CONSEQUENCES OF ORGANIC FARMING ON THE SUSTAINABLE SOCIETY - ROMANIA AND EU

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Abstract.
A major trend adopted by the European Union member countries that are making efforts for sustainable development is the development of organic farming. The article studies the influences generated by the organic farming development in the EU countries, in the period 2006-2014, in terms of sustainable society. The statistical analysis is based on the use of certain variables that have a significant influence on the components of sustainable society. The identification of estimators for panelling data showed the favourable consequences of increasing the organic area for many indicators underpinning the economic, environmental and human wellbeing. The results confirm that the organic farming is a viable alternative to the conventional agriculture for raising the quality of life. The paper essentially quantifies the multiple effects of the organic farming for sustainable development and demonstrates that one of the directions to accelerate the development of the European economy on a sustainable basis is to stimulate the organic farming.

Key words: *organic farming, sustainable society, quality of life, regression model*

JEL Classification**:** *Q01, Q15, Q18*

1. Introduction

The sustainable development is a common goal of all countries in the European Union. This development model proposes a high quality of life based on economic and social development along with the environmental responsibility.

In the sustainable development system, the economic activities have a minimal impact on the nature and ensure the social development. They should not deplete or degrade the existing natural resources and seek to preserve the social identity, relationships and values of each human community [Black, 2004].

Through its specificity, the agriculture is an economic sector that strongly interacts with the environment. In this activity, the natural factors are the main means of production. Over time, the agriculture was mainly developing in favourable areas, i.e. in areas where the existence of water sources, fertile lands and climate conditions ensured the necessary conditions for plants cultivation and livestock raising. The intensification of agricultural practices has generated a negative impact on the environment, the production increase being often accompanied by phenomena such as soil degradation and erosion, water and air pollution, loss of crop and landscape biodiversity [Chamberlain et al., 2000].

In contrast to the conventional agriculture and intensive practices, the organic farming is perceived as more socially and environmentally friendly. The organic farming is an alternative system of production that requires an approach based on ecological principles of the agricultural production [FAO, 2009]. In a definition given by the International Federation of Organic Agriculture Movements (IFOAM, 2009), the organic farming is considered a production system that preserves the health by lands, ecosystems and people, while contributing to the improvement of life quality.

In the European Union, the directions and stages of organic farming development are closely linked to the successive reforms of the Common Agricultural Policy (CAP). The CAP reform 2014-2020 proposes new measures to stimulate the organic farming and improve its beneficial status and role concerning the environment, climate change, local communities and sustainable development [EC, 2013].

In 2013, the European Union had 11.5 million hectares organically managed, which means an area of almost two times higher compared to 2005. This development dynamics was accompanied by a considerable increase in farmers (78%) and organic agricultural products market. More and more consumers prefer organic food because of the

beneficial effects of these products for health and the minimal environmental impact, which imposed new consumption ways, as well as the change of certain socio-cultural patterns. With a sales volume of €24.3 billion in 2013, Europe is currently the second largest organic market after the USA [IFOAM, 2015].

The powerful development dynamism of the organic farming in Europe led to the formulation of a new approach, entitled *An Organic Vision for Europe in 2030* (Barnova, 2015). This approach highlights the strong interdependence between the various components of the sustainable development – social, economic, political, technological and environmental factors – and organic farming. In the years ahead, the Organic Vision aims to impose the sustainable development to each region by using the organic agriculture as a driver of changes and the main tool for meeting the local needs [IFOAM, 2015].

The literature concerning organic farming is largely geared towards presenting the theoretical aspects, comparative analysis of the organic and conventional agriculture, and studies of the long-term trends and effects of the organic farming practices.

In this paper, we carried out an empirical study taking into account the EU countries, including Romania, aiming to identify the link between the organic farming and sustainable development, as well as the implications generated into the society. The paper helps to identify the issues related to the sustainable development of the countries by extending the practices specific to organic farming. The authors used in this paper their own methodological approach to analyse the organic farming influences on the various elements of the sustainable development system, and formulated conclusions and recommendations based on the concrete results derived from this analysis.

After the introductory section, the paper is structured as follows: Section 2 presents the theoretical framework required to carry out the analysis based on literature; The analysis methodology is presented in Section 3; Section 4 includes the empirical study that uses the econometric modelling to identify the impact of organic agriculture in the EU countries on the sustainable development of the societies; Section 5 presents the conclusions of the study.

