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STRATEGIES FOR FEEDING THE WORLD MORE SUSTAINABLY WITH ORGANIC AGRICULTURE

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Abstract

Global hunger and insufficient nutrient intake are worldwide debated issues. The present paper aims to identify the main problems in the agri-food sector and to find solutions for achieving sustainable food systems. Organic farming is proposed as a promising approach. A better understanding of the role that organic agriculture could play in the sustainable development of the food system, helps us to establish the environmental externalities related to the 100% conversion in organic agriculture. It needs more land than conventional agriculture but can drastically reduce the use of nitrogen and plant protection products. However, due to the problem of world hunger, food waste due to inappropriate consumer behaviour, but especially insufficient production, the global conversion to organic farming remains in the scenario stage. Another aspect that requires an interdisciplinary approach is the correlation between high-performance food systems that protect the environment and the interdependencies between crops, animals, and human consumption.

Keywords: green economy, organic agriculture, hunger, sustainable development

JEL Classification: Q1, Q18, Q19

INTRODUCTION

In recent decades, the availability of food on the agri-food market has increased considerably due to the escalation of agriculture and the launch of new, high-performance inputs that generate a more significant amount of food, are more diversified, and of superior quality. The intensification of conventional agricultural systems had a negative impact on the environment and the ability of ecosystems to regenerate. Some of the adverse effects on the environment that intensive agriculture systems bring to the fore are eutrophication of land and water bodies, over-supply of reactive nitrogen, biodiversity loss, and greenhouse gas (GHG) emissions. Several scientific studies in the literature show that by 2050, global food security can be ensured only by increasing agricultural production by 50% if the population reaches 9 billion people. If the intensification of agriculture will be so aggressive and the generation of negative environmental externalities will continue to occur at the same level, it is easy to understand that irrecoverable imbalance of both agricultural and natural ecosystems will occur but especially the increase of pollution indices at the global level. Therefore, it is crucial to identify strategies that reduce the negative impact of agriculture on the environment, which does not endanger food security.

To achieve this goal, the efficiency of agricultural systems must increase, and the adverse effects and risks related to the environment must decrease drastically. Efficient resource management, agroecology, reducing the consumption of animal products, and solving problems related to food waste is necessary to improve the global situation regarding environmental protection. A prominent proposal is organic farming which, although still a controversial topic, can significantly improve the sustainability of agri-food systems. The main characteristics of organic agriculture are promoting crop rotation, improving soil fertility, and reducing fertilizers and synthetic PPP. The positive performance of organic farming has been widely reported to be correlated with the most important environmental indicators. However, the issue of the larger train size train needed for organic farming compared to conventional agriculture for the same amount of production remains unresolved. The environmental benefits of organic farming are lower if the unit of product is taken into account and not the area unit. Another issue that brings organic farming to the forefront is the

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risk that the soil will be left without the nutrients needed to grow legumes; therefore, organic farming is not the best option for feeding the entire population.

MATERIALS AND METHODS

The present research is approached in order to focus on the production yields of conventional agriculture and the unitary impact on the environment in the context of the conversion to organic agriculture. This requires two additional changes to the food system: reducing human consumption of animal products, reducing the amount of feed on arable land, and reducing food waste. The present research aims to answer the question of whether organic agriculture can produce valuable food with more nutrients, in order to stabilize the balance between the quantities produced by conventional agriculture. This assessment involves identifying the main issues and risks related to the conversion to global organic agriculture as a determining factor in sustainable development. The evaluation of the result of combining several synergistic sustainability strategies is necessary to consider the probability of expanding the number of organic food systems, which, although considerably expanding the demand for arable land, protect the environment from excess nitrogen, also reducing the amount of GES.

