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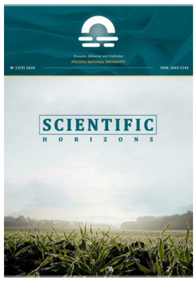

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European Union on the way towards sustainability in the domain of food security, improved nutrition, and sustainable agriculture

Petra Szaryszová
Doctor of Economics, Associate Professor
University of Economics in Bratislava
041 30, 13 Tajovského, Košice, Slovakia
https://orcid.org/0000-0002-1128-2280

Lenka Kuhnová
Doctor of Economics, Associate Professor
University of Economics in Bratislava
041 30, 13 Tajovského, Košice, Slovakia
https://orcid.org/0000-0002-1200-0441

Silvia Megyesiova*
Associate Professor, Head of the Department
University of Economics in Bratislava
041 30, 13 Tajovského, Košice, Slovakia
https://orcid.org/0000-0002-6815-5629

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Abstract. Sustainable development was the global key issue and is in the interest of human beings. Among the 17 Sustainable Development Goals, goal 2 is significant in terms of eliminating hunger, achieving food security, and improving sustainable agriculture. The study aims to analyse the state, development, association, and convergence of indicators that are related to monitoring the European Union´s countries' progress toward to Zero Hunger Goal. For analytical purposes, the univariate statistical approach was used, correlation analysis depicted the linear relationship between the variables, the sigma and Beta convergence coefficients were employed to detect the convergence progress, and the index numbers enabled to follow the changes of the indicators over time. The convergence of the agricultural factor income per annual efforts was discovered, which is a positive signal for the catching-up process of the EU countries. A positive and significant correlation between the government support for the research and development of agriculture and the agricultural factor income was determined, therefore an increase in the government support allocation for research and development for agriculture can lead to an increase of the agricultural income. The analysis highlighted a negative, significant correlation between the ammonia emissions from agriculture and the area under organic farming that supports the idea

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*Corresponding author

of increasing organic farming with benefits to the environment and population health. The study results can be used for further development of the EU's ambitions toward sustainable agriculture and nutrition

Keywords: sustainable development; zero hunger; Goal 2 indicators; organic farming; association

INTRODUCTION

The research relevance was determined by a systemic transformational change that is related to the demanding use of resources and environmental pollution in agriculture and the food industry. Therefore, it is necessary to study the efforts for sustainable economic development, and the elimination of poverty and hunger through relevant measures, which were largely unsuccessful within individual state policies.

A similar study on this topic was carried out by C.G. Gonzalez (2021), who analysed the mechanisms of minimizing the differences between the rich and the poor through development goals to minimize poverty. J. Blesh *et al.* (2019) state that agriculture is the main livelihood for 70% of the global low-income population. They identified that agriculture is closely linked to weather and climate, which is a dominant factor in the variability of food production and associated levels of hunger. In this context, B.W. Muriithi *et al.* (2018) emphasize the necessity of the restoration of a holistic focus with an emphasis on environmental, social, and economic aspects. As such, they considered the climate as an object of further research with the development of a synergistic effect involving innovations in climate research with an emphasis on food security. A. Baer-Nawrocka and A. Sadowski (2019) analysed similar approaches in their study, based on which they consider the economic and technical availability of food. Furthermore, D.C. Bezu (2018) confirms the previous results and extends his study with a household survey and identifies factors (e.g., low level of non-agricultural activities, weather influence, land degradation, population tension) that threaten food security. Most countries with high populations face food insecurity and at the same time have a high birth rate and rapid population growth, which increases the challenge of adequately meeting nutritional needs.

The need to provide timely and accurate information on climate change and climate risk management in connection with the use of innovative tools and methodological procedures is also supported in the study of H. Valin (2019). To effectively use these scientific procedures, it is necessary, according to S. Kumar *et al.* (2023) to include in climate concepts information related to different periods for managing the strategy of optimal sustainable development. In this context, J. Streimikis and T. Baležentis (2020) in their study highlight the strong partnerships between international, and national stakeholders and agricultural and research institutions, as well as community organizations that play a role in supporting the achievement of the Sustainable Development Goals (SDGs). All these researchers are also supported by H. El Bilali *et al.* (2019) who emphasize the strong interconnection of concepts and paradigms of food sustainability. Their study results support the development of a sustainable food concept regarding the availability of food, its accessibility and use.

According to the World Health Organization (2021), all these efforts represent critical challenges that offer diverse opportunities to promote food security. Based on the knowledge gained, the study aimed to quantify the development of indicators such as poverty eradication, achieving food security and improving sustainable agriculture. At the same time, the authors of the contribution focus on a more complex view regarding global food optimality and related indicators in the social and economic field of Sustainable Development (SD).