2. Literature review

The sustainable development issues are widely treated in the literature of the last decades, especially after the popularisation of the concept through the Brundtland report [WCED, 1987]. The concept includes the idea of development achieved by progress and modernisation, but also the idea of conservatism, which ensures the sustainability of the actions [Larsson and Hanberger, 2015].

The indicators for monitoring and evaluation of the sustainable development are numerous. They reflect the progress of a country on several directions important for economy, society and environment.

Worldwide, a first set of sustainable development indicators was created in 1995 by the Commission on Sustainable Development of the United Nations. These indicators constituted the basis for the development of national sustainable development indicators. The subsequent reviews aimed their transformation into complex instruments for measuring, assessing and substantiating the decisions on achieving the goals of sustainable development, including the Millennium Development Goals. The 134 sustainable development indicators are grouped into 14 themes. The newest revised set (2005) ceased to explicitly present the key dimensions of the sustainable development (economic, social, environmental and institutional) due to the complex nature of the sustainable development, in which the elements intertwine [United Nations, 2007]. The need to diversify the indicators is increasing, so as 17 themes and 169 indicators describing the associated targets to be reached have been proposed [UN-DESA, 2015]. Among the areas closely monitored by the system of sustainable development indicators is the agriculture, which has the role to help reaching certain vital goals of the sustainable development – end hunger, food security, sustainable production and consumption, healthy life.

In Europe, the sustainable development indicators system has been introduced following the adoption of the EU sustainable development strategy in Gothenburg, in June 2001. Since 2005, the monitoring reports regarding the progresses made by the EU countries in the sustainable development area have included a large number of indicators (over 100) grouped in 10 themes, used to assess the modalities of reaching the goals and targets of the sustainable development strategy: socio-economic development, sustainable consumption and production, social inclusion, demographic changes, public health, climate change and energy, sustainable transport, natural resources, global partnership and good governance.

To better comply with the development of national wellbeing measures and the EU policy trend in sustainable development, the set of indicators was continuously revised. The latest update of the SD indicators (2014) followed the adoption of the Europe 2020 strategy which includes a reduced number of SD headline indicators. They have the advantage of highlighting the key areas of sustainable development to enable the decision-makers' orientation towards their achievement. But, the general framework of the monitoring modality applied to the sustainable development remained unchanged [Eurostat, 2015].

Through the managed resources and their effects, the farming impacts can be identified in numerous sustainable development areas. Due to the large number of SD indicators and the complex picture created, the own contribution of agriculture to the economic, social or environmental progress is quite difficult to assess.

Another way to assess the sustainable development issues is the methodology called *Sustainable Society Index* (SSI), introduced in 2006. Due to its structure, this composite index enables us to monitor the health of the national social economic and environmental systems, and to quantitatively assess the contribution of various factors to the sustainable development of the society [Maricic et al., 2014].

To achieve the proposed research objective, i.e. analysis of the agriculture impact on the sustainable development, we used in this paper an analysis framework based on the Sustainable Society Index.

3. Methodology

The indicators taken into account in assessing the impact of environmental practices applied in agriculture were identified according to the Sustainable Society Foundation framework. This one developed in 2006 the Sustainable Society Index to measure the sustainability level of 151 countries [SSF, 2015]. The sustainability level of a society is assessed through a series of indicators relating to human wellbeing, environmental wellbeing and economic wellbeing, which are grouped in areas, such as: basic needs, health, personal and social development, natural resources, climate and energy, transition and economy.

The variables considered for the sustainable society analysis are as follows:

Table 1. Variables description

Variable	Content
HW	**Human Wellbeing**
	1) Basic needs
i1	Sufficient food (%) is defined by the percentage of undernourished people in total population
i2	Sufficient to drink (%) is the indicator that expresses the percentage of population with access to an improved water source (at least 20 litres of safe drinking water per person per day on a distance less than one kilometre)
i3	Safe sanitation (%) shows percentage of population with sustainable access to improved sanitation (connection to a public sewer, connection to a septic tank, etc.)
	2) Personal development and health
i4	Education is assessed by the Gross Enrolment Ratio (%). This index expresses the share of students enrolled in primary, secondary and tertiary levels of education, regardless of age, as a percentage of school population at the official entry age for these three school levels
i5	Healthy life (healthy life years) – This index is assessed based on the Health Adjusted Life Expectancy, which measures the number of years spent by the people in good health
i6	Gender equality is expressed by Gender Gap Index whose values are between 0 and 1
	3) Well-balanced society
i7	Income distribution (ratio value) – This index expresses the ratio of income of the richest 10% to the poorest 10% of the people in a country. It is considered that a lower level of income inequality causes social stability
i8	Population growth (% of total population) is expressed by the annual population change, the target being no further increase of population
i9	Good governance (score of -15 to +15) is assessed through the average values of the six Governance Indicators of the World Bank, i.e. voice and accountability, political stability, government effectiveness, regulatory quality, rule of law and control of corruption
ENW	**Environmental Wellbeing**
	4) Natural resources
i10	Biodiversity (%) – change of forest area over 10 years
i11	Biodiversity (%) – share of protected areas in the total territory of a country
i12	Renewable water resources (% of total) expresses the water consumption per year as a percentage of total available renewable water resources
i13	Consumption (global hectares per person) represents Ecological Footprint minus Carbon Footprint and should be as low as possible (target is 0.9 gha)
	5) Climate and energy
i14	Energy use (toe/capita) is the consumption of energy expressed in tons oil equivalents per person
i15	Energy savings expressed in % change over 4 years
i16	Greenhouse gases, expressed in tons of CO_2 emissions per capita
i17	Renewable energy (%) is the consumption of renewable energy as a share of total energy. The renewable energy includes hydro, geothermal, solar photovoltaic, solar thermal, tide,

	wave, ocean, wind, solid biomass, gases from biomass, liquid biomass and renewable municipal waste
ECW	**Economic Wellbeing**
	6) Transition
I18	Organic farming (%) represents the area of organically cultivated land in % of total agricultural area
i19	Genuine savings (% GNI) expresses the true rate of savings in an economy, as percentage of Gross National Income
	7) Economy
i20	Gross Domestic Product per capita (PPP current $) represents the value of economic goods produced in a year, calculated in Purchasing Power Parity, in order to enable comparisons between countries
i21	Employment (% unemployed people) expressed by the percentage of unemployment in total labour force; it should be as low as possible
i22	Public debt (% GDP) – important social and economic indicator representing the share of public debt in GDP

Source: Sustainable Society Index framework, www.ssfindex.com

The set of data required for carrying out the analysis was obtained by collecting the information found in the SSI database for 28 EU member countries, including Romania, for the period 2006-2014.

To study the sustainability of the UE economies, we used the regression analysis. This served to presenting the organic farming role in a sustainable society, determining those items on which its action has a significant role. Applying this methodology for Romania enabled us to assess the importance of organic farming development and its impact on the economic sustainability.

The impact of organic agriculture on the elements defining the sustainable society was found using a panelled data approach. A regression was performed for each sustainable society direction, using a general form of model [Arellano, 1987]:

$$Y_{it} = \beta X_{it} + e_i + u_{it} \qquad (1)$$

where the subscript i is the symbol for country; t denotes the time index; Y_{it} represents the dependent variable expressed by the specific indicators for human wellbeing, environmental wellbeing and economic wellbeing; X_{it} stands for the independent variable represented in analysis by the *organic farming* indicator; β is the coefficient to be assessed; e_i and u_{it} represent error terms, i.e. the potential unnoticed factors that could affect the dependent variable.

The involved variables are transformed using natural logarithms, so the assessed coefficients will represent elasticity. Therefore, the model becomes:

$$LogY_{it} = \beta LogX_{it} + e_i + u_{it} \qquad (2)$$

We preferred to use the panel data analysis with cross-section fixed effects specification to be able to take into account the individual country effects. The results of the Hausmant test revealed the consistency of the estimators with fixed effects. In the assessments carried out, we used the *White standard errors* option (diagonal covariance method) to obtain robust estimators versus heteroskedasticity and the Durbin-Watson test to check the serial correlation between the residuals.

4. Results and discussions

For this study, from all the indicators used to monitor the sustainable society, we selected those variables that are statistically significant.