RESULTS AND DISCUSSIONS

Effect of Organic Nutrition on Crop Productivity

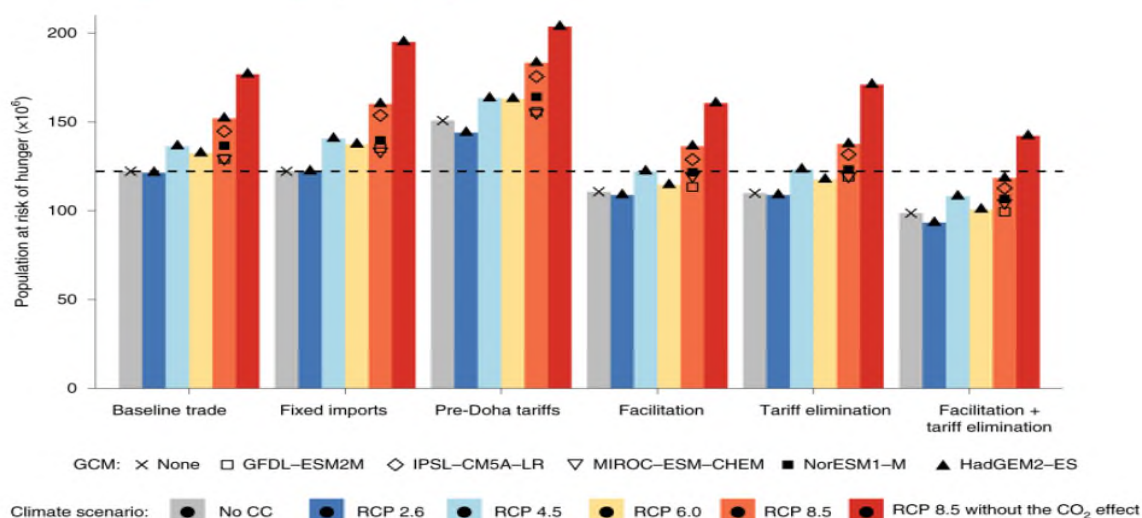
Enhancing the earth with organic compound is a well-known strategy that can increase soil fertility and can improve the nutritional quality of food. This practice involves the application of manure (FYM) on areas cultivated with legumes to the detriment of inorganic substances often used in conventional agriculture (Flaig, 1975). Natural fertilizer contains all the micro- and macronutrients of aromatic plant growth and development (Hesse, 1984) and also contributes to the preservation and improvement of soil structure.

The results of Sharma and Mitra's research on the addition of organic matter to showed that yields for straw cereals and rice have increased considerably. Ranganathan and Selvaseelan found, contrary to previous findings on the possibility of organic farming to dry out nutrient soils by abandoning nitrogen-based fertilizers, that composting can increase legume yields. In the same research, an increase of yield by 20% is reported due to the compost from straw, mushrooms and used rice being compared with the fertilizer based on the macro-elements nitrogen, phosphorus and potassium.

(NPK). Stockdale highlights through its research the benefits that organic farming brings to the global environment, namely: reducing energy consumption, reducing food waste, reducing greenhouse gas emissions and preserving biodiversity. Emerging countries, which face the impossibility of bringing new inputs to agriculture and improving soil quality by transforming conventional agriculture into smart agriculture, pose an increased risk of inability to ensure food security and safety. Crop productivity can be comparable to that of conventional agriculture if it respects the principle of continuity and uses soil enrichment practices with mineral fertilizers and manure (Tamaki et al., 2006).

Even though we are in a time when technological progress is continuous and unstoppable, world hunger still exists in many regions. Currently, over one billion undernourished people suffer from hunger and poverty and their numbers are growing (Fan 2010). Statistics show that a steady 70% increase in agricultural production is needed to cover the food needs of the entire population from 2009 to 2050 (FAO 2009). Developing countries are the first on the blacklist because here are the highest birth rates and with the increase in the number of people, the demand for food will increase in direct proportion. For these reasons, an analysis of all the possibilities for growing agricultural products through different strategies and systems is needed.