LITERATURE REVIEW

The 2030 Agenda is underpinned by 17 Sustainable Development Goals, which were created to integrate various efforts and issues into the framework of sustainable development, including poverty reduction. The new agenda characterizes sustainable development as a holistic benefit of socioeconomic and environmental improvement while adding important aspects, such as economic inequality, justice, gender equality and climate change. Given this broader scope, the SD concept recognizes the need for a comprehensive approach to the transformation between separate goals and represents the essence of the entire 2030 Agenda, SDG 1, which should eliminate poverty. This goal is determined by other SDGs, especially SDG 2: Zero Hunger. The United Nations (UN) emphasizes that "the elimination of poverty and hunger is inextricably linked to increasing food production, agricultural productivity and incomes, especially in rural areas, as it mainly concerns small farmers and their families" (United Nations, 2023).

Food insecurity is defined by N.M. Lowe (2021) as a low level of food access. The author confirmed that moderate food insecurity is associated with irregular and inappropriate eating and obtaining sufficient nutrition, as well as insufficient food. At the same time, the study also indicated slow implementation in the effort to reduce poverty. Food insecurity fluctuations are also often related to a reduction in food intake and related malnutrition to starvation, according to M. Canfield *et al.* (2021). Although, according to the authors, the UN strives to reduce these negative impacts, monitoring the management of global food distribution is insufficient. However, as reported by X. Chen *et al.* (2023), they identified increased food stability mainly in the countries of Asia and Africa, which was mainly caused by the increasing ratio of grain production. Despite increased food stability and productivity, M. Anderson and M. Rivera-Ferre (2021) state that the second SD goal has not been achieved, therefore this environmental-social topic needs to be addressed more deeply. F. Baquedano *et al*. (2021) stated that on a global scale, food security is considered a production and consumption problem by measuring basic economic indicators. As such, a demand-driven concept was used to assess food security in 76 countries around the world. The results showed that the low and middle-income population was not able to secure basic food. Analyses of food safety were enriched by F. Song *et al*. (2022) who identified a new indicator related to the use of arable land area for assessing the global nature of food security. F. Götmark *et al*. (2018) report that although most research analyses food security in terms of land availability and access, it is also affected by countries' population ageing. According to the authors, these dimensions represent a comprehensive approach to food availability. A study by A. Sarkar *et al*. (2021) also suggested that persistent hunger, which is an essential indicator of food security, can normally be attributed mainly to sensitive social arrangements, low salaries, environmental threats of a global nature, and unfavourable logistic networks of countries.

MATERIALS AND METHODS

For analytical purposes, five variables were used the determine the state and development of the EU countries regarding SDG 2. These metrics are part of the European Union´s SDG plan and were downloaded from the Eurostat database (Eurostat, n.d.). EU plan variables, such as groundwater nitrates, were used to estimate soil erosion by water, common bird index by type of species was not included in the analysis (End hunger, achieve food security and improved nutrition and promote sustainable agriculture, 2023). The main reason for the omission of certain metrics is the lack of data availability at the state levels. The analysis was done in two periods to assess changes. The period selection depended on the data availability and characteristics. Based on the EU SDG indicator set (Eurostat, n.d.), the following indicators were included: x_1 – obesity rate by body mass index; x_2 – agricultural factor income per annual work unit (change linked volumes); x_3 – government support to agricultural research and development (Euro per inhabitant); x_4 – area under organic farming (% of total utilised agricultural area); x_5 – ammonia emissions from agriculture (kilograms per hectare).

For analytical purposes, metrics from various periods were employed to track both development vectors. The used data sets come from the statistics office of the European Union and Eurostat (Eurostat, n.d.). The exact assignment of periods depends on the data availability and analysis goal. The indicator x_1 is only available in two years, namely 2014 and 2019, for each of the EU countries. For the variable x_2, the starting season is 2010, i.e., representing period 1, while the second period for the agricultural factor income per annual operations unit was set to the year 2021 as the latest year with available data for each of the EU member states. The first period for the indicators x_3, x_4 and x_5 is the average value of the mentioned variables for 2010-2016. The second period for variables x_4 and x_5 represents the average values for 2017 – 2021, while the average variable x_3 was calculated for 2017 to 2022. The calculated averages were used to eliminate certain random annual fluctuations of the observed metrics. The average variables in the second period were calculated from 2017 to 2021 or from 2017 to 2022 depending on the dataset availability. The two-period analysis was used to follow the most important relative and absolute changes of the SDG 2 indicators (Eurostat, 2023). Fixed-base metric indexes were used to discover the cumulative change of the variables over a broader period.

For the analysis of a metric, the univariate statistical approach was selected (Loveday, 2016), the metrics were characterized by their average level, minimum, maximum, range, standard deviation and/or coefficient of variation (CV). The relative measure of variability, in other words, the coefficient of variation, is suitable for comparing the variability in different time spans or different indicators. The CV is part of the so-called sigma convergence coefficients. M. Simionescu (2014) and R.C. Das (2016) discovered that the regions and countries converge if the CV is declining. Closely related to sigma convergence is the Beta convergence process, which can be explained as a process in which poorer regions and countries grow faster than the richer ones and so the poorer regions catch on them. As R. Witte and J. Witte (2017) stated, the linear correlation between a pair of variables can be defined using Pearson´s correlation coefficient. The analysed metrics were downloaded from the Eurostat web page (Eurostat, n.d.)

