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THE IMPORTANCE OF STUDYING CONSUMER BEHAVIOR IN SUPPORTING LOCAL FOOD PRODUCTION

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Abstract: *This study objective was to highlight the importance of studying consumer behavior and set up a methodological framework for such a study with applicability in encouraging the production of protein plants in order to diversify local production. Understanding consumer behavior is an important step for building strategies towards promoting local food production. Consumer behavior insights may be able to help in creating targeted marketing strategies that emphasize the benefits of local products, such as freshness, quality, and community support, thereby fostering a responsible consumption model and ensuring food security. The importance of studying consumer behavior in supporting local food production has a threefold importance: for promoting a responsible consumption model, for supporting local economies and reducing the environmental impact associated with transporting food over long distances.*

Keywords: vegetal protein, local production, sustainable consumption, consumer's expectations, methodological framework

JEL classification: D11, M31, O33

INTRODUCTION

As the global population continues to grow rapidly, the food industry is currently facing challenges related to nutrition and food security. Together with changing socio-demographic factors, this growth will inevitably put pressure on global resources to meet the demand for nutritious food. Furthermore, the increasing need for protein resulting from population growth is primarily influenced by socioeconomic changes such as urbanization, higher incomes, and an aging population. Therefore, it is important to study the awareness of the role of protein in promoting healthy aging and a well-balanced diet. Organizations such as the World Cancer Research Fund (WCRF) and the World Health Organization (WHO) are now advocating plant-based diets because of their many benefits.

In recent decades, globalization has transformed the entire food market, exerting pressure on the local producers and on the sustainability of the supply chains. The study of consumer behavior is a key element when trying to understand the dynamics of the market. It can also be useful in the design of strategies to support local food production.

This study objective was to highlight the importance of studying consumer behavior with applicability in encouraging the production of protein plants in order to diversify local production. This has a threefold importance: for promoting a responsible consumption model, for supporting local economies and reducing the environmental impact associated with transporting food over long distances.

LITERATURE REVIEW

Behavioral economics combines psychology with economics to understand how psychological, cognitive, emotional, cultural, and social factors influence the economic decisions of individuals and institutions. This approach contradicts classical economic theory, which assumes that people make rational and well-informed decisions. In contrast, behavioral economics recognizes that decisions are often influenced by biases and emotions.

Relevant traditional theories in consumer psychology and behavioral economics include the prospect theory, cognitive dissonance theory and the theory of planned behavior. Newer theories such as Value-Belief-Norm (VBN) theory developed by Stern and Attitude-Behaviour-Context (ABC) theory described by Guagnano, Stern & Dietz are further explaining the factors influencing the consumer's attitude and behavior (Stern, 2000; Guagnano, Stern & Dietz, 1995).

The prospect theory was developed by Daniel Kahneman and Amos Tversky and analyzes how people make decisions under conditions of uncertainty, focusing on how they value gains and losses. For example, consumers may perceive the benefits of buying local products differently depending on how they are presented. A practical example in this sense is the emphasis on the health benefits of consuming protein products and local vegetable sources versus reducing the carbon footprint (Kahneman, 1979).

Leon Festinger studied mass communication from the perspective of cognitive consistency theories, developing a new theory, of dissonance. This theory suggests that there is an inherent tendency among individuals to seek a correlation between their attitudes and behaviors. Dissociations can lead to changes in attitude or behavior to reduce psychological discomfort (Festinger, 1958). For example, consumers who are aware of the environmental and health benefits of locally sourced plant-based protein products, but who continue to eat meat out of habit or convenience, may experience cognitive dissonance. Reducing this dissonance may involve changing behavior towards the consumption of local vegetable products or rationalizing meat consumption through various justifications. By educating consumers and promoting the benefits of local, plant-based foods, marketers can help reduce cognitive dissonance and encourage more sustainable and healthy choices.

The theory of planned behavior was first introduced by Ajzen (Ajzen, 1991). Interpreting according to our objective of study, according to this model, the intention of the consumer to buy local products is likely to be influenced by three main factors: i) attitudes towards behavior, ii) subjective norms and iii) perceived behavioral control. According to the attitudes towards behavior, if a consumer believes that local products are healthier, more affordable and better for the environment, he will have a positive attitude towards purchasing these products. The subjective norms can be linked to the following situation: if a consumer perceives that family, friends or his close social community value local products and support their consumption, this will positively influence his own purchase intention. Lastly, if a consumer believes that they have easy access to local products and that the price is more affordable than for other products, perceived behavioral control will be high, and this will facilitate the purchase intention.

The Value-Belief-Norm VBN theory suggests that personal values influence beliefs, which in turn shape norms that guide behavior (Stern, 2000). This model is suggesting that the environmental and ethical values of the consumer are able to lead to a stronger commitment to sustainable and responsible consumption practices. For example, a consumer who is appreciating the actions towards protection and conservation of the environment will possibly be aware of importance of reducing carbon footprint, and this belief may become a personal norm that leads to purchasing

environmentally friendly products such as organic food, locally sourced and produced goods and services.

The Attitude-Behaviour-Context (ABC) theory is describing the relationship between attitudes, behavior and contextual factors (Guagnano et al., 1995). In this context, the consumer behavior is considered to be determined by the individual attitudes and the context in which this is generated. For example, even if a consumer has a positive attitude towards buying local products, his conscious purchasing decision might be constrained by factors such as availability, price, and accessibility of these products. Therefore, a consumer who prefers to buy locally produced food, can change his behavior in contrast with the supposed attitude, if such products are not readily available or are too expensive for his expectations.

A research by Brown (2003) in Southeast Missouri analyzed consumer preferences for local foods through a mail survey. The results showed that quality, freshness, and price were critical factors in purchasing decisions at farmers' markets (Brown, 2003).

Merlino et al. explored the consumer perceptions of local food and how these perceptions influence their purchasing decisions. Their study indicated that consumers associate the local food with positive environmental impacts, community development and higher product quality, which can lead to successful local food production initiatives (Merlino et al., 2022).

Another study conducted in Denmark examined consumer preferences for organic versus local meat products. The authors concluded that consumers place significant value on geographical proximity in meat production, and a high share of the respondents stated that they were willing to pay higher prices for locally produced organic meat (Denver et al., 2019).

In the paper entitled “Consumers' expectations and willingness-to-pay for local animal products produced with local feed” Profeta & Hamm analyzed the German consumer willingness to pay more for locally produced animal products that use local feed. The paper highlighted a significant preference for products from local production, from feed to final meat product (Profeta & Hamm, 2018).

The consumer ethnocentrism on the market for local products and determinants of consumer behaviors was recently studied by Wojciechowska-Solis. The sample included 1,009 respondents who indicated economic motives for consumer ethnocentrism as a factor in their purchase decisions. The results of this research showed that respondents valued local products such as eggs, dairy, and groats. The key features associated with local food were producer identification, freshness, good taste, and affordability. The study concluded that the local product market supports the local economy, and authorities should promote its development (Wojciechowska-Solis, 2022).

Another study demonstrated that health-conscious behaviour can provide a support for the regional economy. Attitude toward local food and subjective norm, but not perceived behavioral control, were found to have a significant effect on intention to purchase local food (Kumar and Smith, 2017). Other authors (Jefferson-Moore et al, 2014) found that consumers considered that purchasing local foods would be an assurance of the fact that the food was produced in safety conditions, and it is highly qualitative. Moreover, the respondents pointed that they were willing to pay higher prices for locally produced products because of the health benefits that these may bring.

In general, studying consumer behavior is essential for several reasons, as detailed in figure 1.

Figure 1. Reasons for studying consumer behavior

METHODOLOGY STEPS

Several key elements were identified as being important in the design and implementation of the study on the importance of consumer behavior in supporting local food production (figure 2).

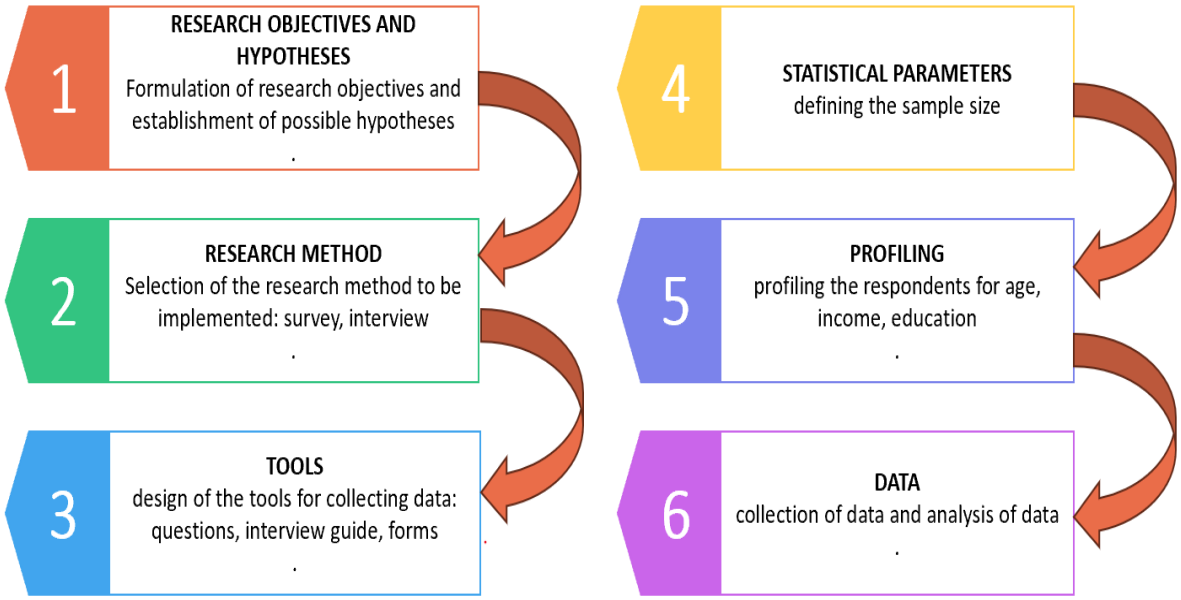

Figure 2. Key elements for study of consumer behavior

First of all, we formulated research hypotheses based on a review of the existing literature and our own objectives of the research. The hypotheses are meant to guide our research and will help focus on key variables. The proposed objectives of the research might take the form of:

- Determining consumers' perception of the consumption of protein foods of vegetable origin and the products obtained from them;
- Determining the consumption behavior and characteristics of consumers of plant-based protein foods and derived products: frequency of consumption, reasons for consumption, the form in which it is consumed, the period in which it is consumed, the price they are willing to pay;
- Determining the determining factors in the consumer's purchase decision: which characteristics and attributes of plant-based protein foods are of major importance in the purchase decision, subject to the analysis of indicators such as: product type, price, packaging, quality, method of preparation, provenance and others;
- Determining consumer preferences regarding the types of plant-based protein foods consumed frequently or occasionally;
- Determining the reasons why consumers choose to consume plant-based protein foods and derived products;
- Determining the frequency with which consumers choose to purchase plant-based protein foods Depending on the occasion or period (diet, fasting, consumption of alcoholic beverages);
- Determining the reputation of manufacturers from whom consumers choose to purchase plant-based protein foods
- Establishing the type of plant-based protein foods mainly consumed and the reasons why this happens;

The stated research hypotheses were based on different possible correlations that may exist between the independent variables of the current research (the socio-demographic characteristics of

the respondents: age, gender, education level, income level) and the independent variables that are the subject of the research. The existence of these correlations, as well as their degree of intensity, will be established and calculated with the help of statistical formulas, using indicators such as the hi^2 test, as well as the values of the contingency coefficient.

