Journal of Research and Innovation for Sustainable Society (JRISS)
Volume 6, Issue 2, 2024
ISSN: 2668-0416
Thoth Publishing House

DOI: 10.33727/JRISS.2024.2.37:352-357

Agriculture and rural development in Romania: navigating the challenges and demands of sustainable development goals

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Abstract. This article examines the potential and problems that Romania's agriculture industry faces in relation to the Sustainable Development Goals (SDGs) of the United Nations, particularly SDG 13 (Climate Action) and SDG 2 (Zero Hunger). Romania's agriculture is essential to the country's economic expansion, rural development, and environmental sustainability, yet there are major challenges due to dispersed landholdings, antiquated infrastructure, and climate change. Crop production per hectare and water usage efficiency are the two main variables used in the study to evaluate resource management and agricultural performance.The yields of rapeseed and wheat have somewhat improved, but the production of barley has remained unchanged. Because of changing irrigation needs and rainfall, water usage efficiency has changed. In order to reach the SDG objectives, the report highlights the necessity of upgrading water management systems and modernising agricultural practices. The present study enhances comprehension of the intricate dynamics of sustainable agriculture in Romania and its conformity with wider sustainability frameworks in Europe and worldwide.
Keywords: *Sustainable agriculture,Water use efficiency, Crop yield, Romania, Sustainable Development Goals (SDGs)*

Introduction

The agriculture industry in Romania is facing two significant difficulties at the same time: rural modernisation and sustainable growth. The nation has vowed to support the Sustainable Development Goals (SDGs) of the UN, which include SDG 13, which places a strong emphasis on climate action, and SDG 2, which strives for zero hunger. The productivity of Romania's agriculture is essential for the country's economic expansion, rural development, and environmental sustainability; nonetheless, the industry needs to change to meet urgent environmental and socioeconomic issues (Mihai & Iatu, 2020). Since agriculture is the primary source of income for a sizable section of Romania's rural population, integrating sustainable techniques is essential to the country's future success.

Several factors, such as dispersed landholdings, antiquated infrastructure, and a lack of use of modern technology breakthroughs, hinder Romania's agricultural output (Streimikis & Baležentis, 2020).

According to Eurostat (2022), these elements make it more difficult for the agriculture industry to compete in the larger European market. In order to overcome these obstacles and guarantee that rural regions contribute to national economic growth, the Romanian government must comply with the European Union's Common Agricultural Policy (CAP) and its sustainable development initiatives (EC, 2022). Sustainable farming methods contribute to environmental degradation mitigation and economic resilience, which is a fundamental component of the larger European Green Deal (FAO, 2023).

The advancement of Romania's agriculture also heavily depends on environmental issues. Due to the effects of climate change, Romania has to address the problems of biodiversity loss, inefficient water usage, and land degradation (Bueno Montaldo, 2013). It is critical to update farming methods in order to encourage environmental stewardship. According to Streimikis and Baležentis (2020), agricultural sustainability frameworks provide a mechanism to reconcile environmental and climatic policies with the objectives of rural development. These kinds of frameworks offer vital indicators to monitor the advancement of both national policy goals and global SDGs.

According to Bueno Montaldo (2013), the successful adoption of sustainable farming techniques will also augment community resilience against socio-economic and environmental issues, improve rural livelihoods, and lessen poverty. Policies for rural development that are in line with the Sustainable Development Goals (SDGs) guarantee that Romania's agriculture industry may expand responsibly, meeting local demands and bolstering efforts towards global sustainability.

Literature Review

The agricultural sector in Romania faces both potential and major obstacles in terms of bringing its agricultural sector into line with the Sustainable Development Goals (SDGs). This is evident from an analysis of current literature on the subject. Key topics and findings from academic and policy sources are examined in this part, with an emphasis on how sustainable practices are integrated with environmental concerns and the socioeconomic effects on rural areas.

Although Romania's agriculture industry has always been a vital component of the national economy, integrating it with the Sustainable Development Goals (SDGs) brings with it both special potential and problems. A more sustainable agricultural system that strikes a balance between economic growth and environmental and social responsibility is needed, according to recent research (Mihai & Iatu, 2020). Romania's rural population depends heavily on agriculture for jobs, food security, and livelihoods, hence these objectives are closely linked to the country's rural development framework (Streimikis & Baležentis, 2020). In order to better understand the difficulties Romania's agriculture sector has in achieving the SDGs, this paper examines the present scholarly debate, paying particular attention to concerns pertaining to productivity, environmental sustainability, and socioeconomic growth.