RESULTS AND DISCUSSION

Obesity is a serious problem in developed countries and is associated with the risk of noncommunicable, chronic diseases like heart disease, certain cancers, hypertension, type-2 diabetes, and stroke. As the obesity rate is considered a destimulant indicator, a decline in its values is rated positively (European Commission, 2022). The analysis of relative and absolute changes in two different periods was conducted to detect the direction of obesity changes. The obesity rate (Fig. 1) for the EU-27 increased from 15.4% in 2014 to 16.5% in 2019, which is a negative tendency. In 2014 the obesity rate ranged from 9.4% to 26.0% while in 2019 it ranged from 10.9% to 28.7%. In 2014 the lowest values were typical for Romania (9.4%), Italy (10.8%) and the Netherlands (13.3%), while the highest rates were achieved in Hungary (21.2%), Latvia (21.3%) and Malta (26.0%). Before 2019, the position of the countries that belonged to the best group and the worst group did not change significantly.

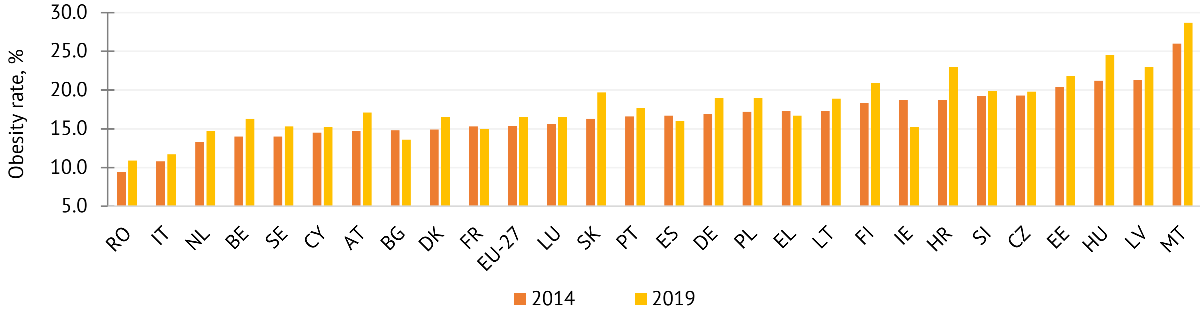

***Figure 1.** Obesity rate in 2014 and 2019 (%)*
***Source:** based on presentation of the data downloaded from the Eurostat database (n.d.)*

An increase in obesity rate was noted in most of the EU countries in the analysed period while a decline was noted only in five EU countries, namely in Ireland, Bulgaria, Spain, Greece, and France. From 2014 to 2019, the highest absolute decline of the obesity rate by 3.5 percentage points (p.p.) was noted in Ireland and the highest increase in Croatia by 4.3 percentage points. Alongside the average obesity rate for the EU-27 increase, the relative variability measured by the coefficient of variation also deteriorated (from 21.6% to 23.6%) and, therefore, no sign of obesity rate convergence was present.

The agricultural factor income per annual operations unit in Euro, 2010, was low in the "new" EU member states while high in the "older" member states (Fig. 2). These results were expected as the less developed countries in the EU are the countries that joined the EU in 2004 or later. The most notable fact from the x_2 metric analysis is a strong convergence process, indicated by the real cumulative growth. The cumulative real growth between 2010-2021 was higher than 100% in Hungary, Slovakia, and Bulgaria (229.6%). The convergence of the less developed countries is possible since the countries with a low agricultural factor income per annual work in 2010 faced a strong real growth of this indicator and, therefore, these countries can be found in the upper left corner of the presented Figure 2. On the other hand, the countries with a high level of this indicator in 2010 reached a low real increase or a real decrease of the analysed variable. These countries can be found in the lower right corner of the presented Chart 4.

