

# Climate Changes and Sustainable Management of Natural Resources: Challenges for Agriculture

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## ABSTRACT

During the last few decades, the concentration of greenhouse gases in the atmosphere has increased. Estimates are showing that the agriculture, forestry and other land use emits less than a quarter of the total anthropogenic emissions of greenhouse gases globally and in this way endangers resources. Observing from the point of the European Union, agriculture emits 436.7 million tons of CO<sub>2</sub> equivalents, corresponding to 9.8% of total greenhouse gas emissions. On the other hand, agricultural production is accompanied by the creation of residues, whose amount often exceeds the weight of the main product, which can be used as a source of renewable energy. About 25% of the harvest residues can be used for energy purposes, without compromising the population food safety, nor adversely affecting the fertility of the land. The aim of this article is to point out on the consequences of the harmful effects of modern agriculture on the environment, but also on the fact that agriculture can offer solutions to the challenges of climate change.

## KEYWORDS

Biomass Energy, CO<sub>2</sub> Equivalents, Greenhouse Gases, Organic Agriculture, Sustainable Management

## 1. INTRODUCTION

Climate change effects each country and interferes with national economies and effects people's way of life. Greenhouse gas emissions have reached the highest level in the history of mankind, weather events are becoming more extreme, the sea level rises, and steady time patterns disappear. On the other hand, the priorities for the further development of the society affect the emissions of greenhouse gases that cause climate change and vulnerability. Nevertheless, there are numerous solutions that enable society to move to clean and more economical economies. Changes are accelerating because much more people turn to renewable energy and a range of other measures that will reduce emissions and increase adaptation efforts (UN, 2018).

Renewable energy policy has evolved over the past several decades, depending on national interests and goals in different countries and regions. In the mid of 1970s and 1980s, renewable energy interest increased as a result of an energy crisis caused by a reduction in oil stocks and a rise in the price of other fossil fuels. Since the 1990s, interest has continued to increase due to the growing concern about the state of the environment at global and local levels, especially after publishing the report "Our Common Future" (UN, 1987) and defining the concept of sustainable development. Then, a

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number of environmental agreements such as the United Nations Framework Convention on Climate Change (1992), the Kyoto Protocol (1997) and many others based on sustainability principles followed.

Renewable energy can also respond to environmental challenges through reduced greenhouse gas emissions, but other socioeconomic benefits can be achieved in the form of equal supply of energy to the population and job creation through investments in this area, which is in line with the principles of green economic development (Roljević and Vuković, 2012b). Increasing investments in renewable energy sources can be the backbone of economic development and energy stability, especially in underdeveloped countries and their rural areas, whose population is significantly dependent on the energy it receives by traditional use of various types of biomass. Globally, the participation of biomass in total renewable energy consumption is significantly dominant (REN21, 2012), and in this article, about the potential of biomass as a natural energy resource will be more words.

As one of the catalysts for sustainable development and sustainable agriculture, organic production fully contributes to the establishment of a balance between sustainable production and consumption, both of food, energy and natural resources, in addition to contributing to greater economic profit in agricultural holdings and the development of rural areas. In this case, the basis for the development of the green economy in the agrarian sector should be based on the strengthening of organic agriculture as one of the forms of pure production technologies (Filipović et al., 2013).

Due to its role in preserving natural resources, organic production, as an alternative to conventional, is gaining in importance (Roljević et al., 2012a). It should also be noted that this type of production reduces the consumption of fossil fuels and increases the carbon dioxide sequestration in the soil, which contributes to the reduced greenhouse gas emissions. Serbia is a signatory of the Kyoto Protocol and belongs to the Non-Annex I group of countries that do not have the obligation to reduce greenhouse gas emissions, but they can participate in certain trade programs for these programs and create so-called “carbon credits” that they can then sell Annex I countries. If the Government would encourage this type of trade system, each organic producer could have received a certain number of carbon credits, which by selling to the buyer from one of the Annex I countries would provide additional cash and thus ensure the rentability and sustainability of its production.

## 2. LITERATURE REVIEW

Carbon dioxide, methane, nitrogen and other oxides naturally are formed and exist in the atmosphere, but their enormous increase in the last 150 years represents the result of human activity. The growth of the concentrations of these gases changes the composition of the earth's atmosphere, contributing to the air warming and global climate change. According to the fourth report of the Intergovernmental Panel on Climate Change (IPCC, 2007), during the period 1970 - 2004, global greenhouse gases (GHG) emissions increased by 70%, more precisely from 28.7 GtCO<sub>2</sub>-eq to 49 GtCO<sub>2</sub>-eq/yr., while 24% of the total has been increased in the period after 1990.

The largest increase in global GHG emissions between 1970 and 2004 was the result of the energy sector's activity (an increase of 145%). The growth of direct emissions in this period from traffic sector is 120%, from the industry sector 65%, while the level of emissions caused by the land purpose changing and its intensive processing increased by 40% (IPCC, 2007). Between 1970 and 1990, direct emissions from agriculture grew by 27%, and, thanks to efforts at the international community, their level remained about the same as in 1990.

Inadequate management of natural resources led to their impoverishment and reduced the future potential of food production. Very rapid deforestation on a global scale and conversion of forest land into agricultural one, as well as the conversion of agricultural land into construction terrain contributed to the reduction of forest and agricultural land potential for carbon dioxide storing. On the other hand, rice and livestock production are considered as the main methane (CH<sub>4</sub>) emitters, while the application of mineral fertilizers in agricultural production is considered as a very important source of dinitrogen monoxide (N<sub>2</sub>O). Bearing in mind that one kilogram of methane has a 25 times greater

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