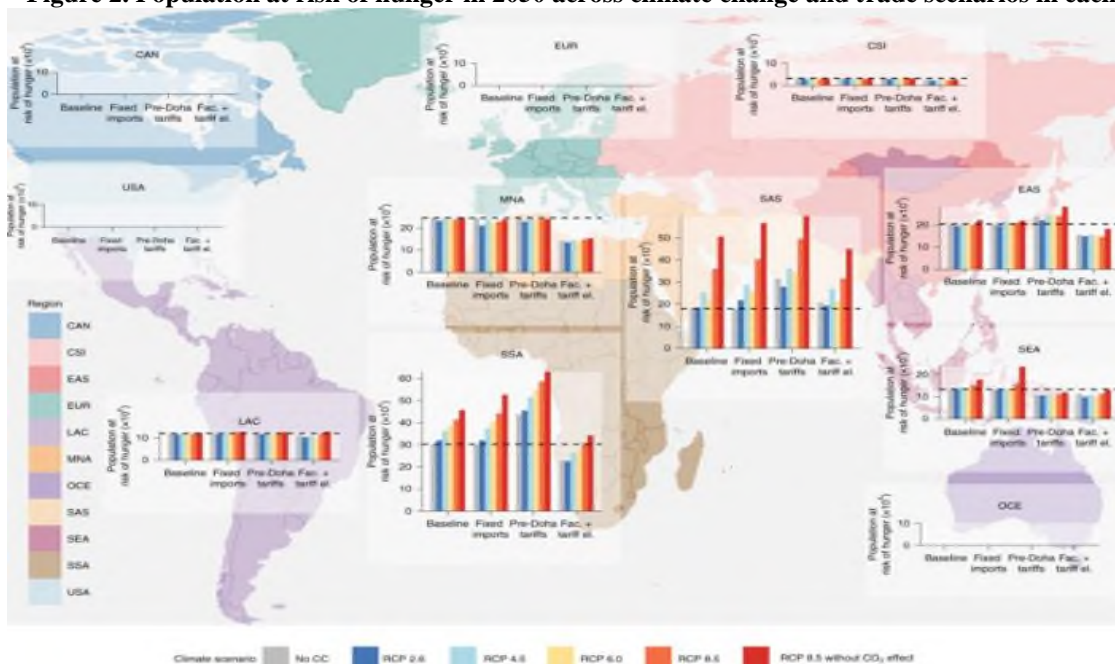
Figure 1. Global population at risk of hunger in 2050 across climate change and trade scenarios



Source: From 'Global hunger and climate change adaptation through international trade', by C. Janssens, P. Havlík, T. Krisztin, J. Baker, S. Frank, T. Hasegawa, D. Leclère, S. Ohrel, S. Ragnauth, E. Schmid, H. Valin, N. Van Lipzig & M. Maertens, 2020

The global outlook for climate change in areas where humanity continues to face hunger and excessive poverty highlights that climate change is having a harder effect in emerging countries where temperatures are usually above average. Maintaining high crop yields is the only way for these countries to ensure food security and reduce the risk of malnutrition. If imports remained at a fixed value, hunger would spread to more territories than at present and the ability of developing countries to ensure efficient management of resources so that available monetary quantities would not fall is close to 0..

Figure 2. Population at risk of hunger in 2050 across climate change and trade scenarios in each region.



Source: From 'Global hunger and climate change adaptation through international trade', by C. Janssens, P. Havlík, T. Krisztin, J. Baker, S. Frank, T. Hasegawa, D. Leclère, S. Ohrel, S. Ragnauth, E. Schmid, H. Valin, N. Van Lipzig & M. Maertens, 2020

Increasing export prices is not an option because food must meet sufficient nutritional conditions for daily food, must be safe and fresh. Figure 2 shows a scenario in which crop yields remain constant and price fluctuations are felt due to climate change and the anthropogenic effect on the environment

Green Economy Perspectives of Organic Agriculture

Agriculture is the sector that has the most in common for the concept of green economy. It is the main food provider for the entire population of the globe, it is a source of income for most people and also the largest consumer of resources. Thus, 40% of the global land area and 70% of water is used by this sector. Besides supplying aliments, agriculture also delivers us with material goods, useful to society and the agricultural sector.

