A REVIEW ON ORGANIC FARMING IN SUSTAINABLE ENVIRONMENT

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Abstract
Population growth and increasing demand for food lead to excessive use of pesticides and chemical fertilizers, which has led to nitrate leaching, groundwater pollution, soil degradation, greenhouse gas emissions and climate change. Climate change for our planet is very real and dangerous; many efforts are being made to reduce greenhouse gas emissions into the atmosphere. One of the agricultural method that uses organic origin fertilizers and emphasis on techniques such as crop rotation and co- planting is organic farming. Organic farming can be described as a system of management and agricultural production that is a combination of a high level of biodiversity with environmental practices that help to conserve natural resources. The main goal of this article was reviewed the effect of organic farming system on greenhouse gases emissions, soil property, nutrient contents and human health.

Key words: *conventional agriculture, climate change, soil properties, greenhouse gases emission, human health.*

INTRODUCTION

With growing population, the need to increase agricultural production is unavoidable. In fact, agricultural production has grown significantly in recent decades. one of the agricultural methods that used all over the world is conventional system of farming. In this system, agricultural yields have increased (*Philip Robertson et al., 2014*), because this system based on improved crop varieties, the use of synthetic and mineral fertilizers and pesticides. The result leads to nitrate leaching and groundwater pollution, soil degradation, greenhouse gas emissions, in addition excessive land use has also led to the loss of soil organic matter and soil biodiversity (*Schrama et al., 2018*). The use of inappropriate agricultural techniques leads to soil degradation. On the other hand, deforestation to find new agricultural land is one of the most important factors in greenhouses emission and global warming (*Matuštík et al., 2020*). Agriculture contributes a large share of the greenhouse gases (GHGs) emissions that are causing 17% of climate change directly through agricultural activities and an additional 7-14% through changes in land use (*FAO, 2020*). Overall, conventional farming system has a negative impact on the ecosystem (*Stubenrauch et al., 2021*).

One suggested solution to reduce negative effect of agriculture on the environment, is organic farming (*Seufert et al., 2012*). organic farming systems based on less or no use of pesticides and synthetic fertilizers, less nitrate leaching and other pollutants into underground water, recycling of animal or farm waste, and reduced soil erosion and degradation (*Schweizer et al., 2018; Neri et al., 2019; González-Cencerrado et al., 2020*). The use of this method of farming leads to maintain and increase soil fertility, preserve the genetic diversity, minimize environmental pollution and obtain high quality food by applying sustainable productions (*Orpet., 2020; Santarelli et al., 2020; Sainju et al., 2021., Stubenrauch et al., 2021*). Some of the main effect of organic farming are shown in Fig. 1.

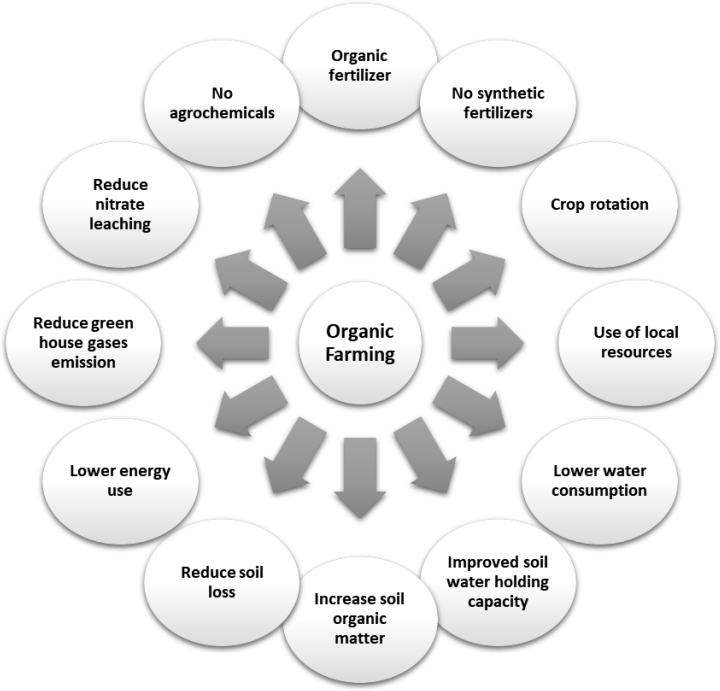

Fig. 1 The main effects and principals of organic farming (*Furtak, & Gałązka., 2019*)

