# Chapter 22
# Climate-Smart Approach for Sustainable Agriculture

**Nicolae Suvorov**
*The Bucharest University of Economic Studies, Romania*

**Alina Mădălina Stancu**
*The Bucharest University of Economic Studies, Romania*

## ABSTRACT

*The 21st century comes with a great challenge in terms of sustainable agriculture and food security, which is also a worldwide debated issue due to problems such as population growth, degradation of natural resources including loss of biodiversity and considerable soil degradation, and last but not least, climate change. In fact, climate change poses the greatest threat to agricultural systems and the health of ecosystems and natural balance. The green revolution comes as a lifesaver for the environment, streamlining the allocation of natural resources but at the same time involves huge costs in term of money, time, and labor. Due to the intensive use of fossil fuels, chemical treatments in agriculture, and animal husbandry, environmental problems such as climate change tend to become more pronounced resulting in negative environmental externalities globally. A smart approach to sustainable agriculture is to reinvent and innovate traditional agricultural practices in order to identify ways and possibilities to reduce the risks related to the use of pesticides in close connection with the health of ecosystems.*

## INTRODUCTION

Climate change is one of the biggest economic and socio-ecological issues of the 21st century. Responsible for many environmental problems, such as pollution, climate change, soil degradation, and loss of biodiversity, are intensive anthropogenic activities that endanger the natural balance. The agricultural sector is the economic path with the greatest impact on climate change, and the effects include: variation in rainfall, increase in average temperatures, intensity and frequency of extreme weather events and their impact on the global agri-food system. The effects of climate change adversely affect both the

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live animal production system and crops in most parts of the world. In addition, these environmental problems lead to droughts, extinction of important species, water scarcity and ecosystem degradation.

On top of all these problems, agriculture is a significant contributor to greenhouse gas (GHG) emissions, with almost 17% directly caused by agricultural activities and another 7% to 14% by agricultural land use. The most dangerous chemical compound is nitrous oxide, which is formed from soils, fertilisers, grazing animals, manure and urine, followed by methane gas emissions from rice cultivation and ruminants. These two greenhouse gases contribute more to global warming than any carbon dioxide emissions. Efforts by farmers around the world to adapt to climate change are insufficient to reduce the harmful effects of greenhouse gases, mainly because of the specificities of this environmental problem. More effective policies are the key to solutions for maintaining the natural balance and reducing the risks associated with the use of chemicals in agriculture.

## MATERIALS AND METHODS

The analytical framework for the present paper is developed according to the PICo (Population, Phenomenon and Context) criteria. The reference segments for the population are the major consumers of resources - economic agents in agriculture but also the rest of the population. The present phenomenon we are facing nowadays is overconsumption, hunger, poverty and huge differences between the rich and the poor in the context of negative environmental externalities produced by the anthropogenic footprint, especially global warming.

This paper aims to determine ways and possibilities to reduce greenhouse gas emissions (mitigation) by applying smart strategies and effective management systems that combine traditional agricultural practices with new technologies. The study is conducted in conjunction with a review of the literature on climate change and smart approaches to this global concern, as well as an analysis of best alternative traditional climate change mitigation practices. The main aspects of this research are recommendations for ensuring food security, preserving the environment, managing resources efficiently, and creating a socio-economic framework for farmers and agricultural economic agents.

The research methodology is carried out by analysing several scientific papers relevant to this topic from Scopus, Google Scholar, Web of Science databases. The papers were searched in the first stage by keywords and abstract, then by the whole content. Studies by the Food and Agriculture Organization of the United Nation were also considered useful.

The novel elements of the present study can be found in the last part of the research where 5 interdisciplinary approaches are presented to reduce global warming risks and to reduce the consumption of natural resources. The recommendations are based on the principles of sustainability in the agriculture, market and labour sectors in the context of improving living standards, ensuring food security and possible conversion to organic farming.

## RESULTS AND DISCUSSIONS

Greenhouse gas (GHG) and carbon dioxide emissions are the main cause of global warming and extreme weather events affecting almost all areas regardless of ecosystem (IPCC 2013). The link between GHG concentrations and global temperatures is a well known, intensively debated issue and has been present