In Romania, agriculture and rural development are changing, and the SDGs—especially SDG 2 (Zero Hunger), SDG 13 (Climate Action), and SDG 15 (Life on Land)—are essential to this (Streimikis & Baležentis, 2020). Romania's agricultural policy is becoming more in line with EU directives, which place a high priority on climate resilience and sustainability, as Mihai and Iatu (2020) point out. Romania approaches sustainable agriculture with the goal of minimising the sector's environmental impact while increasing production, and the European Green Deal and the Common Agricultural Policy (CAP) are two important EU frameworks that drive this approach (European Commission, 2022). The fragmented landholdings, antiquated infrastructure, and restricted access to technology continue to be major obstacles for Romania in its efforts to align its agricultural sector with these goals (FAO, 2023).

The literature emphasises how crucial it is for national policy to include these international frameworks. A methodology for assessing agricultural sustainability that connects local agricultural policy with the SDGs is being developed, as discussed by Streimikis and Baležentis (2020). With an emphasis on important metrics including greenhouse gas emissions, soil health, biodiversity preservation, and water usage efficiency, this framework provides a tool to track Romania's progress towards sustainable development. In order to meet SDGs 13 (Climate Action) and 15 (Life on Land), the sector must not only contribute to economic growth but also reduce its environmental effect. This is why these metrics are so important.

According to Streimikis and Baležentis (2020), a significant obstacle to sustainable agriculture in Romania is the fragmentation of farms, which impedes modernisation and lowers total production. Romania has some of the smallest typical farms in the EU, and a large number of farmers continue to use antiquated, inefficient methods of farming (FAO, 2023). This division makes it more difficult for the industry to use cutting-edge, environmentally friendly farming techniques that have the potential to increase output while halting environmental deterioration. To make matters worse, smallholders find it challenging to switch to more environmentally friendly methods due to limited access to technology and funding (European Commission, 2022).

Romanian agriculture's susceptibility to climate change is another major obstacle. By increasing the frequency of catastrophic weather events like floods and droughts, Mihai and Iatu (2020) contend that climate change is already having an effect on Romania's rural areas. Rural populations whose main source of income is agriculture are disproportionately impacted by these occurrences. That's why reaching SDG 13 (Climate Action) requires changing agricultural methods to be more robust to climate change. Unfortunately, despite increased awareness of the necessity of climate-adaptive solutions, their implementation is still sluggish because of inadequate funding and inventive potential (Bueno Montaldo, 2013).

In contemporary literature, environmental sustainability in agriculture has also received significant attention. According to Streimikis and Baležentis (2020), methane and nitrous oxide from livestock and fertilisers are the main sources of greenhouse gas emissions from Romania's agricultural industry. In order to fulfil the objectives established by the Paris Agreement and SDG 13, reducing these emissions is imperative. Romania has implemented many initiatives to encourage sustainable agricultural methods, including crop rotation, decreased use of pesticides, and organic farming (FAO, 2023). However, there is still uneven adoption of these measures, particularly among smaller farms that find it difficult to cover the upfront expenditures of switching to more environmentally friendly practices (European Commission, 2022).

The literature also emphasises the importance that technology plays in modernising agriculture. Technological advancements like data analytics, satellite tracking, and precision farming can greatly increase agricultural output and sustainability (Streimikis & Baležentis, 2020). Nevertheless, as Mihai and Iatu (2020) point out, Romania's rural infrastructure is still insufficiently prepared to facilitate the broad adoption of new technologies. A lack of trained labour in rural regions and restricted access to high-speed internet are further barriers to the modernisation of the agriculture industry.

In Romania, where a sizable section of the population depends on agriculture for a living, the socio-economic component of sustainable agriculture is especially important for rural development (FAO, 2023). Sustainable farming methods, especially in rural areas with high unemployment rates, can help lower rural poverty, increase food security, and generate new employment possibilities (Bueno Montaldo, 2013). However, many rural regions now lack the infrastructure and financial resources necessary to realise these benefits (Streimikis & Baležentis, 2020). Furthermore, Romania is confronted with a demographic dilemma as younger generations go for better economic prospects in metropolitan areas or overseas, leaving behind an ageing rural population that is less inclined to embrace modern agricultural technology (European Commission, 2022).

The body of research also emphasises how crucial community-based strategies are for rural development. The necessity of capacity-building initiatives that enable local communities to direct their own development is emphasised by Bueno Montaldo (2013). By assisting rural communities in becoming more resilient and self-sufficient, these initiatives can lessen their need for outside aid and promote long-term sustainability.

The agriculture industry in Romania is facing important possibilities and difficulties in relation to the Sustainable growth Goals at this critical juncture in its growth. Even if the nation's agricultural policies are now more in line with EU directives, there is still more to be done to address climate change, upgrade rural infrastructure, and modernise farming methods. According to the literature, ensuring a robust agricultural sector that supports both national and global sustainability goals would need a

comprehensive approach that incorporates environmental sustainability, technical innovation, and socio-economic growth.