For example, we can suggest testing the following hypotheses:

- Consumers with a higher level of awareness of the ecological impact of their choices are more likely to buy local food products;
- Most of the time, the respondents are not looking for a minimum price, in the buying process, they are looking for the best ratio between the price and the quality of the products. In these cases, quality could be defined by several coordinates, such as freshness, healthy eating and taste. Consumers may also prefer products that are labeled "high in protein." Purchase criteria, such as taste or price, are more important than health or dietary benefits in the consumer's decision to purchase plant-based protein products.
- Respondents believe that a high protein content is positive for weight management, healthy bones and muscles, and disease prevention.
- The main factors that discourage respondents from purchasing plant-based protein foods are related to taste, price, unnatural ingredients, time-consuming preparation and lack of variety. It is also possible that the gender of the respondents has a large impact on the preference for meat-based meals, as meat consumption is considered masculine.
- Respondents' main motivations for consuming plant-based protein foods are: environmental impact, animal welfare and health improvement.

In the next step, the research method was selected. The research method may include surveys, interviews, case studies, or a combination of them. Surveys are typically used to obtain quantitative data from a large number of respondents, while interviews can provide in depth qualitative insights. For surveys, it will be necessary to create a questionnaire that includes questions about consumption habits, preferences for local products, perceptions of their quality and accessibility, and motivations for purchase choices. For interviews, an interview guide is to be developed with topics and questions that will stimulate in-depth discussions. Regarding the sample size, it should be representative of the target population (eg. a specific geographical area, age range, income category, etc.). This can be done through probability sampling techniques such as simple or stratified random sampling to ensure that the results are generalizable. The sample size should be large enough to allow relevant statistical analyses.

It is also important to collect demographic data about respondents, such as age, gender, education level, geographic location, and income. This data will help to analyze and interpret the different behavior of consumer groups and to identify specific patterns.

Moving forward, the collection of data will be done according to established research tools, ensuring the accuracy and reliability of the data collected. Informed consent of participants will be assured.

In the final step, after data collection, statistical and interpretive analysis followed. Quantitative analysis could include descriptive statistics, correlation tests, regression analyses, etc., while qualitative analysis could involve thematic coding of open-ended responses.

CONCLUSION

This study is highlighting the importance of consumer behavior analysis in promoting local food production, with a specific objective to encouraging the cultivation of protein crops. By understanding consumer behavior, targeted marketing strategies can be developed that will highlight the benefits of locally produced food that brings about freshness, health benefits and community support. In the same time, the literature overview has highlighted the fact that the study of consumer behavior has a threefold importance: it promotes a responsible consumption pattern, supports local economies and reduces the environmental impact associated with transporting food over long distances. Further research will include transfer into practice of the designed methodology, by the development of a survey among consumers related to their attitudes towards locally produced vegetal based protein food finalized with the quantitative and qualitative analysis of the results generated by this survey.

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CERTIFICATION OF ENTERPRISES FROM THE REPUBLIC OF MOLDOVA IN THE ISO 22000 AND ISO 22005 SYSTEM: BENEFITS AND BARRIERS

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Abstract: *In order to aspire to join the EU that the Republic of Moldova (currently a candidate country) has, the main economic conditions it must satisfy are the existence of a functional market economy, as well as the ability to face competitive pressure and market forces in within the European Union. Another condition is the existence of the capacity to assume the obligations of a member state of the European Union, including adherence to the objectives of the political, economic and monetary union. One of the objectives of EU food safety policy is to protect consumers while ensuring the smooth functioning of the single market. EU legislation covers the entire food chain - "from farm to consumer" - in an integrated way and applying a "one health" approach. This desired, at the first stage, can be ensured by implementing the food safety management system - ISO 22000 and ISO 22005 which specify the basic requirements for the design and implementation of a traceability system for food and agro-food products. The given study was focused on the knowledge of the food and agro-food enterprises from the Republic of Moldova certified in this system, as well as what are the benefits but also the impediments encountered by them both during the certification period and during the activity.*

Keywords*: certification in the system, food safety, benefits of certification*

JEL Classification: A10, C83

INTRODUCTION

For the purpose of accession to the EU that the Republic of Moldova has, the main economic conditions it must satisfy are the existence of a functional market economy, as well as the ability to face competitive pressure and market forces within the European Union. Another condition is the existence of the capacity to assume the obligations of a member state of the European Union, including adherence to the objectives of the political, economic and monetary union.

It is also necessary for the candidate country to adopt the Community acquis and ensure its effective implementation through appropriate administrative and judicial structures.

Wider use of standards is reorienting agricultural and food supply chains from centers of competition based on price to those based on quality. The most generic of the systems and most commonly adopted by manufacturers in the food industry are ISO 22000 and ISO 22005. (1,2)

The implementation of these international standards allows food and agri-food enterprises to:

- regulate and analyze the degree of nutritional coverage of different segments of the population; reducing the risks of nutritional diseases (diabetes, celiac disease (gluten intolerance), overweight and obesity, micronutrient deficiencies);
- analyze the specific risks associated with non-compliant food products: microbiological; pesticide residues; abuse of food additives; technogenic contaminants; allergens etc.;
- apply biotechnology and food engineering to ensure the nutritional value and amplify the biological effects of food, develop food products with bioactive components and functional ingredients; to ensure the quality and harmlessness during the period of validity of the products;

- ensure consumer protection against food fraud, ensuring the authenticity of food products. (3)

MATERIALS AND METHODS

The main objective of the survey is the evaluation of the food product quality certification process according to international standards ISO 22000 and ISO 22005 in the Republic of Moldova.

The survey was conducted using the Computer Assisted Web Interviewing (CAWI) methodology, based on filling in an online questionnaire created using Google Drive.

A list of 75 enterprises was drawn up, according to which the questionnaires were sent. 57 (76%) companies were available to participate in the survey.

The questionnaire was administered via personal e-mail to the respective e-mails of food and agri-food enterprises, specifying the objectives pursued by the survey and including the direct access link to the survey.

The survey period was from February 13 to February 28, 2023.

The responses were continuously monitored through the personal Google Drive platform, and the results were processed and interpreted.

RESULTS AND DISCUSSION

An important factor in the capacity of the Republic of Moldova as a candidate for EU accession is obtaining certificates in various ISO systems. The companies that have participated in the survey mentioned that in addition to the ISO 22000 and ISO 22005 certificates, they also hold other certificates such as: ISO 45001 Occupational health and safety management systems; SA 8000 Certification of the social responsibility management system; ISO 14001 Environmental Management Systems Certification; EMAS III Community environmental management and audit system and others. Ensuring the safety and quality of food products is the mandatory condition for increasing consumer confidence. This objective can be ensured by implementing the Food Safety Management System - ISO 22000, which provides a framework of harmonized requirements worldwide.

Adopting a Food Safety Management System (FSMS) is a strategic decision for an organization that can help improve its overall food safety performance. The potential benefits for an organization of implementing an FSMS based on this document are:

a) the ability to consistently provide safe food, products and services that satisfy customers and applicable legal and regulatory requirements;

b) approaching the risks associated with its objectives;

c) ability to demonstrate compliance with specified FSMS requirements. (1)

As a result, we have obtained: 53 (93.0%) enterprises are active and 4 (7.0%) are not active.

Next, we will analyze the results of the survey operating only with 53 enterprises that are certified with ISO 22000.

The ISO 22000 certification is not limited to food manufacturers, the standard being also applicable to packaging manufacturers, which come into direct contact with the food product. Other potential users of ISO 22000 certification are additive manufacturers, manufacturers of machines and equipment used in the food industry, service providers along the food chain (logistics and transport companies, cleaning, disinfection, disinsection and deratization services for food manufacturers) and public food service providers (canteens, restaurants, catering, etc.).

Carrying out a direct analysis for each benefit, we determined which of them played an important role in the activity of companies after obtaining the ISO 22000 international certificate. The results of the analysis are presented in figure 1.

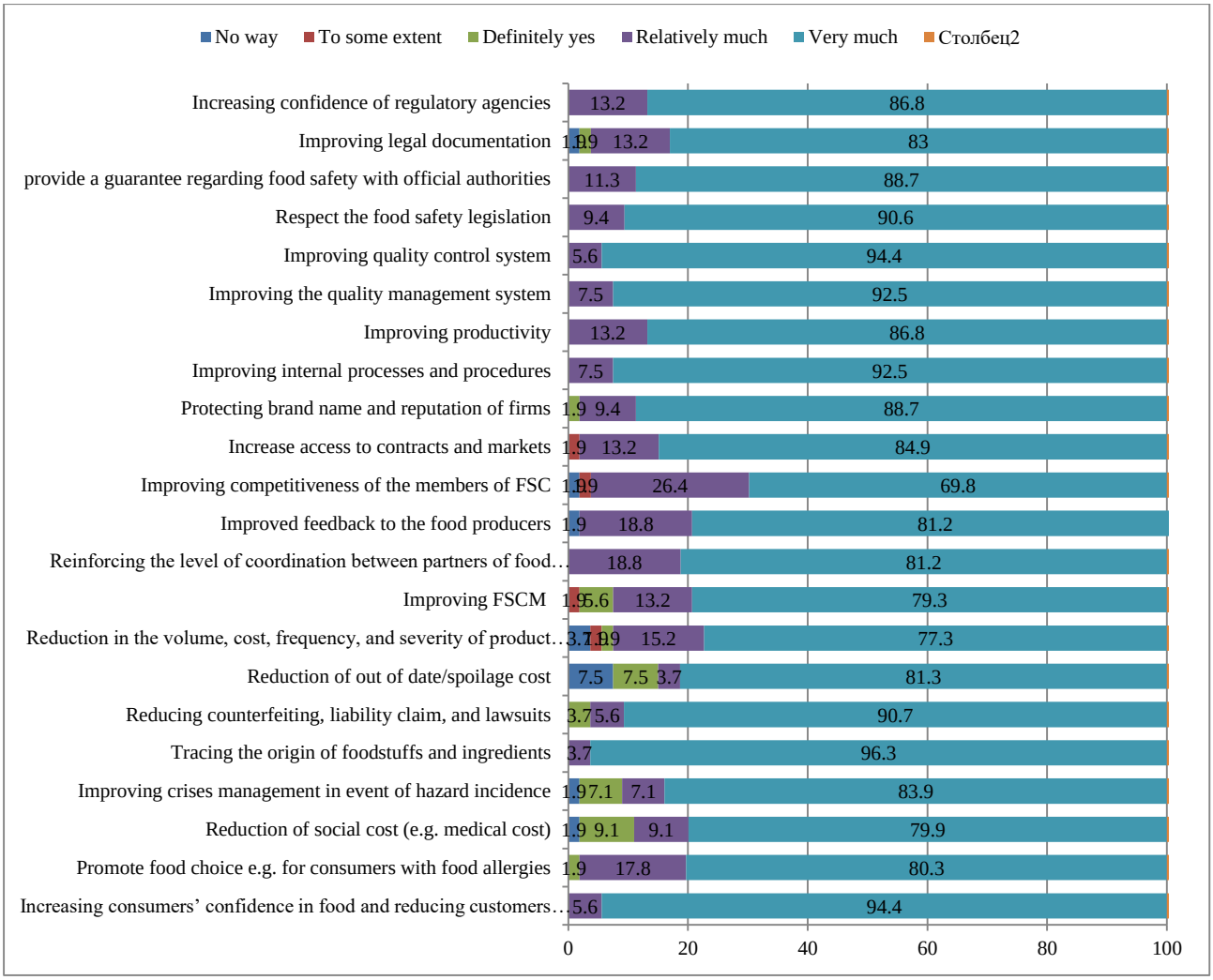

Figure 1. The opinions of companies regarding the benefits of certification according to the international standard ISO 22000, %