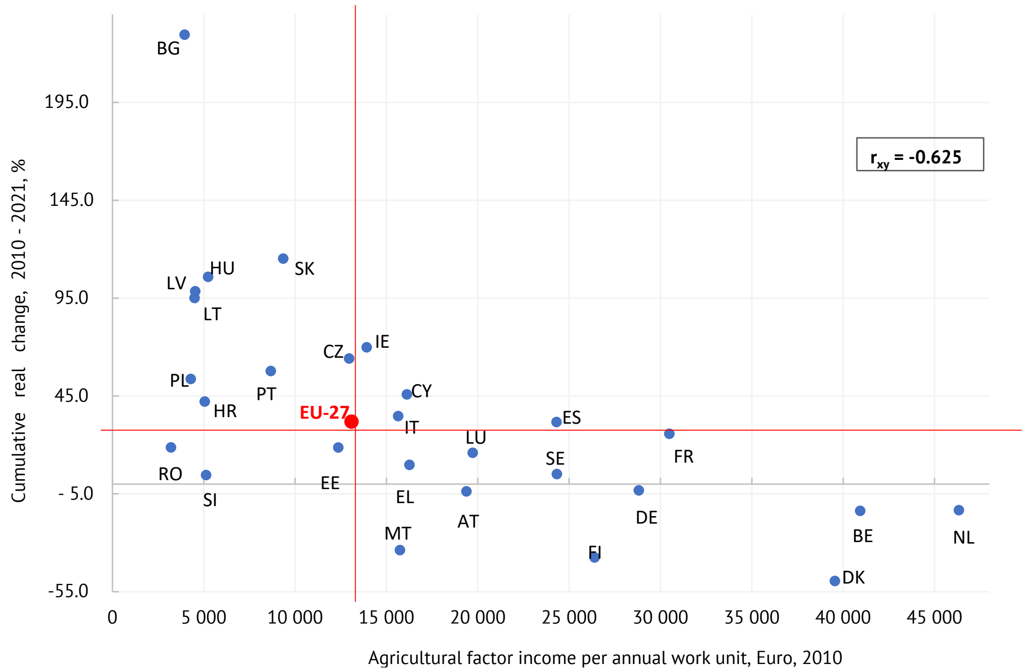

***Figure 2.** Agricultural factor income per annual work in the EU in 2010-2021*
***Note:** EU countries country codes: BE-Belgium, BG-Bulgaria, CZ-Czech Republic, DK-Denmark, DE-Germany, EE-Estonia, IE-Ireland, EL-Greece, ES-Spain, FR-France, HR-Croatia, IT-Italy, CY-Cyprus, LV-Latvia, LT-Lithuania, LU-Luxembourg, HU-Hungary, MT-Malta, NL-the Netherlands, AT-Austria, PL-Poland, PT-Portugal, RO-Romania, SI-Slovenia, SK-Slovakia, FI-Finland, SE-Sweden*
***Source:** based on presentation and calculations based on data downloaded from the Eurostat database (n.d.)*

The high negative value of the correlation coefficient points out a strong β-convergence process, while the decline of the coefficient of variation from 92% in 2010 to 56.7% in 2021 depicts a strong Sigma convergence process. This development can be considered as a positive notion. The government budget allocation for Research and Development (R&D) for agriculture in most of the EU countries is lower than the EU-27 average (Fig. 3). To avoid a comparison of data that could be affected by certain annual fluctuations of the x_3 indicator, the average values for time spans 2010-2016 and 2017-2022 were calculated. The average value of the government support allocation for R&D for agriculture ranged from 0.7% to 19.7% from 2010 to 2016 and from 0.6% to 20.1% from 2017-2022. The notably insufficient government backing for agricultural research and development in Luxembourg, Croatia, and Malta during 2010-2016, and in Luxembourg and Romania in the subsequent period, stands out, given that the indicator x_3 in these nations fell below 1.2%. Among the countries, with a higher than the EU-27 average governmental budget allocation for R&D for agriculture, the older and more developed EU member states can be found. The new and less developed EU countries offer lower support for R&D in general, which can also reflected in their allocations for research and development for the agricultural sector of the economy, which was also low.