The practices of organic farming are based on the least possible use of plant protection products and the prohibition. The division of chemically synthesized substances that can influence human health in cooking if consumed. Through the practices of organic farming the soil is less negatively influenced by the use of synthetic products. Nothing to remove diseases and pests and genetically modified organisms and their derivatives are not allowed. And standardization by organic farming. The definition of organic agriculture in Romania is to obtain agri-food products without the addition of synthesized substances. And without chemical food additives, so that it complies with food quality and safety standards.

Ecological agriculture as a secondary branch of Agriculture and as an engine for sustainable development of rural areas in Romania. It is growing and it is a real opportunity for another branch of export to Romania.

Farmers oriented towards organic farming and those with studies in agriculture are inclined towards new technologies that do not use harmful substances for human consumption.

The potential of organic farming in Romania exceeds 20% of the total agricultural area.

In order to improve the agro-ecological sector and develop it, the competitiveness of organic products for export markets must meet the following:

- expanding production and markets by creating organized producer groups;
- identifying new export markets as well as consolidating the existing ones by promoting Romanian ecological products;
- orientation of production and sales towards primary products and their processing prom maintaining a higher value on the national component of the value chain;
- the implementation and development of the legislative system in order to consolidate the control system by implementing new measures in order to supervise the control and certification bodies, in order to increase the quality of the Romanian exported products;
- allocation of funds for research activities to promote exports of Romanian organic products;
- satisfaction of internal and external needs by creating a system of production, processing and marketing of organic products at an appropriate level;
- bringing added value to the professional training of all those involved in the ecological sector.

Following the application of statistical methods "Analysis of main components" and "Regression and correlation method" we reached the conclusion that ecological farming is much more expensive but the products are sold at much higher prices both on the domestic market and especially on foreign market compared to those obtained through conventional agriculture. In recent years, in Romania, there has been an important market segment that is interested in organic agricultural products, even if prices are higher. Also, the same positive results were obtained in the case of canned organic fruits and vegetables. Although they were sold on the market at higher prices than those obtained by conventional methods, organic preserves were highly sought after on the Romanian market. Following the use of the same statistical method, we made comparisons between products in different countries of the European Union.

Thus, we found that Italy is the European country with the most organically cultivated areas with over 1 million hectares (Sicily and Sardinia representing half), i.e. 1/5 of the total EU-25, followed by Germany, Spain, France and Austria. At the same time, in Italy are found the most organic farms representing 31% of the total EU-25, being left by Austria, Spain and Germany.

Compared to Romania, in 2002 only 0.2% of agricultural areas were cultivated by organic farming methods (43,000 ha were cultivated through organic agriculture, 20,000 ha were pastures, 12,000 ha were wheat crops, and 10,000 ha were crops).

Environmental impact of organic agriculture

To demonstrate the need for efficient production systems and responsible management of natural resources, it is useful to identify the effects of traditional agriculture on the environment. These environmental externalities affect the massive and irresponsible deforestation, pollution and contamination of soil, water and air with pesticides or chemically synthesized substances and most importantly - greenhouse gas emissions. The latter are the main driver of problems related to climate change that not only influence the natural balance but can destroy the economic and social systems.

Adaptation of agriculture to climate change depends very much on the approach of farmers to future agricultural practices. Immediate gains exclude sustainable strategies and we are currently facing an exaggerated and accelerated exploitation of non-renewable natural resources. The construction of organic matter in the soil can be the sustainable basis of a high-performance agricultural system that also takes care of the environment. If the soil is enriched with organic matter and free of chemicals that force unnatural plant growth, it can serve to increase resistance to drought, floods and extreme temperatures. The literature tells us that carbon accumulation is three times lower in organized agricultural practices than in conservation. (Robertson and colab. 2000).