Source: prepared by the authors

Analyzing the questionnaires on the categories of the criteria for the perception of the benefits of certification in the ISO 22000 system, high values were obtained. Thus, the companies that mentioned the benefits of certification in accordance with ISO 22000 with the qualification "Very much" mentioned:

• tracing the origin of food products and ingredients - 51 (96.2%) enterprises;

• increasing consumer confidence in food products and reducing customer complaints (increasing food quality and safety) as well as improving the quality control system - 50 (94.4%) enterprises;

• improvement of processes, internal procedures and the quality management system - 49 (92.5%) enterprises;

• reduction of counterfeiting, liability, claims and legal processes – 48 (90.7%) enterprises;

• compliance with food safety legislation – 48 (90.6%) enterprises;

• protecting the brand name and reputation of companies, as well as guaranteeing food safety in close collaboration with official authorities - 47 (88.7%) companies;

• improving productivity and increasing the confidence of regulatory agencies – 46 (86.8%) enterprises;

• increasing access to contracts and markets – 48 (84.9%) enterprises;

• improvement of crisis management in case of occurrence of dangers - 45 (83.9%) enterprises.

As can be seen, out of 53 enterprises, the majority mentioned that following the certification, these economic entities obtained significant advantages and benefits in their activity.

With the liberalization of trade between the Republic of Moldova and the European Union, in the context of the approval of the candidate status for EU accession, the Moldovan authorities undertook a series of reforms related to this process, including in the field of implementation of international standards. The latest developments reveal that, in addition to the technical barriers, there are numerous and important institutional and local obstacles in the way of collaboration with partners from abroad and even with those from the Republic of Moldova, as a result of the poor training of specialists or their absence. Of the 53 companies participating in the survey, less than half encountered impediments in the certification process with the international standard ISO 22000. The most frequent barriers were nominated: Figure 2.

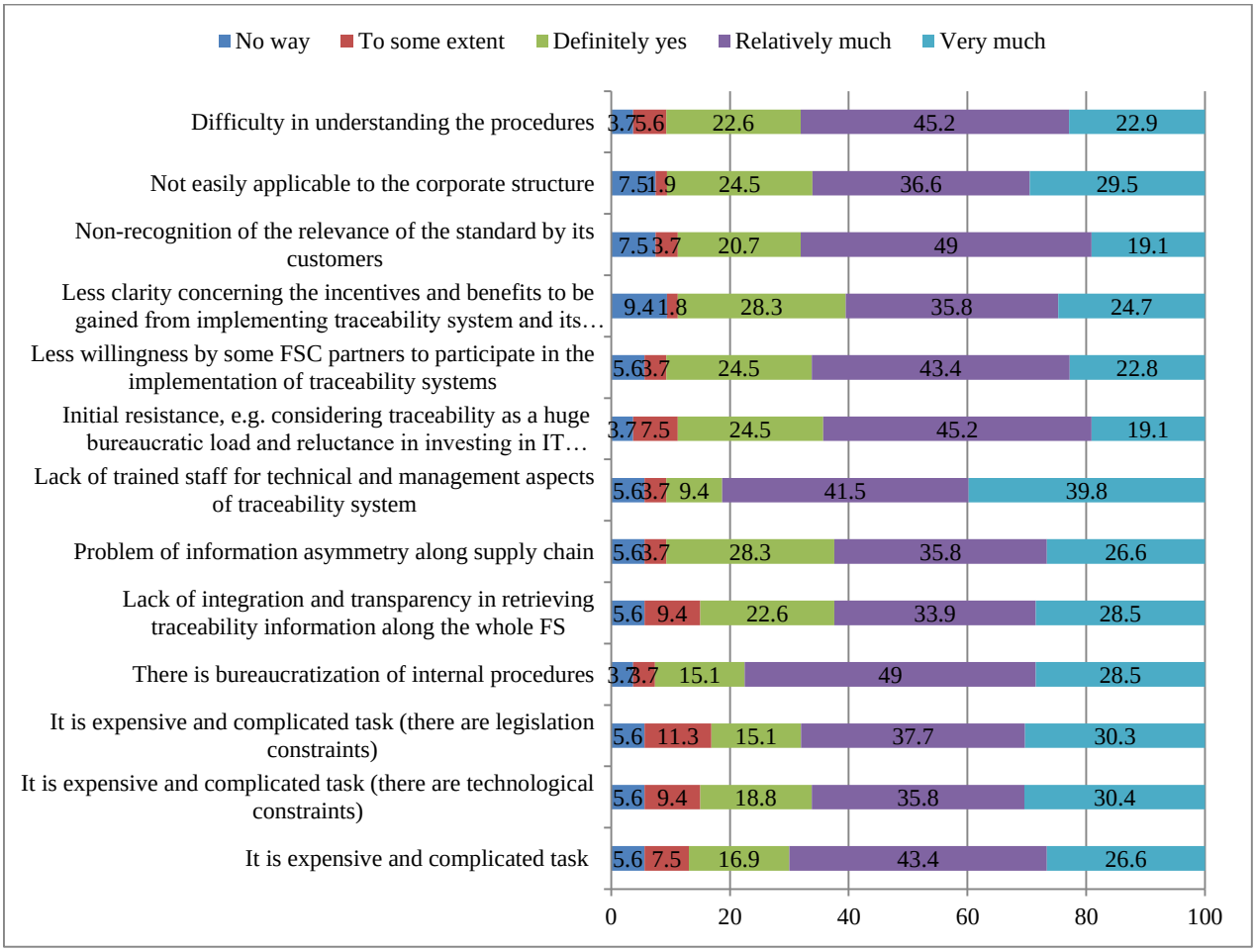

Figure 2. The opinions of enterprises regarding the barriers encountered following certification according to the international standard ISO 22000, %

Source: prepared by the authors

• there is a bureaucratization of internal procedures -26 (49.0%) enterprises;

• non-recognition of the importance of the standard by its customers – 26 (49.0%) enterprises;

• initial resistance, for example: considering traceability as a huge bureaucratic burden and reluctance to invest in funds supported by traceability IT systems and less attention to the connection between the quality of information on quality and safety with the flow of products, difficulties are attested in understanding the procedures - 24 (45.2%) enterprises;

• it is an expensive and complicated task (there are economic constraints, the cost of certification) as well as less willingness of some FSC partners to participate in the implementation of traceability systems – 23 (43.4%) companies:

• lack of qualified personnel for the technical and management aspects of the traceability system – 22 (41.5%) enterprises;

• it is an expensive and complicated task (there are legislative constraints) -20 (37.7%) enterprises.

If we analyze which of the barriers obtained the qualification "Very much", 21 (39.8%) enterprises mentioned the lack of qualified personnel for the technical and management aspects of the traceability system.

Of particular interest was the information on the certification of companies in the ISO 22005 system Traceability in the food and agri-food production chain. (2). Regrettably, only 16 companies answered affirmatively, which is 28.1%. Figure 3.

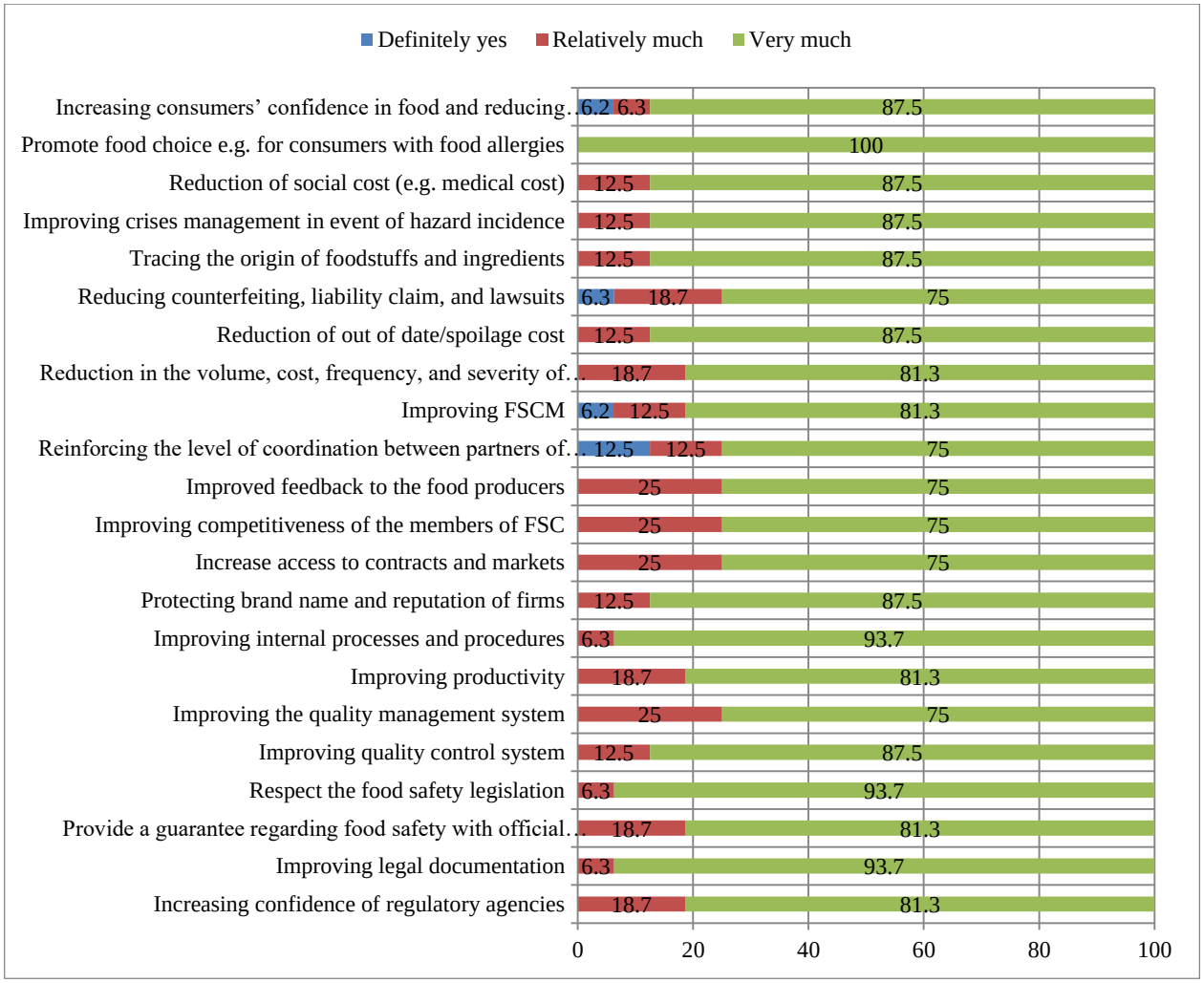

Figure 3. The opinions of companies regarding the benefits of certification according to the international standard ISO 22005, %

Source: prepared by the authors

A traceability system is a useful tool to help an organization operating within a food and agri-food chain to achieve the objectives defined in a management system. The complexity of the traceability system may vary depending on the characteristics of the product and the objectives achieved.