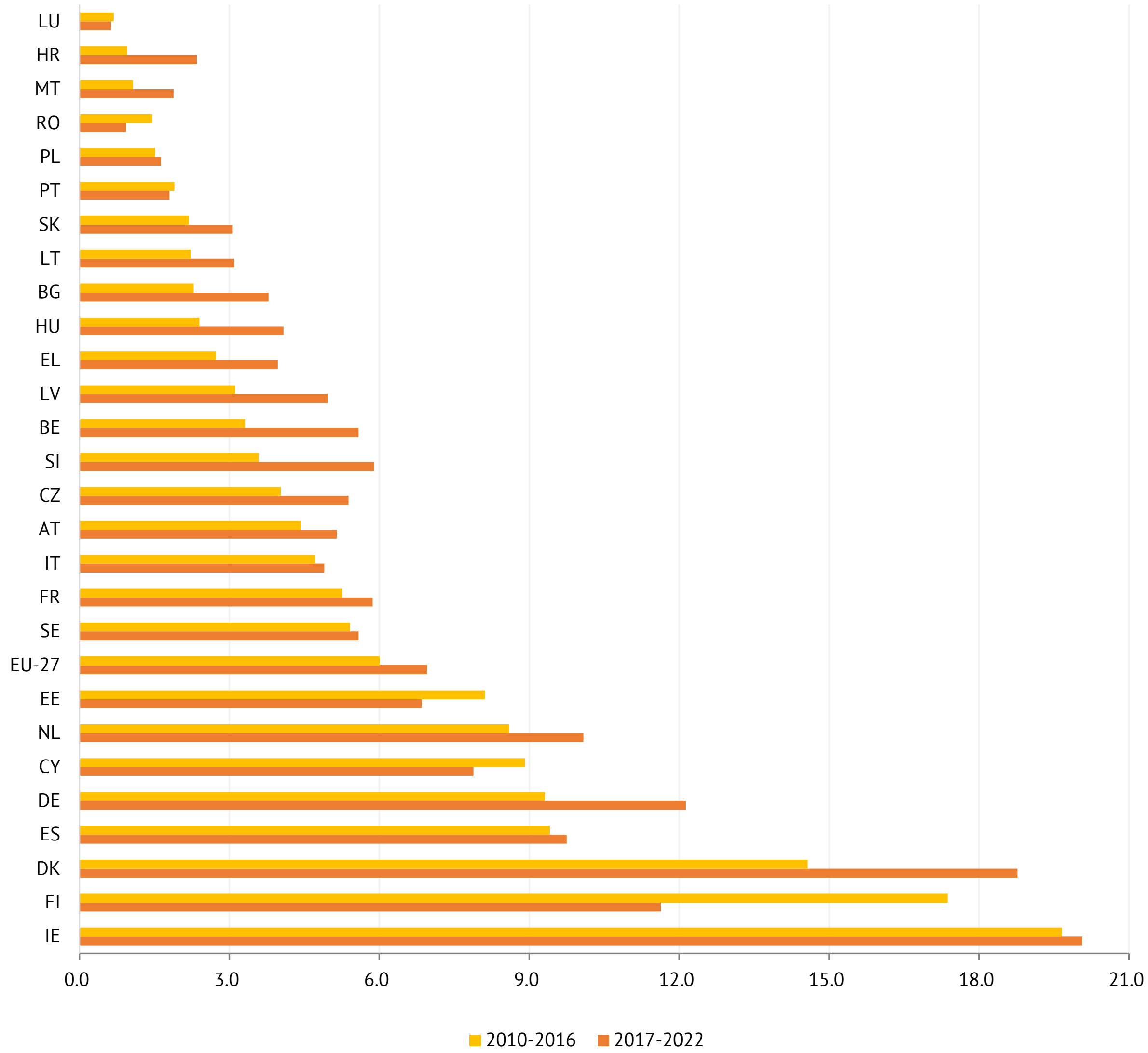

Figure 3. *Government budget allocation for R&D for agriculture, Euro per inhabitant in 2010-2016 and 2017-2022*
Source: *based on presentation and calculations based on data downloaded from the Eurostat database (n.d.)*

The only indicator among the EU SDG indicator set used to measure the progress toward SDG 2 with a targeted value for 2030 is the area under organic farming.

The percentage of total utilised agricultural area under organic farming should be as high as 25% in 2030. In 2021, only in one country, namely Austria, the indicator x_4 overpassed this threshold (Fig. 4).

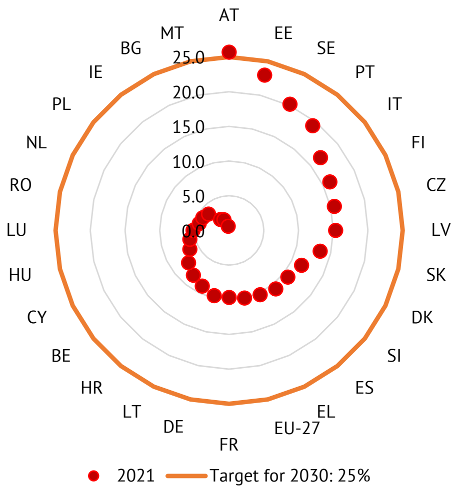

Figure 4. *The area under organic farming in 2021 and the target for 2030 (percentage of total utilised agricultural area)*
Source: *based on presentation based on data downloaded from the Eurostat database (n.d.)*

Organic production can help reduce public health risks to the population and, surprisingly, organic farming areas in some countries are only 0.6% (Malta) or 1.7% (Bulgaria). In 2021, the distance to the targeted value was lower than 10 p.p. in seven EU countries while it was higher than 15 p.p. in 14 countries. The state of indicator x_4 presents a low interest of the countries to invest time and money to extend the area under organic farming to an acceptable level also in a situation when it is clear, that organic production has an important positive effect on the health and nutrition of the population. The leader among the EU countries in case of the indicator x_4, Austria, should be a good example that it is possible to increase the area under organic farming to much higher percentages compared to other EU members and so to offer organic food with higher nutrition, to cut pollution due to organic farming or to combat climate change. The positives of organic farming are uncountable not only from the quality and nutrition benefits but also from the environmental aspects of the production. But still, most of the EU countries did not catch the positives of organic farming and so still the percentage of the total utilised agricultural area under organic farming is incomprehensibly low.