According to the 2007 IPCC report, deforestation is one of the main factors influencing greenhouse gas emissions and is constantly driven by increasing agricultural land area. (Baker et al. 2007).

The increase of the agricultural production can be determined in two ways: the increase of the surfaces of the agricultural exploitations and the increase of the yield per ha on the same surface. As the expansion of the agricultural area determines the need for deforestation and other negative effects on the environment, it is preferable for the yield to increase in direct proportion to the degree of mechanization.

Discussion

Implementation in a food system designed at the optimal parameters of organic agriculture can lead to sufficient food supply and also can reduce the impact on the environment in agriculture. Therefore, it is necessary to calculate as accurately as possible the feeding ratios of the animals, the reduction of the number of animals, the consumption of animal products and as much as possible the best management of the food in order to limit their waste. Transforming organic production into an agricultural production system that provides the same quantities is not viable, having the impact of increasing the use of agricultural land. The overall conversion to organic farming could be properly assessed by modelling the consequences and should be based on an appropriate forecast of food systems. To the detriment of objectives through which to produce maximum crop yields, the global perspective is to maintain soil fertility, ecosystem services and nutrient recycling. It is found that the global average demand for animal products is declining, which leads to a more sustainable alimentary system centred on the use of natural resources with a low impact on the environment and also improving human health.

The present research shows that through organic agriculture can contribute both to provide sufficient food and to improve the impact on the environment. The condition is the production of sufficiently large proportions of legumes as well as the reduction of quantities of animal products and food waste. The development of organic farming should not focus strictly on sustainable production

as it would reduce the need to increase yields, and a set of efficient production and consumption measures could provide an optimal food system.

Developing the world's food system in a sustainable way by applying in part and in combination the following: increasing organic yields, increasing organic production, reducing food waste and reducing the number of animals and consumption of animal products.

The certification process

In order to obtain certification in the field of organic farming, local producers of vegetables, fruits or animal breeders must comply with the rules established by both national and Community legislation. Producers must facilitate the visits of the control and certification bodies in order to inspect and give assurances regarding the conformity of the agricultural activities carried out in accordance with the provisions of the laws in force regarding the ecological production.

The inspection and certification bodies in Romania were approved by the Ministry of Agriculture and Rural Development in accordance with the criteria of independence, impartiality and competence, established in Order no. 895 from 2016 for the authorization of the regulations on the coordination of the investigation and certification system and the supervision of the activity of the control bodies.

It is important to note that certified organic products contain at least 97% organic ingredients. We also consider it very important to know that a large part of local producers in Romania grow vegetables, fruits or animals in an organic system, but do not have information channels to capitalize on their organic products at the right price.

CONCLUSIONS

The most important fact to note from the present research is that organic agriculture and the integral conversion of the practices of agricultural production systems to ecological standards is the surest way to return to the values of traditional agriculture but with modern techniques. The legislation in force and the regulation on the export of organic products oblige the emerging states belonging to the European space to take important steps in order to convert traditional agriculture to agriculture based on modern technologies.

The success factors that contributed to the development of the agri-food market based on organic products are: consumer behavior and daily shopping cart component with strong external influences, compliant labeling and standardization of organic products, economic and social welfare of farmers who practice eco-friendly alternatives.

In order to increase the competitiveness of domestic organic food producers compared to foreign ones, the recommendations for the sustainable development of Romania are:

- constant information of consumers on the benefits and advantages of full consumption of organic products.
- actions of physical and online promotion of organic agriculture so that consumers understand the benefits of consuming organic products
- creation of online platforms for trading organic products

Additionally to the advantages it generates to human consumption, organic farming, as a secondary branch of the economy, has an important role to play in the general economic development and conservation of the environment.

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