An organization's implementation of a traceability system depends on:

– the technical limits inherent to the organization and the products (i.e. the nature of the raw materials, the size of the lots, collection and transport procedures, processing and packaging methods);

– cost-benefits of applying such a system.

A traceability system alone is insufficient to achieve food safety. As with the ISO 22000 standard, the implementation of the ISO 22005 standard has brought benefits to food businesses. Among the respondents' opinions regarding the benefits of certification according to the ISO 22005 international standard that have accumulated high values, we can mention the following:

• promotion of food choice 16 (100%) enterprises;

• improvement of legal documentation and compliance with food safety legislation was mentioned by 15 (93.7%) companies;

• improving crisis management, tracing the origin of food products and ingredients, as well as improving the quality control system of 14 (87.5%) enterprises;

• improving FSCM (Financial Supply Chain Management), productivity, reducing the volume, cost, frequency and severity of product recalls, providing guarantees from official authorities in terms of food safety as well as increasing the confidence of regulatory agencies 13 (81.3%) of enterprises.

As we mentioned above, as in the case of the implementation of the international standard ISO 22000, companies face the same impediments in the implementation of certification according to the ISO 22005 standard - technical, institutional, local, insufficient training of specialists or even their absence.

Analyzing in detail the opinions of the respondents regarding the main barriers that appear in the way of a company certified according to the ISO 22005 standard, we mentioned that in the case of barriers, most companies had different opinions on the qualifications (1= in no case; 5 = a lot), but it stands out the qualification "Very much" with 35.10% and "Relatively much" with 33.17%, which in total constitute almost 70% of the enterprises. The results of the analysis are presented in figure 4.

Among the most important barriers, companies mentioned the following impediments with the qualification "Relatively much":

• there is the problem of information asymmetry along the supply chain 9 (56.3%);

• non-recognition of the importance of the standard by its customers 7 (43.7%);

• lack of integration and transparency in the retrieval of traceability information throughout the entire FSC (FOREST STEWARDSHIP COUNCIL) 7 (42.0%);

• difficulties in understanding procedures;

• less availability of some FSC partners to participate in the implementation of traceability systems 6 (37.5%) enterprises;

• initial resistance, referring to traceability as a huge bureaucratic burden and reluctance to invest in investments supported by IT traceability systems and less attention paid to the link between information quality 6 (37.5%) of businesses.

For the qualifier "Very much" they mentioned the following barriers:

• lack of qualified personnel for the technical and management aspects of the traceability system – 9 (56.3%) enterprises;

• little clarity regarding the incentives and benefits that can be obtained from the implementation of the traceability system and its investment cost 8 (50.5%);

• does not apply easily to the structure of the enterprise – 6 (37.7%);

• it is an expensive and complicated task (there are economic and legislative constraints, the cost of certification)- 6 (37.5%).

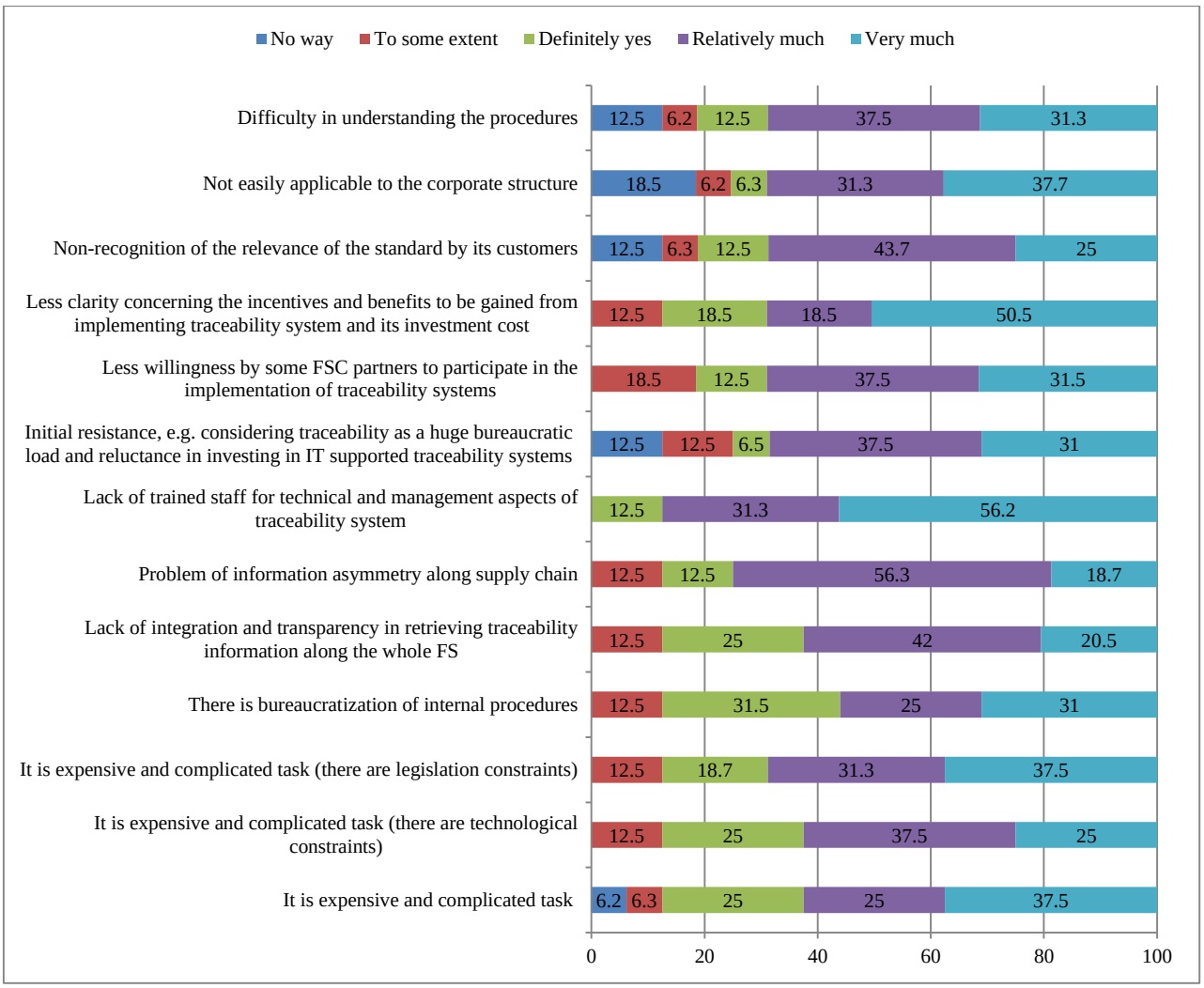

Figure 4. The opinions of enterprises regarding the barriers encountered following certification according to the international standard ISO 22005, %

Source: prepared by the authors

CONCLUSIONS

Following the analysis of the results of the survey undertaken among food and agri-food enterprises, we can mention that the accession to the European community for these enterprises from the Republic of Moldova is a terrain with many technical, institutional and local obstacles. A factor not to be neglected is the insufficient training of specialists or even their absence. On the part of the companies, on the one hand, there is a lack of information regarding the certification system, a lack of confidence in their own capabilities to comply with international standards, and on the other hand, there is an insufficiency of non-governmental bodies, which would contribute to information and practical training of entrepreneurs in this field. Since the accession to the European Union area clearly requires the presentation of an annual report on the fulfillment of the conditions set out in the

Commission's opinion, the implementation of international standards in the field of food quality and their certification will be inevitable.

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DIRECTIONS FOR IMPROVING THE QUALITY OF TOURISM SERVICES

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Abstract: *The authors (Langvinienė, 2014; Prentice, 2020; Grasso & Sergi, B.S. Eds., 2021) claim that over the past few decades, tourism has continuously expanded and strived to become one of the largest and fastest growing economic sectors in the world. Tourism is primarily a vital industry for the social and environmental development of local communities. Due to the influence of economic, social and political processes of globalization, tourism has become one of the leading industries in many countries.*

Keywords: *tourism, tourism service, tourist promotion*

JEL Classification: C83

INTRODUCTION

The measures and directions for improving tourism services were studied by the following authors: Lin, Yang, C.-L., & Ho, T.-M. 2015; Ho, Feng, S.-Y., & Yen, T.-M. 2015; Zhang, Xu, Z., Gou, X., & Chen, S. 2021. The quality of tourism services is determined by underdeveloped infrastructure, low diversity of tourism services, competition, threat of war, lack of information, seasonality of tourism, adaptability and uniqueness of the service, possibilities of using the service, features of service use, service provider and his awareness, unqualified personnel.

Research problem. What are the directions for improving tourism services? The aim. After analyzing the aspects of the quality of tourism services from a theoretical point of view, provide directions for improving the quality of tourism services.

MATERIAL AND METHODS

Research methods used to achieve the goal: comparative analysis and summarization of scientific literature, qualitative research-interview. 23 informants participated in the study. Confirmatory or negative case selection was used for the sample - confirmation of established facts or exceptions to the rules are sought when the researcher lacks clarity on the research questions.

RESULTS AND DISSCUSION

Authors, Lin, Yang, & Ho, 2015; Gražulis, & Narkūnienė, 2017; Grasso, & Sergi, 2021, state that currently facing intense competition in the tourism industry, improving service quality has become even more important, as it especially helps tourism service facilities, travel agencies to increase market share and attract more tourists.

The quality of tourism services is the main indicator of the level of development achieved by each form of tourist movement, which is faced by many scientists, businessmen and other researchers, because it has a significant impact on customer satisfaction and loyalty, price, business success and profitability. The quality of tourism services originates from the interaction between customers and service, service providers, and service quality is monitored through process and results.

A comparative analysis of the scientific literature revealed that the quality of tourism services depends on many factors: variety of services; provision of services; natural and cultural

environment; HR management; information and communication; destination and management; technology integration; level of infrastructure development. These factors positively affect the quality of tourism services. A detailed comparative analysis of the scientific literature delves into specific qualitative studies related to each of these factors, providing insight into their impact on the quality of tourism services.

The conducted qualitative research (23 informants) identified directions for improving tourism services that can help improve the quality of tourism services: improving customer interaction and involvement; staff training and development; application of IT technologies; promotion of cultural exchange; improvement of tourism infrastructure; community participation and empowerment; promotion of responsible tourism behavior; security assurance. The theoretical and practical aspects of research can help tourism companies to continuously improve the quality of their services and thereby maintain customer loyalty.

