management, agroforestry, resistant varieties and improved water management. A critical element of such an approach is weather forecasting for improved decision making and the timely implementation of mitigating strategies.

Protected Agriculture (PA) which is being defined as the "*modification of the natural environment to achieve optimal growth*" (Jansen and Malter, 1995) is a viable adaptation option for mitigating the threats of climate change and variability. Such threats include high temperatures, intense rainfall, increased frequency of natural events and high pest populations.

With special reference to semi and fully protected structures; the technology has inherent features that mitigate against some of the abiotic and biotic threats facing agricultural production under a changing environment. Features include in part, structural designs, roof and side coverings and growing systems; all of which shelter the crop from adverse conditions, optimize the use of the inputs (in particular land, water) thus resulting in greater yields per unit area. The adoption of the PA technology, therefore, has the potential to significantly contribute to national food and nutrition security goals.

Determining the role of the technology within the context of climate smart agricultural programs will be critical to firmly root protected systems in agricultural development strategies and programs that address food and nutrition security in light of the forecasted increased threats due to climate variability and change.

CLIMATE CHANGE PROJECTIONS FOR SMALL ISLAND DEVELOPING STATES (SIDS)

According to the current list of the United Nations Department of Economic and Social Affairs, fifty-two states and territories are categorized as Small Island Developing States (SIDS). SIDS are located across the Indian, Pacific and Atlantic oceans, and also in the Caribbean Sea. The southwest Pacific and the Caribbean Sea have a high concentration of SIDS. In the Atlantic and Indian oceans, SIDS are located predominantly around the African continent.

These 52 SIDS face similar sustainability challenges, including exceptional vulnerability to climate change. Of particular importance to SIDS are the projected rise in sea levels which threaten the very existence of some islands. Also, changes in precipitation causing drought directly affect drinking water and impact food security through a decline in agricultural production. In addition, increased sea surface temperatures can cause coral bleaching which in turn affects artisanal fisheries and reduces storm surge protection. Further, extreme events impact infrastructure, agriculture and cause salt water intrusion into the freshwater lens (UNFCCC, 2005).

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