Data and Methodology

The data sources and methods used to examine the trends in Romanian agriculture's crop yield per hectare and water usage efficiency, as well as how well they match with more general European patterns, are described in this chapter. Considering Romania's agricultural productivity and resource management in relation to the Sustainable Development Goals (SDGs), these two indicators offer a comprehensive insight of the country. Crop yield data includes important agricultural items including wheat, barley, and rapeseed; on the other hand, water usage efficiency looks at the amount of water utilised per hectare for farming in the past several years.

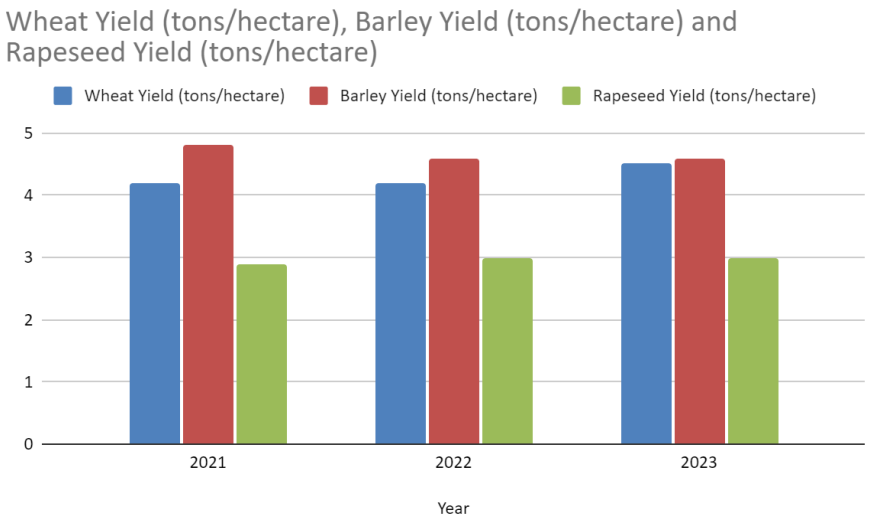
The research's suggested methodology makes use of quantitative techniques for doing descriptive statistics, compiling data sets, and spotting trends. By employing these techniques, the research seeks to offer a broad framework for understanding the functions, connections, and effects of various variables in Romania's agriculture industry. By comparing Romania's agricultural performance to that of other European nations, this method aids in identifying areas of strength and future development. Additionally, the study makes it easier to understand how these elements support environmental sustainability, rural development, and national agricultural policy.

Results and Discussion

To evaluate Romania's agricultural performance in respect to its sustainability objectives, the study that follows looks at important agricultural indicators, particularly crop output per hectare and water usage efficiency. With an emphasis on identifying obstacles and chances for development within the larger European framework, this section seeks to offer insights into the variables influencing agricultural production and resource management by examining these developments over the last several years.

The statistics on agricultural yield per hectare in Romania from 2021 to 2023 shows trends for three important crops: rapeseed, barley, and wheat. Based on the information at hand, wheat yield in 2021 and 2022 stayed consistent at 4.2 tonnes per hectare, while in 2023 it increased little to 4.52 tonnes per hectare. Even if it is slight, this rise points to a slight boost in production, which is either the result of improved farming techniques or advantageous growing season weather in 2023. The lack of statistics for 2024, however, raises questions about whether this encouraging trend will persist, particularly in light of the present environmental issues like droughts (Eurostat, 2022; INS, 2023).

Figure 1. Crop Yield in Romania 2021-2023



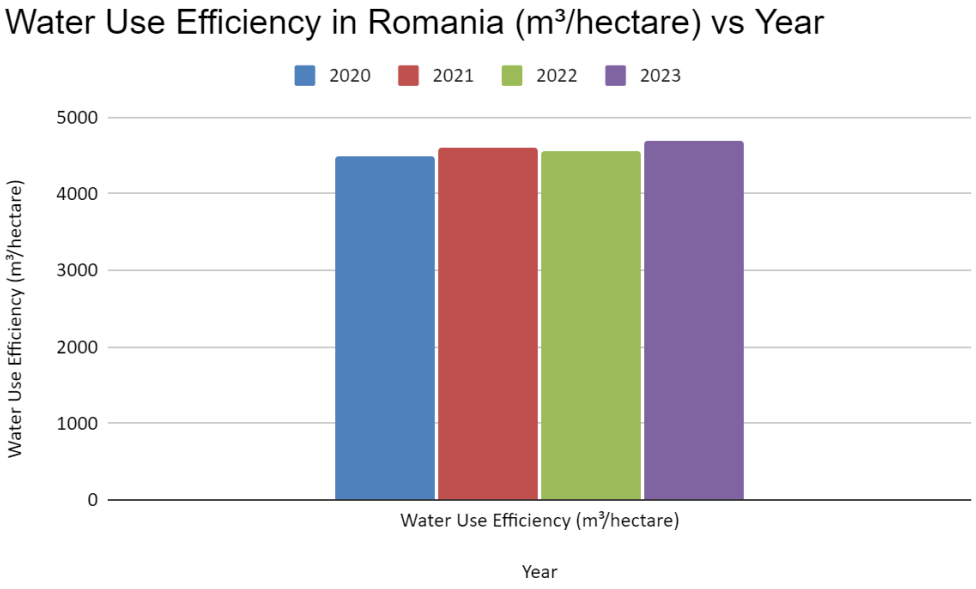
Source: Eurostat, 2021,Eurostat, 2022, INS, 2023