CONCLUSIONS

The concept of the quality of tourism services is defined at the level of the quality of services provided to tourists and their characteristics. Quality tourism services should ensure high customer demand depending on factors: variety of services; provision of services; natural and cultural environment; HR management; information and communication; destination and management; technology integration; level of infrastructure development.

The directions for improving tourism services determined by qualitative research can help improve the quality of tourism services: improving customer interaction and involvement; staff training and development; application of IT technologies; promotion of cultural exchange; improvement of tourism infrastructure; community participation and empowerment; promotion of responsible tourism behavior; ensuring security. Improving the quality of tourism services is an important process that tourism companies must constantly carry out in order to meet customer needs, improve customer experience and maintain a competitive advantage.

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THE INFLUENCE OF THE STATE'S SOCIAL RESPONSIBILITY ON THE OPERATIONS OF BUSINESS ENTITIES IN THE FILD OF AGRICULTURE IN SERBIA

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Abstract: *In this paper, the authors analyze the importance of the continuity of business of economic entities engaged in agricultural activity in the Republic of Serbia. Since Serbia is an agricultural country with a significant share of agriculture in the domestic GDP, significant impact of agriculture on the environment, nutrition and health of people, the state has an undoubted interest in the good business operations of economic entities in agriculture, but also an obligation towards this sector of the economy. In the research of the period from 2020 to 2023, the authors came to the knowledge that domestic business entities need knowledge and financial incentives in order to constantly adapt to changes in the market caused by external influences. Since the state, as well as the owner of a business entity that performs agricultural activity, is interested in the continuity of business in the agricultural activity, the authors concluded that it is necessary to provide such a policy that will stimulate the existence of a safe shareholder/owner of economic entities, improve standards in this activity and enable sustainable, continuous operation of these economic entities in the long term.*

Keywords*: agricultural activity, sustainable business, external influences, good of general interest, social responsibility.*

JEL Classification: A10, C83

INTRODUCTION

The business sector, as a leading force of economic development, is in a unique position where it can help and, undoubtedly, significantly influence the creation of a fairer, more inclusive and more sustainable society, and as this understanding becomes common for both companies and social partners, the increase is evident inclusion of the business sector in society (Rajnović, Lj., et al, 2019).

Socially responsible business (CSR) represents the organization's commitment to contributing to the sustainability of economic development, cooperating with employees, their families, the local community and society in order to improve the quality of their lives and the environment, which is one of the ways for companies to gain a large number of users and customers (Gill, A., 2008). All successful global corporations have been implementing the concept of corporate social responsibility for decades, which is why companies invest additional funds in these goals.

The increased interest of companies in their role in society is conditioned by increased sensitivity and awareness of ethical and environmental problems. Therefore, consumers are becoming increasingly sensitive to the performance of companies in the field of social responsibility, especially those whose products and services they use (Herrmann, K. K., 2004). These trends, in the field of legal regulation and consumer behavior, create pressure on companies and require them to operate on economically, socially and environmentally justified and acceptable strategies and principles (Vives, A., 2008).

Corporate social responsibility is an organization management concept that maintains a balance between economic and social goals for the sake of establishing higher standards of living, while maintaining the company's profitability, for people inside and outside the company (Tabaroši, S., 2005). Corporate social responsibility is the socially responsible and ethical relationship of the company towards the community in which it operates and other social actors in the community and e

company (stakeholders or constituents) (Savković, V., 2009). Since every company has two basic goals:

- economic - making a profit, because the capital owner invests his property in a business entity in order to achieve a return on the investment and earn and
- legal - compliance with legal regulations,
- the social community set an additional goal for them, which has become indispensable in business, namely the ethical goal (Carroll, A., 1996).

Therefore, in addition to the interests of the owners, the question arises of respecting the interests of all other persons interested in the company's operations (constituents or stakeholders) (Koevski, G., 2005), namely:

- interest of external stakeholders - creditors and customers
- the interest of employees,
- the interest of the company's management,
- own interest of the business entity,
- the interest of the state in a sociological sense (Brian, R. 2004; Bukvić, R., Rajnović, Lj., 2019).

Of all the interests mentioned, it is clear that the interest of the owner of the business entity is the most important, the return of invested funds and the acquisition of profit, otherwise he would not have the motive to invest his own funds in the business. Because of this, he has the greatest business risk (Savković, V., 2009; Bukvić, R., et al., 2019). He participates in all the results of the company - he receives a profit or, unlike all other constituents, bears losses. The economic results of the business are reflected directly in the property of the owner, there is no socialization of losses and participation in the profits of other persons. Both success and failure "happen" only to the owner.

With such a state of affairs, the question arises as to how to arrange the stated goals in the field of agriculture in the Republic of Serbia (RS), so that the interests of all constituents are satisfied:

- Agriculture is the primary branch of the economy in the RS. Agriculture is present in all economic and political systems that accompany people in all regions and climate zones. The economic activity of agriculture, even in the most developed countries of the world, in addition to factors and phenomena created by people, is determined by the conditions created by the forces of nature and other external influences that the business entity in the field of agriculture cannot influence, and often cannot even predict.
- Agriculture faces double demands:
  - it needs to find a way to produce quality food for the population and
  - at the same time take care of nature protection while preserving biological diversity, and at the same time it is necessary
  - that the investor achieves a return on the invested capital and achieves a profit from the business.
- Ecologically sustainable agriculture that makes reasonable use of natural resources is essential for food production and people's quality of life. For all that, the farmer needs a foundation in the material sense and permanent acquisition of new knowledge.
- According to the data of the Serbian Chamber of Commerce, agriculture and the food industry participate in the creation of the country's gross domestic product (GDP) with about 17%, but if we look at the overall contribution of agriculture to other sectors of the economy, especially producers and processors of inputs and raw materials, this participation exceeds 40% of the

total GDP. Therefore, it is obvious that there is a great complementarity between the sustainable development of agriculture and the overall economic development.

- Serbia has extremely favorable natural and climatic conditions for the development of agriculture, including fertile soil. Although the issue of climate and fertile soil remains important for extensive agriculture, such as cereals and industrial plants, and has long lost its importance for most other crops (Ristić, L., 2013), the Republic of Serbia has a rich tradition in the field of agriculture. .
- But natural features are no longer the main prerequisites for agriculture - Israel has turned from a desert into an oasis, and Saudi Arabia and Australia have large farms in the middle of the desert that are irrigated with water from the ocean using desalination, for which they use solar energy.
- New technologies, including robotization, are significantly changing today's agriculture. Vegetables are no longer grown only in fertile soil during the agricultural season, but in greenhouses all year round, and the temperature and irrigation are controlled by computers. Not even the soil is used, but more and more vegetables are grown directly in water, into which micronutrients are poured at the moment they are needed and in the required quantity, thereby maximizing yields and minimizing costs. Machines that replace workers are being used more and more: tractors that are controlled in the field from the office via the Internet; a series of four tractors where the driver is only in one vehicle, while the others follow him using sensors; machines that pick only fruits of precisely specified characteristics (maturity and size), etc.
- In accordance with the priorities of the Common Agricultural Policy of the European Union (CAP) (https://www.consilium.europa.eu/hr/policies/cap-introduction/), the primary objectives in the field of agriculture declared by Serbia are as follows:
  - ensuring a quality and safe product
  - preservation of the environment and animals
  - raising the competitiveness of farmers
  - preserving rural communities and strengthening their position and self-sustainability.
- Sustainable development of agriculture is a very complex concept, especially in the modern conditions of constant changes and innovations and from the point of view of economic policy makers. The experience, especially of developed countries, shows that the directions of sustainable development in modern conditions must be based on (Pašalić, Mrnjavac, 2003): a territorial and multi-sectoral integral approach, instead of a sectoral approach to development, encouraging networking and the formation of cooperative relations and various partnerships, focusing on multiple positive synergistic effects and collective efficiency, preservation of local identity and social capital, with creative adaptation to external changes and selective approach to innovation, first of all, new technologies, promotion of qualitative instead of quantitative approach to development, etc. It should not be emphasized how important the correct choice of future directions of rural and agricultural development is for our entire further socio-economic development.
- Due to the characteristics, specificity and complexity of agricultural production, the market of agricultural products and the state agricultural policy, the risk in agriculture is extremely high. Frequent changes in the market prices of primary agricultural products and inputs for agricultural production have become a feature of modern agriculture. In such conditions,

farmers are more often exposed to financial stress caused by a sudden and unexpected decrease in the prices of primary agricultural products and/or an increase in the prices of inputs for agricultural production. How to behave in such a situation is a question to which it is not easy to give a precise answer. In the conditions of a very volatile economic environment, which carries a high degree of uncertainty and risk, changes are more dynamic and as such require the necessary knowledge and stable financial resources from the producer (Bošnjak, Rodić, 2010). This means that manufacturers will have to adopt new technologies.

- Society expects agriculture to sustainably produce enough health-safe food, nutrients and raw materials for production, while at the same time preserving the environment. It is a huge challenge, knowing that demand for food, nutrients and fiber may increase by 70% by 2050 and that 60% of the world's largest ecosystems that help produce these productive resources are already degraded or used unsustainably. This means that food production must have sustainable growth, while at the same time the impact of agriculture on the environment must be dramatically reduced (Foley et al., 2011).

The key hypothesis from which the work is based is that the sustainable business of economic entities in the field of agriculture in the RS depends on the comprehensiveness and continuity of adequate efforts of all key actors of sustainable development, and above all the state, in terms of state aid for permanent innovation, i.e., the introduction of more appropriate development option in the strategic management of sustainable operations of economic entities in this area, in the conditions of a dynamic environment, which cannot be avoided, as well as in the context of numerous internal problems of the economic entities themselves in this area in RS and the inevitable application of ethical principles of socially responsible business, in addition to the standard goals of economic subjects.

MATERIAL AND METHODS

For the purposes of this paper, the authors conducted research by interviewing 50 owners of agricultural farms and small companies engaged in agricultural production in the territory of the municipality of Pećinci, for at least ten years.

The research was conducted over a period of three years, from 2020 to 2023. In the observed period, all persons had a long history of business, they regularly settled all obligations towards the state and other stakeholders, they had knowledge about the application of numerous new technologies in agriculture. They financed the business exclusively from their own funds.

In order to research the mentioned topic, it was necessary to determine how to ensure a successful and long-term business, to do business with profit, while ensuring satisfactory product quality and environmental protection, as well as following the latest trends in business - respect for ethical principles.

Owners of business entities gave answers to the following questions: do they make a profit (possible answers were: low, medium, good); whether they easily get financial help from third parties, not counting the state; are the state's financial incentives satisfactory, do they invest in new technologies (possible answers: no, insufficient amounts, sufficient amounts).

In addition, data from local markets and several literary sources (professional and scientific literature) were used.

Method of comparative analyses was implemented.

RESULTS AND DISCUSSION

Business entities whose business was the subject of the survey have been voluntarily applying ethical principles in business practice for years, because they are aware that the success of their business and profits directly depend on the satisfaction of the users of their products. Therefore, they must operate in such a way as to provide a quality product and take care of the environment.