The average ammonia emissions from agriculture measured in kilogram per hectare ranged from 6.8 to 113.2 in the period 2010-2016 and from 7.0 to 112.0 in the period 2017-2021 (Fig. 5). Not only the range did not change significantly during the analysed period but also the coefficient of variation showed no significant change as it declined from 21.9% to only 21.4% in the analysed periods.

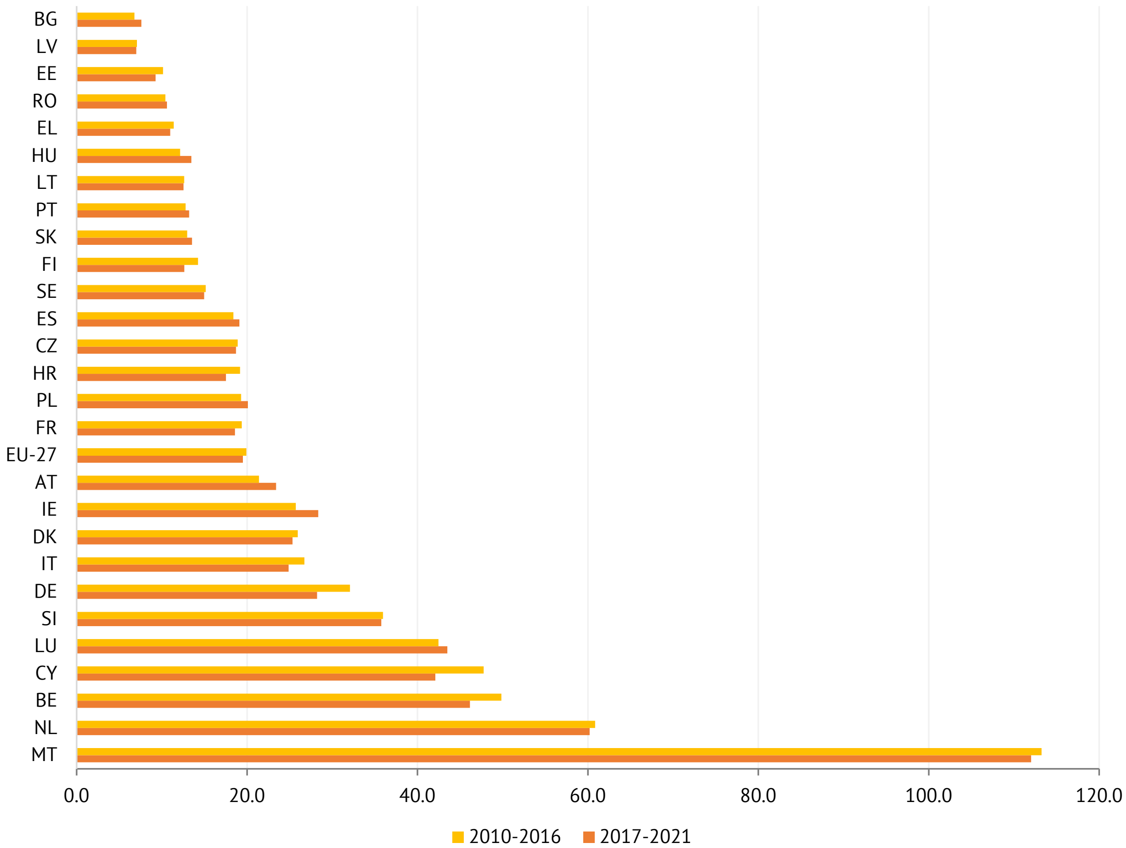

Figure 5. *Ammonia emissions from agriculture, kilograms per hectare in 2010-2016 and 2017-2021*
Source: *based on presentation and calculations based on data downloaded from the Eurostat database (n.d.)*

The highest ammonia emission from agriculture was typical for Malta, the Netherlands and Belgium with no change of their worst positions in 2010-2016 and 2017-2021. Conversely, the exceptionally low level of indicator x_5 in the more recent EU nations, particularly Bulgaria, Latvia, and Estonia, merits a positive rating, considering that agricultural ammonia emissions were below 10 kilograms per hectare. A most significant decline in relative terms was achieved in Germany, where the indicator x_5 shrunk by 12% (from 32.1 kg to 28.2 kg per hectare) in the analysis of two periods. A high relative decline was achieved in Cyprus (11.8%) and Finland (11.3%). The atmospheric ammonia negatively affects the air quality, it significantly contributes to $PM_{2.5}$ air pollution and, thus, the ammonia generates substantial health damages, which can cause chronic respiratory illnesses, lung damage, irritation of the eyes and nose, and premature mortality.