The characterisation of the variables used for modelling the interdependence between the organic agriculture and the elements of sustainable society in EU and Romania is shown in Table 2.

Table 2. Descriptive statistics

Variables	Mean		Maximum		Minimum		Std. dev.	
	EU	ROU	EU	ROU	EU	ROU	EU	ROU
I4 – Education (%)	89.87	80.54	106.03	83.69	74.00	76.27	7.86	2.82
I5 - Healthy life (healthy life years)	70.21	64.92	75.49	66.76	62.80	63.10	3.32	1.25
I6 - Gender equality (scores Gender Gap Index)	0.71	0.68	0.84	0.69	0.64	0.68	0.04	0.004

I9 - Good governance (scores of World Bank)	//6.39	0.61	11.97	1.11	-0.16	-0.16	3.03	0.47
I12 – Renewable water resources (% use of total)	13.92	3.59	71.92	4.23	0.60	3.25	14.70	0.42
I14 – Energy use (toe per person)	3.59	1.81	9.33	1.93	1.6	1.73	1.53	0.07
I16 - Greenhouse gases (CO2 per capita)	8.03	4.23	24.43	4.56	3.38	3.73	3.64	0.33
I17 - Renewable energy (% use of total energy consumption)	10.86	13.96	37.39	16.73	0.13	11.97	8.91	1.68
I18 – organic farming (% of total agr. area)	5.13/	1.21	19,70	2.10	0.05	0.67	4.10	0.49
I20 - Gross Domestic Product (current $ per capita)	28923.2	11744.2	81356.9	13395.9	9409.5	9409.5	12866.4	1332.7

Source: SSF, http://ssfindex.com/data/

The comparative analysis of the indicators specific to the sustainable society shows that, in the period under review, in Romania there were significant differences compared to the sustainable development in EU. Thus, the share of students enrolled in educational systems is over 9% lower than the European average. In terms of ensuring the population health, it is noted that, in Romania, the Healthy Life Years indicator is about 6 years lower than the EU average. A notable difference in the human wellbeing is also found in terms of ensuring good governance. This indicator is over 10 times lower than the EU average, reflecting negative aspects in terms of political and legislative stability, government effectiveness, presence of corruption at high levels, etc.

The environmental aspects are illustrated by variables that assess the saving of natural resources and the impact on climate change and energy resources. In Romania, the share of freshwater consumption in total renewable resources is more than 4 times lower, which means less pressure on the environment. The energy used for economic activities is over 2 times lower compared to the EU, which partly explains the lower level of GHG emissions. Another positive aspect is the large share of energy consumption from renewable sources.

Undesirable differences are found in terms of economic wellbeing. The area occupied by organic farming has a small share in the total agricultural area, being well below the European average. GDP per capita is more than two times lower than the EU average, which shows the lower economic performance of the Romanian economy.

The results of regression analysis of the organic agriculture impact on the sustainable society in the EU and Romania are the following ones (Table 3):

Table 3. Sustainable society regressions on organic farming impact

Dependent variable	**Explanatory variable: I18 - Organic farming**			
	EU		**Romania**	
	Coefficient	**Regression quality**	**Coefficient**	**Regression quality**
I4 – Education	0.033* (0.000)	R-sq. 0.919 F-test 57.6* DW 1.5	ns	-
I5 – Healthy life	ns	-	0.049* (0.000)	R-sq. 0.950 F-test 49.6* DW 1.7
I6 – Gender equality	0.018* (0.000)	R-sq. 0.881 F-test 38.0* DW 1.5	0.012** (0.029)	R-sq. 0.916 F-test 28.5* DW 2.3
I9 – Good governance	ns	-	-1.136** (0.031)	R-sq. 0.971 F-test 85.9* DW 2.1
I12 – Renewable water resources	ns	-	-0.236* (0.004)	R-sq. 0.985 F-test 167.1* DW 2.1
I14 – Energy use	-0.14* (0.000)	AR(1) R-sq. 0.979 F-test 184.2*	ns	-
I16 – Greenhouse gases	-0.198* (0.000)	R-sq. 0.968 F-test 119.3* DW 1.9	-0.151* (0.003)	R-sq. 0.974 F-test 96.2* DW 2.0