When it comes to the realization of the economic, for the owner, the main goal - making a profit, the assessment was made descriptively: good profit, medium, low: 20% of the respondents stated that they were satisfied with the profit; 40% that the profit is medium and 40% that the profit delay in the payment of subsidies, difficult access to other means of financing and, as a result, the inability to invest in acquiring new knowledge and investing in environmental protection.

The answers of the service users were: The answers of the respondents were: that in order to satisfy all business goals, including the demanding ethical goal and introduction to new technologies, they do not have satisfactory financial resources and that, considering the importance of the activity, the state should make an additional effort and provide greater assistance to these business entities.

Table 1. Presentation of the realization of business goals and required funds

No.	Elements of business	Business			Is there a need for greater state support?
		2020	2021	2022	2020 - 2022
1.	Can they predict external influences on business?	No- 0% Partially –60% Sufficient -40%	No- 0% Partially – 60% Sufficient 40%	No- 0% Partially – 50% Sufficient -50%	Yes
2.	Are the state's financial incentives satisfactory?	Ne	Ne	Ne	
3	Are they satisfied with the profit?	Good-20% Medium: 30% Low: 50%	Good-20% Medium: 40% Low: 40%	Good-20% Medium: 40% Low: 40%	
4	Do they invest in new technologies?	Insufficient amounts: 90%, Sufficient amounts -10%	Insufficient amounts: 90%, Sufficient amounts	Insufficient amounts: 90%, Sufficient amounts: 10%	

Source: Research of Autors.

The growth of the world population, the limitation of agricultural resources on a global level, the accelerated adoption of new technologies, new regulations resulting from public policies and a society that expects agriculture to sustainably produce enough health-safe food, raw materials for energy production, while at the same time preserving the environment together shape the future environment in which agricultural producers will operate.

Bearing this in mind, special attention must be paid to family farms in the Republic of Serbia, given that the largest part of production capacity in agriculture in the Republic of Serbia is owned by family farms (Božić and Muncan, 2007): 79.9% of agricultural land, 85.5% of arable land , 83.8% of arable land and 97% of the total number of tractors, where they achieve the largest part of production, about 88% of corn production, about 73% of wheat production, about 65% of sunflower production and about 50% of soybean and sugar beet production.

The ownership structure of agricultural holdings in the Republic of Serbia is dominated by small holdings, low economic power holdings of less than 3 ha make up about 60%, while holdings with more than 10 ha make up only about 8% of the total number of agricultural holdings in the Republic of Serbia. This highly polarized farm ownership structure follows the traditional pattern of

the European model of agriculture with large commercial farms in the north and small family farms in the southern part of the country (Christiaensen, L., Swinnen, J., 1994).

It is also a fact that transition and restructuring initiated and strengthened the development of family farms in the countries of Central and Eastern Europe (Bakus, L. Z., et al., 2009). In the Republic of Serbia, the creation of larger family farms has become more pronounced in recent years, especially in the Autonomous Province of Vojvodina (AP Vojvodina). This was also contributed to by the fact that in the Republic of Serbia, small family farms were relatively more important even during the communist period, which represented a good starting point for the development of rural entrepreneurship in terms of consolidating holdings.

The agricultural sector in the Republic of Serbia is characterized by a dual structure: large corporate farms operating with a lack of investment funds and with a surplus of employees and family farms. The largest number of family farms is located on holdings smaller than ten hectares. There is a large number of commercial family farms, which direct most of their agricultural production to the market. In recent years, the trend of aging of the agricultural population has been pronounced. A small number of young and educated people are interested in staying in rural areas and engaged in agricultural activities. Also, modern techniques and technologies are still insufficiently applied in agricultural production, state aid in the material sense is very low, significantly lower than in the least developed countries of the European Union, and farmers have to fight personally to acquire new knowledge. It can be concluded that the average yields in agriculture in Serbia are significantly below the European ones.

It is also considered that family farms represent a very suitable organizational form since they reduce transaction costs (Đurić, K. & Njegovan, Z., 2016). Here comes the hypothesis that if the freedom of self-organization is guaranteed, mostly family farms develop and survive, and that is because they have low transaction costs (Ristić, L., 2013). One of the descriptive arguments used to support this hypothesis is that in Western Europe, family farms persisted as the main form of organization. However, from a historical point of view, the development process of family farms in the European Union (EU) was not only a consequence of self-organization, but was strongly shaped by state and agrarian policies. (Christiaensen, L., Swinnen, J., 1994).

In the European Union, there are well-planned structural funds to support agriculture: national funds; numerous donations; pilot projects; small municipal budgets (mainly for infrastructure), while sources of financing for economic entities in the field of agriculture in the Republic of Serbia are quite limited and insufficient. A large number of rural areas in the Republic of Serbia are characterized by depopulation and economic underdevelopment, while at the same time urban parts of the country record a higher concentration of population and economic activity. Due to this negative tendency, it is necessary to devise future directions for the sustainable development of agriculture and rural areas, in accordance with their specificities and the requirements of the domestic and international environment, whose influence is obviously unavoidable.

On the other hand, social factors include the social and economic environment that exists within a country and its market and is equally accessible to all economic organizations. The modern state has a regulatory function in the economy (Nehme, M., et al., 2008). It is about the fact that the task of the state is to ensure the legal order and the economic environment is equal for everyone. Then, legislation, a tax policy that is aimed at all creators of new value, a stable currency (exchange rate) according to the world's leading currencies, rail and road traffic and a stable supply of electricity.

In this regard, in the last few years, investors are much more focused on environmental standards, social and management standards, so-called. Environmental, Social, Governance concept

(ESG concept) when considering investment and sales decisions (CSR Directive 2022/2464 EU). As ESG standards become an increasingly prevalent tool for investment evaluation, the role of the business sector in the green transition becomes apparent. In this way, the current concept of socially responsible business is improved and additional content related to the protection of the environment is created, with which economic entities engaged in agricultural activity are directly connected. At the same time, significant regulatory activity at the European Union level is already reshaping markets. A set of public policies that have been adopted or are in the process of being adopted, regarding sustainable financing, circular economy, responsibility in the supply chain and actions that affect the climate, set new demanding expectations for companies operating on the European market. Additionally, the adoption of the new Directive on corporate sustainability due diligence will encourage sustainable and responsible corporate business with the aim of including human rights and environmental issues in company operations and corporate governance (CSR Directive 2022/2464 EU).

Observed from the aspect of CSR, i.e. relationship between the state and its other stakeholders, it can be concluded that it bears the greatest responsibility and obligation (Vasiljević, M., 2013). The authors believe that the state has an obligation to provide citizens with the most optimal living and working conditions, determined by the overall level of development, in the area of economic and social development, through various types of support for economic entities that perform agricultural activities, regardless of the ownership form of the companies that perform this activity.

The issue of responsibility for the functioning of agriculture, infrastructure, and activities of general interest through ensuring continuity, quality, volume, and development cannot be left to anyone else but the state. It is one of the basic obligations, rights and responsibilities of the state, which is why the state must be interested in the good functioning of agricultural activity.

Since the state, as well as the owner of a business entity that performs agricultural activity, is interested in the continuity of business in agricultural activity, the authors concluded that it is necessary to provide such a policy that will stimulate the existence of a safe shareholder/owner of business entities, improve standards in this activity and enable sustainable, continuous operation of these economic entities in the long term.

In order to set up its ESG strategy correctly, the country must know the interests of its stakeholders well. These are all those individuals, groups and organizations that the state influences with its activities, including planning and adoption of various regulations (Vives, A., 2008).

The process / set of tools by which the state identifies and prioritizes stakeholders, gains insight into their views, sets inclusion goals and identifies optimal ways to achieve them is called stakeholder inclusion, and can be classified as follows:

- Dependency: these include groups or individuals who are directly or indirectly dependent on activities, products or performance, or on which the organization's operations depend.
- Responsibility: consists of groups or individuals towards whom the organization has or may have in the future – legal, commercial, business or ethical/moral responsibility
- Influence: groups or individuals who can influence the decision-making of the organization or its stakeholders
- Level of tension: groups or individuals requiring immediate attention due to financial, or wider economic, social or environmental issues
- Diversity; perspective: groups or individuals whose different views can lead to a new understanding of a situation and the identification of new opportunities.

CONCLUSION

Sustainable development, as a modern development concept that harmonizes the social, economic and ecological interests of current and future generations, is very applicable in the field of agriculture, which is confirmed both in theory and in practice, especially in developed countries. Economic entities in the field of agriculture in the RS have certain resources for the successful implementation of the concept of sustainable development. However, there are also numerous limiting factors of development, so large-scale structural changes and significant investments in this area and state assistance are necessary, considering that agriculture has a significant role in which the state must be interested, among which the production of healthy food and protection living environment. In order for the owner of capital to achieve his goal, the acquisition of profit, in the current phase of the state of agriculture in the RS, he needs significant support from the state.

The importance of financing companies engaged in agriculture is in the timely provision of necessary and adequate (quantitatively and qualitatively) sources of financing in order to realize agricultural production, and to achieve economic and sustainable business operations of economic entities, it is understood that financial resources are placed in a timely manner and for the long term, with a low interest rate rate and grace periods, without restrictive collaterals and without currency clauses, tax benefits, familiarization with new trends and technologies.

Therefore, the state's obligation to provide citizens with the most optimal living and working conditions in the territory where they live, naturally determined by the overall level of development in the area of economic and social development, will not be overcome regardless of the ownership status of the companies engaged in agriculture.

The issue of responsibility for people's health, a healthy environment, through ensuring continuity, quality, volume and development cannot be left to anyone else but the state. It is one of the basic obligations, rights and responsibilities of the state.

It could be concluded that the complexity and sensitivity of certain social and environmental issues imply the need for well-designed stakeholder engagement strategies and ongoing stakeholder dialogue. This also requires businesses to identify material issues – to understand what ESG topics are and why they matter most to stakeholders. After setting up meaningful stakeholder engagement strategies and a well-thought-out materiality analysis, the business is on the right track to being sustainable while preserving ethical principles and thus making a positive contribution to the community.

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ECONOMIC EFFECTS OF INVESTMENT IN MINI DIGITAL SOLAR DRYER

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Abstract: *In theory and practice, there comes to increase in focus to digitalization in agriculture, as well as about the rational use of available natural resources, primarily land, water and energy. The use of renewables, such is solar energy, can be done in various purposes, for example for energy supply of, among other income-generating activities, processing capacities at the farms. However, agriculture in Serbia is still largely performed in traditional way, without implementation of innovative solutions, or use of modern knowledge. Caused by that, the main goal of this research is to determine the economic effects of investing in establishment of mini digital dryer based on solar energy, which can be used for drying fruits, vegetables, medicinal herbs, spices and mushrooms. Research is based on real data obtained from the use of digital solar dryer implemented at experimental farm, while for investment analysis are applied usually used dynamic methods. Analysis has also considered assessing the impact of change in investment, value of inputs (plant based raw material), or price of final food products on the gained results of economic analysis. The analysis has indicated positive economic results of introduction of innovative drying system for agricultural products, whereby the economic effects of investment are sensitive the most to change in price of final food products.*

Keywords: *investment, food processing, agricultural products drying, renewables, solar energy.*

JEL Classification: A10, C83

INTRODUCTION

Other gainful activities (OGA) performed on the farms (including processing of agricultural products) are receiving more and more attention in the business analysis of farms (McNally, 2002; Cholewa, Smolik, 2021). They provide the opportunity to better use the available capacities and gained primary products, to create additional income on the farm, i.e. to obtain value-added through the processing of agricultural products (Romagnoli et al., 2021; Shahzad, Fischer, 2022). Therefore, since 2014, the value of OGA has been monitored in the EU's FADN database (Graph 1.). Value of the total OGA output (SE700), as well as the value of total output (SE131) for the average EU's farm has growing trend, while the share of SE700 in SE131 is relatively stable, ranging between 5.18-5.66% in the observed period.