The correlation analysis discovered an interesting linear relationship between the analysed indicators (Table 1). Moderate, positive, and statistically significant correlation between the agricultural factor income per annual yield unit and the government support for agricultural research and development in both analysed periods means, that in a country with a higher government support for agricultural research and development also a higher agricultural factor income is expected and vice versa. An increase in the agricultural factor income is therefore possible through an increase in government support for research and development in the agricultural sector of the economy.

Table 1. *Pearson Correlation Coefficients*

Pearson Correlation Coefficients, N=27 Prob > |r| under H0: Rho=0					
Indicator	x_1_2014	x_2_2010	x_3_2010-2016	x_4_2010-2016	x_5_2010-2016
x_1_2014	1.000	-0.294 0.14	-0.023 0.91	-0.039 0.85	0.259 0.19
x_2_2010	-0.294 0.14	1.000	0.470 0.01	0.027 0.89	0.371 0.06
x_3_2010-2016	-0.023 0.91	0.470 0.01	1.000	0.046 0.82	-0.029 0.89
x_4_2010-2016	-0.039 0.85	0.027 0.89	0.046 0.82	1.000	-0.370 0.06
x_5_2010-2016	0.259 0.19	0.371 0.06	-0.029 0.89	-0.370 0.06	1.000
Indicator	x_1_2019	x_2_2021	x_3_2017-2022	x_4_2017-2022	x_5_2017-2022
x_1_2019	1.000	-0.406 0.04	-0.169 0.40	0.028 0.89	0.282 0.15
x_2_2021	-0.406 0.04	1.000	0.414 0.03	0.034 0.87	0.204 0.31
x_3_2017-2022	-0.169 0.40	0.414 0.03	1.000	0.027 0.89	0.011 0.96
x_4_2017-2022	0.028 0.89	0.034 0.87	0.027 0.89	1.000	-0.402 0.04
x_5_2017-2022	0.282 0.15	0.204 0.31	0.011 0.96	-0.402 0.04	1.000

Notes: *p values in italics, statistically significant (p<0.05) linear correlation in bold*
Source: *based on calculations based on data downloaded from the Eurostat database (n.d.)*

The discovery of a moderately negative and statistically significant linear connection between agricultural ammonia emissions and indicators of organic farming areas is particularly intriguing. This finding is a valuable notion, as in case of an increase in the area under organic farming a decline of the ammonia emissions from agriculture is expected. As such, with organic farming not only the consumption of food with higher quality is expected, but the next benefit for the population would be a decline in the ammonia emissions from agriculture. The population will benefit from organic farming due to the shrinking of the negative emissions from agriculture which will help to reduce some non-communicable diseases.

Comparing the results and conclusion obtained in this study with the results obtained by other scientists, it is worth noting the convergence process of some macroeconomic characteristics in the EU over time (Simionescu, 2014; Das, 2016). The results are in line with other researchers regarding ammonia emissions, pollution, and its negative impact on population health (Ma *et al.*, 2021; Wyer *et al.*, 2022) and the fact, that due to the increase of the area under organic farming the ammonia emissions from agriculture is declining. There is evidence that in upper-middle and high-income countries, overweight and obesity (FAO, 2019) is a huge social, economic and health challenge that should be monitored very closely. According to the publication of Eurostat (2023), non-systemic access to food, which reflects poverty and social exclusion, also occurs at the EU level. It was identified based on the increase in the number of inhabitants who had limited access to food, as well as the inappropriate geopolitical conditions of food chains, which increases the coefficient of relative as well as the absolute value of poverty. The study results highlight that, before the start of the COVID-19 pandemic, one in five European citizens was at risk of poverty, while less than 7% of the European population could not afford meat or fish products. As a result of the impact of the pandemic, this percentage has increased to almost 9% of the European population. The COVID-19 pandemic has also adversely affected food stability by disrupting long-term supply chains, further exacerbating poverty, resulting in reduced purchasing power and reduced demand for food waste (Clapp & Moseley, 2020). FAO (2019) also stated that the world is not on track to meet the SDGs. The rapid expansion of industrial agriculture after World War II caused a global decline in both wild and domesticated animal and plant species. J. von Braun *et al.* (2021) react to this situation in their study with critical claims that governments ignore those stakeholders who suffer most from the failure to meet the broad goals of SD. At the same time, they draw attention to low-quality and unreliable data in several countries of the world. D. Banik (2019) shared a similar opinion and also emphasized the importance of integration in the socio-economic and environmental fields. Yet, this approach demands more than just intersectoral coordination through information sharing; it necessitates interdisciplinary research as well. Even though the SDGs are not binding for countries, it is assumed that individual governments will take responsibility for the processing of national frameworks, which are supposed to help in achieving the "global goals".