I17 – Renewable energy	ns	-	0.197** (0.022)	R-sq. 0.960 F-test 62.4* DW 2.0
I20 - Gross Domestic Product	0.168* (0.000)	R-sq. 0.966 F-test 143.3 DW 1.5	0.289* (0.000)	R-sq. 0.978 F-test 116.7* DW 2.3

Notes: All variables are expressed in natural logarithms; p-values are in parentheses; ** significant at 5%, * significant at 1%

The explanation of organic farming consequences for the sustainable development was found with several regression models. Each model explains the variation of an indicator specific to the sustainable society with the influence of organic farming. The F-statistic values show that the regressions obtained have a high explanatory power concerning the studied phenomenon (over 88%). The ADF unit root test showed that all variables are stationary, so there are prerequisites to obtaining correctly assessed coefficients. The estimators calculated based on the log-log type models are coefficients of elasticity and they show the elasticity of the sustainable society elements versus the variation of the organic farming share.

Based on our estimates, we can say that in all EU countries (and therefore in Romania also), the organic farming has a significant impact on some of the sustainable society elements. But there are some variables over which the influences are insignificant.

The organic farming practice is favourably acting in the EU countries in terms of education level, gender equality, lowering energy consumption, reducing air pollution, and stimulates the growth rate of the gross domestic product.

The organic farming consequences on the Romanian society generally follow the trend shown at European level, but there are also some specific issues.

In terms of human wellbeing, the organic farming development has implications primarily on the quality of life in Romania. The estimator obtained for the variable *Healthy life* (the elasticity coefficient is 0.0496) shows that there are significant possibilities to increase the number of healthy life years. Also, in terms of human wellbeing, it was found that the increase of organically cultivated areas contributes to the increase of gender equality (0.0125). The organic farming practices are not clearly addressed to certain social structures but, by promoting the balance between the economic and environmental systems, they stimulate some aspects, such as the equality of opportunities and participation of all people in economic activities and, therefore, the increase of life expectancy. The area where the organic farming has a negative impact is the good governance, possibly due to increasing demands on the restructuring of the legal, organisational and productive techniques specific to this type of agriculture.

Based on these results, we can say that, in Romania, the organic farming practices have a positive impact on the environmental wellbeing and, in particular, on the natural resources, climate and energy areas. The increase in areas intended for organic farming leads to a decrease in the fresh water consumption per year, as share in the total renewable water resources (-0.236). Also, the GHG emissions are decreasing (-0.151), which means a decrease in the agriculture contribution to air pollution. The organic farming stimulates the use of renewable energy sources (0.197), resulting in lower consumption of conventional fuels.

Regarding the Economic wellbeing, the organic farming contributes to the Gross Domestic Product growth rate (0.289), having thus a favourable influence on the economy of the country.

The results are in line with the views of some specialists and international bodies which consider that the organic farming is a viable alternative to the conventional agriculture, with potential to reduce the global warming [Muller and Aubert, 2014]. The organic farming can accelerate the social and economic wellbeing [Schader, Stolze and Gattinger, 2012], having a favourable impact on the health of humans and ecosystems [IFOAM, 2005].

5. Conclusions

The European agricultural policy aims to develop agri-food systems based on organic farming practices, which constitute an opportunity for the sustainable development of the national economies [Bellon and Penvern, 2014].

In this paper, we carried out an analysis aiming to identify the interdependent relationship between the organic farming practice and the specific elements of the sustainable society, for the EU countries and Romania.

The analysis was based on the indicators through which the European bodies are monitoring the degrees of sustainability of the EU member countries in the period 2006-2014. The analysis results confirmed that the organic farming produces important consequences for the sustainable development of the society in all EU countries, including Romania.

The organic production systems do not use synthetic chemicals and nutrients, pollute less, protect the natural resources and promote the biodiversity, determining therefore beneficial actions targeting the quality of environment, ecological systems and food. Practicing organic farming on an extensive scale can contribute to human, environmental and economic wellbeing, which gives it an important role in increasing the degree of sustainability of the society.

The estimators obtained for Romania suggest that the development of organic farming generates favourable consequences in terms of life quality, a better labour market integration, increase in life expectancy, reduced pollution, saved conventional resources and economic growth. These implications can be found in many areas that are closely related to the sustainable development and demonstrate the need for increased actions to boost the transition towards sustainable forms of production in agriculture.

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