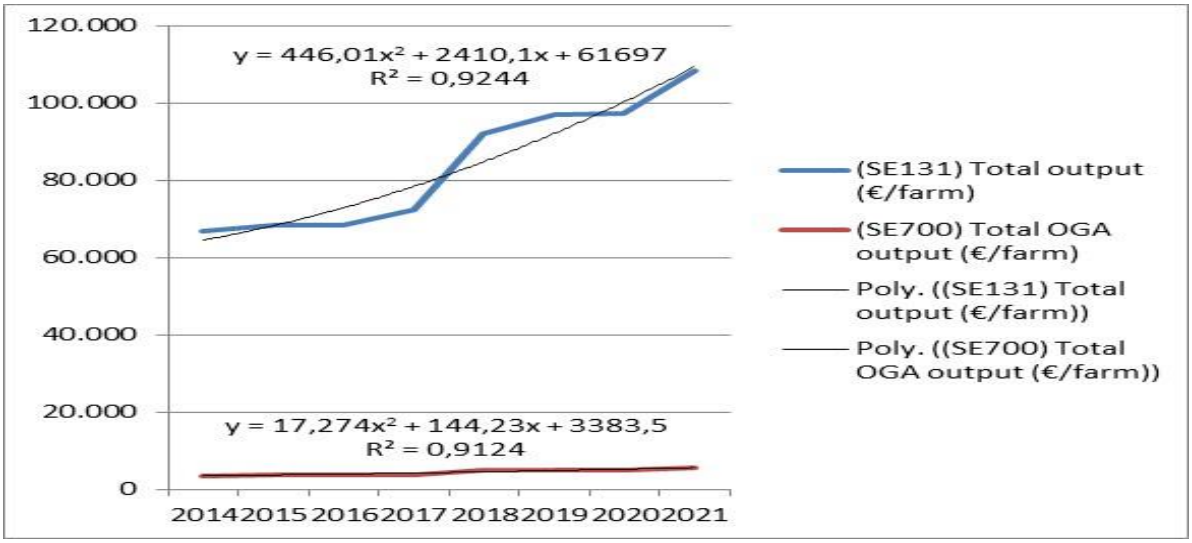

Figure 1. Value and trend of the SE131 and SE700

Source: Authors' calculation based on FADN, 2023

Special focus should be directed to activities linked to the processing of agricultural products, which are combined with strivings to increase global energy efficiency, i.e. that include the use of renewable energy sources (RES).

Several authors have been dealt in Serbia with the issue of the RES use in agriculture (Brkić et al., 2003; Tešić et al., 2006; Subić et al., 2017; Vasiljević et al., 2018; Gajdobranski et al., 2021; Jeločnik, Subić, 2021; Despotović et al., 2022), or specifically with the solar energy use in drying of fruits, vegetables, medicinal herbs and spices, and mushrooms (Doder, Đaković, 2017; Tasić et al., 2018; Nikolić, 2022).

Toward the Farm Structure Survey (FSS) for Serbia in 2018. (SORS, 2019), in overall number of farms involved in processing, there are over 45% of them active in milk processing, or 38% in fruits and vegetables processing. Besides, 8% of them are active in processing of other agricultural products, or 9% in meat processing (figure 2.).

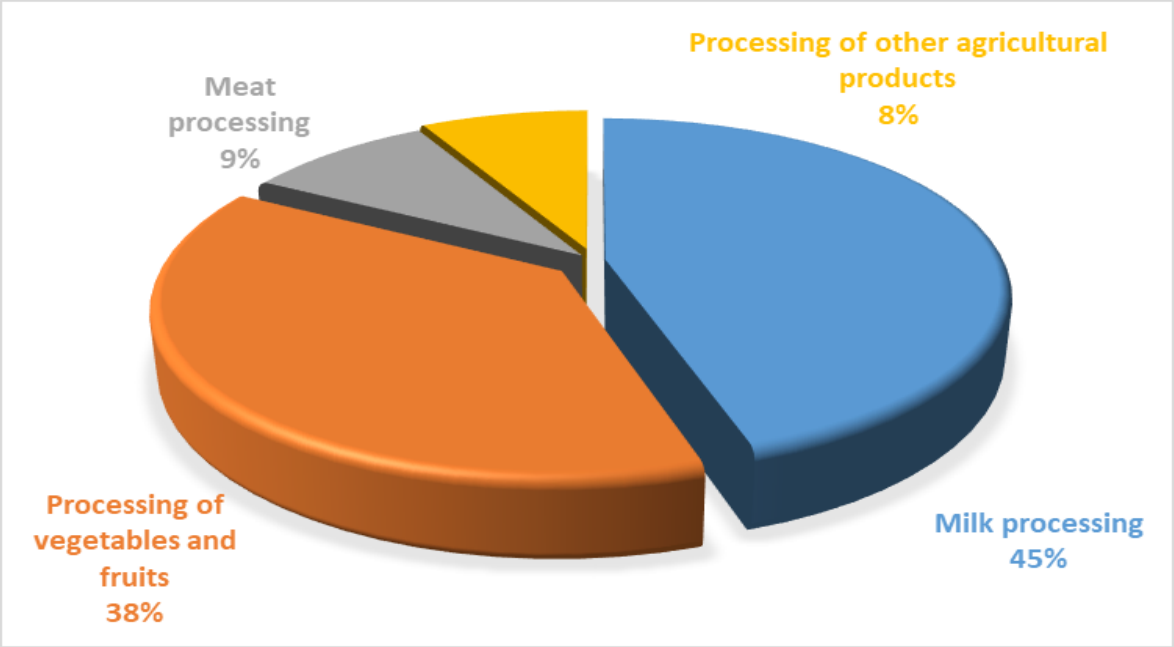

Figure 2. Structure of farms involved in agricultural products processing in Serbia (in %)
Source: SORS, 2019.

The use of fossil fuels in the process of artificial mechanical drying is expensive and certainly does not have a positive influence on environment and climate. Meanwhile, drying under the influence of solar heat and radiation is completely dependent on available weather conditions (Mustayen et al., 2014; Nukulwar, Tungikar, 2021).

Besides, drying of agricultural products directly by sun on open field is not suitable for large-scale production, as products are exposed to many external risks and damages (e.g. pests and microorganisms, rain, or dust), while the method is labor intensive and time consumed (Tiwari, 2016).

On the other hand, using solar dryers (drying system in a closed space) represents cheaper and more efficient method compared to drying products in open field (Mustayen et al., 2014). A study of Nukulwar and Tungikar (2021) shows that a solar dryer not only saves the fossil fuels, eliminating the negative impact of drying to environment, but also improve the hygiene and quality of dried products, especially in terms of taste and colors.

Some authors Fudholi et al. (2010) believe that the drying of agricultural and marine products represents one of the most attractive and profitable utilization of solar energy in the global business. Solar

drying is becoming an increasingly popular alternative for replacing the mechanical dryers, both due to high energy prices and growing environmental awareness of agricultural producers and final consumers over the world (Asnaz, Dolcek, 2021).

In developing countries, food drying by the use of solar energy is increasingly emphasized as a way to effectively respond to demand for healthy, natural and cheap food products, while in same time provides sustainable income for farmers (Kumar et al., 2016; Udomkun et al., 2020).

The development of efficient and cost-effective solar dryer that includes a thermal energy storage system for permanent drying of agri-food products in stable manner and moderate temperatures (40-75°C) also imposes potentially viable alternative for fossil fuels in many developing countries (Bal et al., 2010).

Besides air-based solar collectors, there are also in use the water-based solar collectors, or their hybrids (Fudholi et al., 2010; Fudholi, Sopian, 2019).

The most dominant parameters that affect drying intensity in indirect type of solar dryers are: temperature and air flow speed, solar radiation, type of agro-product, initial content of moisture and overall mass of agro-product. The drying rate of processed food products within mentioned dryers was high, while the products' quality remained unchanged after drying (Lingayat et al., 2020).

In case of analysis of solar dryer and onions, Bennamoun and Belhamri (2003) have been indicated that the drying results are influenced by the overall surface of collector, air temperature, or characteristics of processed agricultural products.

Processor is mainly focused to costs optimization, achieving the energy efficiency, or final products' quality and price, while the greater use of dryer (out of season) will further decrease the costs of drying, ensuring the profitability of utilized investment (Tiwari, 2016).

The main goal of this research is to justify the investment in mini digital solar dryer, as well as to define which factors affects the investment profitability the most.

MATERIAL AND METHODS

An innovative facility for ecological processing, i.e. natural drying of fruits, vegetables, medicinal herbs, spices and mushrooms based on use of solar thermal energy transferred into the forced air flow was established on the experimental farm of the Secondary Agricultural-Chemistry School in Grabovac, Obrenovac municipality during the agricultural season 2022/23. As the research impose economic analysis of investment in innovative system for drying plant food products that originate from farm production, used data refers to those collected at the School's experimental farm. Besides, there are also used data from local markets, or several literary sources (professional and scientific literature) focused to processing of agricultural crops, or investments.

In order to monitor the trends of certain FADN indicators, such are total output and total OGA output, there is used the trend method. Assessing the economic effects of investment in innovative solar dryer, as in some previous research linked to the RES utilization, involve dynamic methods, i.e. net present value NPV, internal rate of return IRR, modified internal rate of return MIRR and dynamic payback period DPBP (Subić, Jeločnik, 2017; Subić, Jeločnik, 2016; Subić, Jeločnik, 2021; Jeločnik et al., 2016). In addition, it was analyzed the impact of change in size of investment, or value of costs of fresh crops (raw material), or price of food products (dried products), i.e. it was performed the sensitivity analysis of economic effects of investment (change in value of NPV, IRR, DPBP).

RESULTS AND DISCUSSION

In food industry, or food processing technology, one of the ways for natural preservation of food products represents the process of drying (dehydration), (Sagar, Suresh Kumar, 2010). The drying process requires the use of large volume of heat (for drying) and electricity (for airing), whether electricity is further converted into thermal energy, or some other energy sources such are natural gas, wood or biomass are initially combusted and later used for drying (Dev, Raghavan, 2012).

Energy costs significantly affect the price of final food products and overall profitability of production (Ciaian, 2011). On the other side, the sun represents infinite and totally free source of clean, or "green" energy (Sen, 2004), where solar thermal energy is used, which is contained in infra-red spectrum of solar radiation (mainly in range of 0.7 μm - 3 μm), (Granqvist, Niklasson, 2018). So, in research are determined the economic effects of the processing plant for ecologically sustainable use of solar energy for drying different types of products mainly in food industry, or potentially in wood industry.