Organic farming has been adopted in about 186 countries (*Ramakrishnan et al., 2021*), With covering a total area of 72.3 million hectares around the world (*Willer et al., 2021*). As shown in Fig. 2, Oceania (35.9 million hectares, 50 percent) and Europe (16.5 million hectares, 23 percent) are the Continents with the largest organic agricultural land in the world. After them, South America has (8.3 million hectares, 11 percent), Asia (5.9 million hectares, 8 percent), North America (3.6 million hectares, 5 percent) and Africa (2 million hectares, 3 percent) (*Willer et al., 2021*).
The main aim of this article was reviewed the effect of organic farming system on GHGs emissions, soil property, nutrient contents and human health.

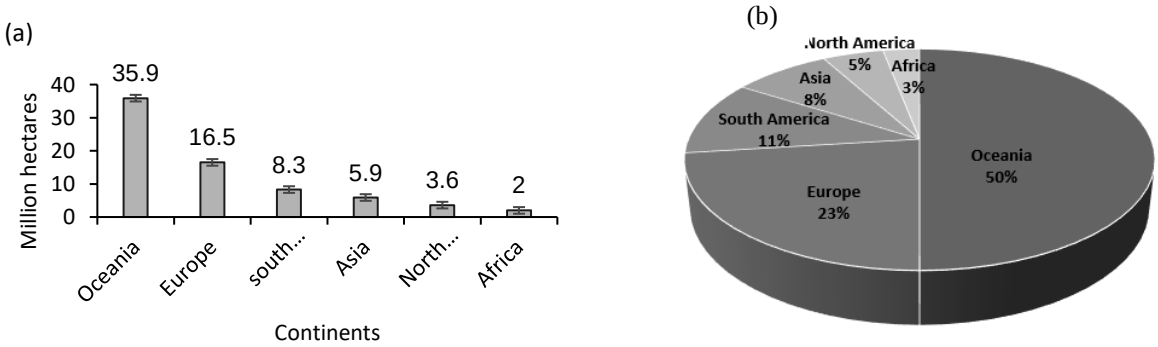

Fig. 2 Organic agricultural land areas around the world depending on (a) the Million hectares and (b) percent in 2019 (*Willer et al., 2021*)

MATERIALS AND METHODS

This review was carried out by identifying original English papers; reviews of recent case studies; national reports that focused on the effect of farming systems (organic and conventional) on GHGs emission, global warming, soil properties, nutrient contents of productions and human health. Microsoft PowerPoint and Microsoft Excel version 2016 were used to draw the figures.

RESULTS AND DISCUSSION

The effect of organic farming system on greenhouse gases emissions: Climate change and global warming become a much-debated issue in recent years (*Moudrý et al., 2013*). *Engler & Krarti. (2021)* stated that currently agriculture is responsible for about one-third of GHGs emissions which is the cause of climate change. Climate change is very real and dangerous for our planet, many efforts are being made to reduce greenhouse gas emissions into the atmosphere (*Sujatha et al., 2021*). In addition to using methods to reduce anthropogenic GHGs emissions, it is essential to look for rapidly methods to absorb carbon dioxide from the atmosphere.

Since management of organic farming systems, based on using less gasoline, diesel, natural gas and using no synthetic fertilizers or pesticides**,** thereupon directly and indirectly, emitting less carbon from combusted fossil fuels. All of this would strongly suggest that a switch to organic farming would lead to a reduction in net GHGs emissions (*Makaju et al., 2021*). *Kitamura et al. (2012)* has been reported that lower emissions of GHGs emissions (CO_2, CH_4 and N_2O) from organic fertilizers compared to chemical fertilizers. For the future farmers should focus on organic agriculture, because conventional system based on the use of synthetic and mineral fertilizers and pesticides, and leads to groundwater pollution and greenhouse gas emissions.