The amount produced of barley decreased slightly between 2021 and 2022, from 4.8 to 4.6 tonnes per hectare, and then stayed steady until 2023. This declining tendency may point to production vulnerabilities in barley, which may be related to the adverse environmental circumstances that have been covered in the literature. With a little increase from 2.9 tonnes per hectare in 2021 to 2.98 tonnes per hectare in 2022 and 2023, the yield for rapeseed has exhibited a more encouraging trend. Rapeseed's consistent performance indicates that, in comparison to other crops, it has shown more adaptability to the current agricultural and environmental stresses (Eurostat, 2023).

Romania faces difficulties in optimising agricultural output, as seen by the minor variations in crop yield among different crops. These disparities might be caused by a variety of factors, including fragmented landholdings, antiquated infrastructure, and climatic unpredictability. Nevertheless, they underscore the necessity of ongoing investments in agricultural technology and practices that are climate-resilient.

When looking over the statistics on water usage efficiency, represented in cubic metres per hectare, sheds light on the amount of water utilised in Romania's agriculture between 2020 and 2023. The water usage efficiency in 2020 was 4,500 m³/hectare, while in 2021 it increased little to 4,600 m³/hectare. But in 2022, this number decreased slightly to 4,550 m³/hectare, and then it increased once again to 4,700 m³/hectare in 2023 (FAO, 2020; INS, 2023).

Figure2. Water Use Efficiency in Romania



Source: FAO, 2020, FAO, 2021, INS, 2022, INS, 2023

Variations in rainfall and drought patterns, which have an immediate impact on agricultural water demand, might be the cause of this variation in water usage efficiency. For example, the increase in water usage in 2023 may be a result of drier weather that increases water demand and makes irrigation systems more important. According to these trends, Romania's agriculture sector could be having trouble managing water resources as efficiently as possible, which is important if sustainability and resilience are to be achieved in accordance with the SDGs, especially SDG 6 (Clean Water and Sanitation).

The lack of data for 2024 makes it difficult to assess whether these trends will continue in their entirety, but the rise in water usage in 2023 emphasises the need for better water management techniques, such as crop types that use less water or more efficient irrigation systems. With the predicted effects of climate change, increasing water usage efficiency will be essential to maintaining the agricultural sector's long-term viability in Romania.

Crop yield per hectare and water usage efficiency are two metrics that show how Romania's agricultural performance is currently doing in relation to more general sustainability goals. Although there have been improvements in certain places, notably in the yields of wheat and rapeseed, the variations in agricultural production and water use efficiency highlight the continuous difficulties associated with resource management and climatic unpredictability. To satisfy the needs of both national and international development goals, as well as to solve these problems, sustained investment in and monitoring of sustainable agriculture methods will be necessary

Conclusion

The results of this research demonstrate the vital role Romania's agriculture industry plays in achieving global and national sustainability objectives. Although there has been significant success in agricultural production as seen by slight increases in crop yields, especially in wheat and rapeseed, there are still ongoing issues with infrastructure, technology adoption, and climate resilience. The variation in water usage efficiency from 2020 to 2023 suggests that resource management has been uneven, which is probably made worse by different weather patterns, such as droughts. Romania's agriculture sector has to prioritise modernising farming practices, enhancing irrigation systems, and implementing crop types that are adaptable to climate change in order to be in line with SDG 2 and SDG 13.

Furthermore, the industry's capacity to fully benefit from cutting-edge agricultural technology is constrained by its reliance on small-scale farms and dispersed landholdings. Targeted investments in rural infrastructure, improved smallholders' access to financial resources, and more comprehensive legislative measures that promote rural development and environmental stewardship are all necessary for sustainable growth. Romania may improve its agricultural sustainability within the context of the European Green Deal and the Common Agricultural Policy (CAP). It will be essential to maintain attention on raising crop yields and enhancing water use efficiency if the agriculture industry is to support national economic resilience as well as global environmental initiatives.

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