The study brought an important and up-to-date analysis of the state and development of the indicators that are part of the EU SDG indicator set used by the EU for monitoring to progress toward sustainable development of the EU member states. The challenges require more innovative approaches and strategies to agricultural and food systems that address both the pandemic, such as coronavirus, and climate challenges (Rasul & Molden, 2020). Lessons from best practices suggest and provide an opportunity to accelerate the changes to even more sustainable and resilient food systems and redound to climate change mitigation (McNeill, 2019). Measures to address the challenges of the COVID-19 pandemic can be linked to increased agricultural sustainability and improved resilience of food systems by investing in natural capital and embracing economic, ecological, and social considerations in the production, distribution, and consumption of food (HLPE, 2020). While pointing out that health issues are a priority in the short term, in the long term, government policies and actions are required to prioritize agricultural sustainability and constructing healthy food systems (Watts *et al.*, 2020). Policy decisions should focus on meeting urgent public health and food requirements, ensuring long-term resilience and sustainability in agriculture, as well as considering the impacts of climate change.

CONCLUSIONS

The development of the indicators that are used by the EU authorities to follow the successes or failures toward the SDG 2 was positive with only one exemption. The obesity rate, as a significant health determinator, increased in most of the EU countries, on average for the EU-27 it increased from 15.4% in 2014 to 16.5% in 2019. The indicator of annual agricultural factor income per worker exhibited a noteworthy positive shift, notably increasing in real terms within countries that initially had low productivity at the start of the analysed period. This shift notably contributed to the convergence of this indicator. In Bulgaria, the real agricultural factor income jumped by 229.6% between 2010 and 2021. The Government support for agricultural R&D is unfortunately low in the "new" less developed EU countries. The EU should increase the support of organic farming as this indicator has a target value for 2030 at 25%. In 2021 only Austria achieved this milestone, while the EU average achieved 10%. The ammonia emission from agriculture did not change significantly over the analysed period. The highest ammonia emissions from agriculture in 2021 were achieved in Malta (120.4 kilograms per hectare) while the lowest was in Latvia (6.8 kg per hectare). A noteworthy correlation was discovered between the ammonia emissions from agriculture and areas under organic farming. This correlation was negative and significant, which means that in a country with a higher proportion of area under organic farming, a lower ammonia emission is expected and vice versa. This is an important message for the EU countries that should more intensively support the formation of areas under organic farming. The benefit of such support will result in the decline of ammonia emissions from agriculture and the production of food with higher quality. Both positives will result in a better environment, better nutrition, and improvement of the public health of the population. Further research should concentrate on challenges of sustainability all over the world: countries face challenges on how to transform agriculture and food systems to be more resilient and climate-smart to severe global turns.

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CONFLICT OF INTEREST

The authors of this study declare no conflict of interest.

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Європейський Союз на шляху до сталого розвитку у сфері продовольчої безпеки, поліпшення харчування та сталого сільського господарства

Петра Шаришова
Доктор економічних наук, доцент
Економічний університет в Братиславі
041 30, Таговського, 13, м. Кошице, Словаччина
https://orcid.org/0000-0002-1128-2280

Ленка Кухнова
Доктор економічних наук, доцент
Економічний університет в Братиславі
041 30, Таговського, 13, м. Кошице, Словаччина
https://orcid.org/0000-0002-1200-0441

Сільвія Мегєсьова
Доцент, завідувач кафедри
Економічний університет в Братиславі
041 30, Таговського, 13, м. Кошице, Словаччина
https://orcid.org/0000-0002-6815-5629

Анотація. Сталий розвиток є ключовим глобальним питанням і відповідає інтересам людини. Серед 17 Цілей сталого розвитку, ціль 2 є важливою з точки зору подолання голоду, досягнення продовольчої безпеки та покращення сталого сільського господарства. Метою дослідження було аналіз стану, розвитку, зв'язку та конвергенції індикаторів, які стосуються моніторингу прогресу країн Європейського Союзу на шляху до досягнення Цілі «Нульовий голод». Для аналітичних цілей використовувався одновимірний статистичний підхід, кореляційний аналіз показав лінійний зв›язок між змінними, коефіцієнти сигма та бета конвергенції були використані для визначення прогресу конвергенції, а індексні показники дозволили простежити за змінами показників у часі. Було виявлено зближення показників доходу на фактор сільськогосподарського виробництва в розрахунку на річні зусилля, що є позитивним сигналом для процесу наздоганяючого розвитку країн ЄС. Визначено позитивну та значущу кореляцію між державною підтримкою досліджень і розробок у сільському господарстві та сільськогосподарським факторним доходом, тому збільшення державної підтримки на дослідження і розробки у сільському господарстві може призвести до зростання сільськогосподарського доходу. Аналіз виявив негативну, значущу кореляцію між викидами аміаку в сільському господарстві та площею органічного землеробства, що підтверджує ідею збільшення органічного землеробства з користю для довкілля та здоров›я населення. Результати дослідження можуть бути використані для подальшого розвитку амбіцій ЄС щодо сталого сільського господарства та харчування

Ключові слова: сталий розвиток; нульовий голод; індикатори Цілі 2; органічне сільське господарство; асоціація