The effect of organic farming system on soil property: Soil productivity and quality are key factors in plants performance. Organic farming method allows to sustainable soil management, conserve the biodiversity of the environment and to maintain the closed circle of elements (*Furtak, & Gałązka, 2019*). Accumulation of organic matter in the soil improves soil quality. *Lori et al. (2017)* demonstrated that the positive effect of organic farming on soil quality including the characteristics of the microbial community (*Lori et al., 2017*). Microbial biomass is affected by agricultural methods, systems of farming and soil management. Many studies showed that organic farming has a positive effect on soil's microbial biomass compared to other farming systems (*Lagomarsino et al., 2009; Wolińska et al., 2015; Kabiri et al., 2016*).
One of the soil quality indicators is the amount of soil organic matter. in organic farming systems amount of soil organic matter are significantly higher than conventional systems (*Crystal-Ornelas et al., 2021*). Soil organic matter plays a very important role in soil fertility and affects a wide range of physical, chemical and biological of soil properties, including nutrient cycling, aggregate formation, water retention and maintain soil moisture, suppression of the disease, pH buffering and cation exchange capacity (*Celestina et al., 2019; Murphy, 2015*).
To achieve environmental sustainability, farmers should use organic amendments instead of chemical fertilizers. Biochar is known as an amendment that has a very good effect on soil properties. addition of biochar to soil cause to increases carbon sequestration and improvement of soil properties, reduction of GHGs emission, reduction of heavy metals bioavailability and decrease amount the leaching of nutrients and pollutants from soil (*Asadi et al., 2021; Ghorbani et al., 2019*).

The effect of organic farming on nutrient contents and human health: Since chemical fertilizers and pesticides have a negative effect on ecosystem and health of humans and other living organisms, special attention should be paid to reducing the use of chemical fertilizers. organic farming is based on using natural materials in agricultural products and cause to produce safe food products with preserving ecological balance and sustainability. Many studies and researches have shown that fruits and vegetables grown from organic production have a higher nutritional value (*Hallmann & Rembiałkowska, 2012; Yu et al., 2018*). *Armesto et al. (2020),* has been reported that the ratio of compounds was higher in organic squashes than in conventional ones.

Essential issues in organic farming: Green waste (consisting of garden refuse, domestic or industrial kitchen waste) due to its nutritional value (because of high nitrogen content), and potentials to mitigate the greenhouse gas emissions (*Diacono et al., 2019*) is widely used in organic farming. If green wastes contain persistent herbicides, they pose health risks to organic farming (*CalRecycle, 2020*).
Another thing that is widely used as an organic amendment in organic farming is municipal sewage sludge and due to good source of nitrogen, phosphorous, and organic matter, helps improve plant growth

and soil properties (*Ramakrishnan et al., 2021*). The presence of high amount of organic matter in the sludge cause to absorbs heavy metals from sewage during the treatment process. Therefore, the use of municipal sewage sludge in organic farming in the presence of heavy metals, is a hidden danger because heavy metals can readily enter the plant tissues and if it is higher than the allowable level, it is considered a threat to human health. (*Weldegebriel et al., 2012*). The future research and policy regulations need to ensure the unintentional entry of pollutants into organic products and protect the health of humans and ecosystems.

Disadvantage of organic farming: Despite the positive effects of organic farming, we have to accept that nothing is not complete perfect. some studies have reported lower performance of the organic farming than conventional farming system in relation to the amount of yield, indeed, the lower yields of organic farming systems are considered as their main disadvantage (*de Ponti et al., 2012; Seufert et al., 2012*). it means that, for produce the same amount of food more land is usually needed in organic farming systems than conventional farming.

CONCLUSIONS

There are many future challenges in the agricultural sector. Efforts to reduce greenhouse gas emissions and Protecting climate and biodiversity, protecting water pollution with reduce nitrate leaching and pollutions, closing nutrient cycles with organic amendments and achieving healthy yields in resilient agricultural systems require further developing organic farming. Due to the positive effects of organic farming on the environment, we need to look for solutions for the lower yields of this system of farming. The use of organic amendments in organic farming systems can increase crop yields, but different organic amendments have different effects and requires careful consideration.

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