The overall investment implies the value of 2,453,000.00 RSD (Table 1.), (1 EUR = 117.5 RSD). Within the structure of investment in fixed assets, the largest share has the investment in equipment, contrary to investment in implementation activities and facility. Investment is financed exclusively by own assets, without any credit lines from commercial bank.

Table 1. Overall investment in solar dryer (in RSD)

No.	Element	New investment	Total investment	Share in total investment (%)
I	**Fixed assets**	**2.230.000,00**	**2.230.000,00**	**90,91**
1.	Facilities	576.000,00	576.000,00	23,48
2.	Equipment	864.000,00	864.000,00	35,22
3.	Implementation	790.000,00	790.000,00	32,21
II	**PWC**	**223.000,00**	**223.000,00**	**9,09**
Total (I+II)		**2.453.000,00**	**2.453.000,00**	**100,00**

Source: IMP, IAE, 2023

General assumption in line to agro-economic analysis of investing in solar dryer is that working season of dryer (use of full capacity) is over the period May - October (180 working days), which largely overlaps with the fruiting season of crops that are usually subject to drying. This period characterizes maximal insolation, i.e. volume of solar energy that will be transformed into thermal energy required for drying the selected crops.

Practicing certain lines of agricultural production in larger scale on experimental farm and good marketability of dried food products have resulted in drying of primarily fruits and vegetables, such are plums (pitted), apples (rings without seeds), grapes (without seeds), peppers (whole fruit) and tomatoes (rings). Fresh vegetables are mainly produced in greenhouse, while fruits and grapes are grown in filed, ensuring good employment of dryer capacity in pre-defined working season. The basic expectations consider that selling of food products with higher degree of processing will activate created value added what will significantly affect the overall profitability of experimental farm. Analysis fits to production cycles of fruit, vegetable and grape growing during the season 2022/23.

Estimated value of fresh agro-products that enter the drying process represents their production costs per unit gained at the experimental farm. Used raw material, i.e. fruits, grapes and vegetables are classified as II class, having no mechanical damages, and satisfactory quality and nutritional value. So, fruits are classified only according to size and shape. Final food-products (dried fruits, grapes and vegetables) are sold at farm gate in bulk to local consumers, at sales prices slightly higher than usual, according to their eco-character based on performed eco-friendly drying process (Table 2).

Table 2. Forming of total income by the use of solar dryer (in RSD)

No.	Sales income	UM	Annual average		
			Price per UM	Annual quantity in UM	Total
0	1	2	3	4	5=3x4
1.	Dried pepper	kg	385,00	210,00	80.850,00
2.	Dried tomatoes	kg	860,00	270,00	232.200,00
3.	Dried apples	kg	905,00	315,00	285.075,00
4.	Dried plums	kg	415,00	550,00	228.250,00
5.	Dried grapes	kg	265,00	375,00	99.375,00
6.	Generated surplus of energy	KW	22,75	7.200,00	163.800,00
Total					**1.089.550,00**

Source: IMP, IAE, 2023

In some months, out of drying season, but with generally satisfactory insolation (March, April and November), it is estimated that the installed system for thermal energy generation can effectively work full two months. As at that time there are no drying activities, generated energy (7,200 KW) would be used for additional heating of production space at the experimental farm (barn and greenhouse), what will represent additional income for the school derived from the use of solar dryer system (savings in unspent electricity, i.e. costs cut for electricity for industrial users usually classified in high tariff).

Table 3. Total costs (in RSD)

No.	Class of costs	Years				
		I	II	III	IV	V
I	**Material costs**	**304.200,00**	**304.200,00**	**304.200,00**	**304.200,00**	**304.200,00**
1.	Direct material	272.500,00	272.500,00	272.500,00	272.500,00	272.500,00
2.	Energy	0,00	0,00	0,00	0,00	0,00
3.	Other material costs	31.700,00	31.700,00	31.700,00	31.700,00	31.700,00
II	**Non-material costs**	**468.458,33**	**468.458,33**	**468.458,33**	**468.458,33**	**468.458,33**
1.	Depreciation	100.458,33	100.458,33	100.458,33	100.458,33	100.458,33
2.	Labor	360.000,00	360.000,00	360.000,00	360.000,00	360.000,00
3.	Interest	0,00	0,00	0,00	0,00	0,00
4.	Other non-material costs	8.000,00	8.000,00	8.000,00	8.000,00	8.000,00
Total (I+II)		**772.658,33**	**772.658,33**	**772.658,33**	**772.658,33**	**772.658,33**

Source: IMP, IAE, 2023

The energetic sustainability of investment (solar dryers) does not require the use of electricity from the public grid during its exploitation (energy is drawn from solar energy). Of course, the possibility of access to the power grid is possible during longer period without solar insolation, in order to prevent a temporary stoppage of the food processing and negative impact on planned profitability.

Exploitation of dryer does not require special maintenance, except one-time disinfection after each individual drying cycle. In Table 3. are presented summary of all costs derived from processing of selected fruits, grapes and vegetables over the one season.

Profit-loss statement of analyzed investment is presented in next table (Table 4.).

Table 4. Profit-loss statement (in RSD)

No.	Element	Years				
		I	II	III	IV	V
I	**Total revenues**	**1.089.550,0**	**1.089.550,0**	**1.089.550,0**	**1.089.550,0**	**1.089.550,0**
1.	Sale incomes	925.750,00	925.750,00	925.750,00	925.750,00	925.750,00
2.	Generated surplus of electricity	163.800,00	163.800,00	163.800,00	163.800,00	163.800,00
II	**Total expenditures**	**772.658,33**	**772.658,33**	**772.658,33**	**772.658,33**	**772.658,33**
1.	Business expenditures	772.658,33	772.658,33	772.658,33	772.658,33	772.658,33
1.1.	Material costs	304.200,00	304.200,00	304.200,00	304.200,00	304.200,00
1.2.	Non-material costs without depreciation and interest	368.000,00	368.000,00	368.000,00	368.000,00	368.000,00

No.	Element	Years				
		I	II	III	IV	V
1.3.	Depreciation	100.458,33	100.458,33	100.458,33	100.458,33	100.458,33
2.	Financial expenditures	0,00	0,00	0,00	0,00	0,00
2.1.	Interest	0,00	0,00	0,00	0,00	0,00
III	**Gross profit (I-II)**	**316.891,67**	**316.891,67**	**316.891,67**	**316.891,67**	**316.891,67**
IV	**Tax on gross profit***	31.689,17	31.689,17	31.689,17	31.689,17	31.689,17
V	**Net profit (III-IV)**	**285.202,50**	**285.202,50**	**285.202,50**	**285.202,50**	**285.202,50**

* Rate of Tax on gross profit is 10%. Source: Calculated according to IMP, IAE, 2023.

Related to derived Cash flow investment is liquid during the overall observed period of investment exploitation, while the elements Economic flow are presented in Table 5.

Table 5. Economic flow (in RSD)

No	Element	Zero moment	Year				
			I	II	III	IV	V
I	**Total revenues (1+2)**	**0,0**	**1.089.550,0**	**1.089.550,0**	**1.089.550,0**	**1.089.550,0**	**2.668.591,7**
1.	Total incomes	0,0	1.089.550,0	1.089.550,0	1.089.550,0	1.089.550,0	1.089.550,0
2.	Salvage value	0,0	0,0	0,0	0,0	0,0	1.579.041,7
	2.1. Fixed assets	0,0					1.356.041,7
	2.2. PWC	0,0					223.000,0
II	**Total expenditures (3+4+5)**	**2.453.000,0**	**703.889,2**	**703.889,2**	**703.889,2**	**703.889,2**	**703.889,2**
3.	Investment	2.453.000,0					
	3.1. In fixed assets	2.230.000,0					
	3.2. In PWC	223.000,0					
4.	Costs without depreciation and interest	0,0	672.200,0	672.200,0	672.200,0	672.200,0	672.200,0
5.	Tax on gross profit	0,0	31.689,2	31.689,2	31.689,2	31.689,2	31.689,2
III	**Net profit (I-II)**	**-2.453.000,0**	**385.660,8**	**385.660,8**	**385.660,8**	**385.660,8**	**1.964.702,5**

Source: Calculated according to IMP, IAE, 2023

Reconsidering obtained results, it is expected that the experimental farm will achieve in next five years an NPV in value of 453,930.04 RSD (with assumed discount rate of 5%) by the exploitation of investment (solar dryer), (Table 6).

In accordance with the value of IRR investment could be considered economically justified, as its value is higher than assumed discount rate (9.87% > 5%).

The investment is also justified by indicator of MIRR method (8.63%). It is expected that the investment will be paid off in 4.71 years, what is a shorter than the usual credit line expiration (5 years), or exploitation period (above 20 years), so according to mentioned indicator investment could be also considered economically justified.

Table 6. Indicators of investment economic justification

Indicator	Value
Net Present Value	453.930,04 RSD
Internal Rate of Return	9.87%
MIRR	8.63%
Dynamic Payback Period	4.71 years

Source: Calculated according to IMP, IAE, 2023

In order to determine the impact of changing the most important factors on the economic effects of investment, sensitive analysis was performed. As analyzed component was occurred the increase in value of investment, assuming that the other parameters remain unchanged (Table 7.).

Table 7. Sensitivity analysis related to change (increase) in investment value

Change in investment value (in %)	Net Present Value	Internal Rate of Return	Dynamic Payback Period
+ 5%	340.016,36	8,52%	4,78 years
+ 10%	226.102,68	7,26%	4,85 years
+ 15%	112.188,99	6,08%	4,93 years
+ 20%	Negative	Lower than discount rate*	Over 5 years

Source: Calculated according to IMP, IAE, 2023. * Used Discount rate is 5%.

By sensitivity analysis was determined that in the case of increase in investment for 19.92% it will be achieved the threshold value, as in that moment NPV equalizes to zero.

In addition, it was done the impact analysis of the change (decrease) in price of final food products on economic effects of investment (Table 8.), assuming other parameters unchanged. In this case, the threshold value of NPV is achieved when the price of dried (final) food products is decreased for 12.58%, as then the NPV equals to zero.

Table 8. Impact of change in selling price of dried food products

Decrease in selling price of dried food products (in %)	Net Present Value	Internal Rate of Return	Dynamic Payback Period
- 5%	273.569,46	7,94%	4,82
- 10%	93.208,87	6,01%	4,94
- 15%	Negative	Lower than discount rate*	Over 5 years

Source: Calculated according to IMP, IAE, 2023. * Used Discount rate is 5%.

On the other side, increasing the price of inputs, i.e. raw material (Table 9.), such are fresh peppers, tomatoes, apples, plums and grapes (crops used in drying process) for 42.75%, the NPV equals to zero.

Table 9. Impact of change in price of fresh fruits and vegetables (costs of raw material)

Increase in price of input (in %)	Net Present Value	Internal Rate of Return	Dynamic Payback Period
+ 5%	400.839,84	9,30%	4,74
+ 10%	347.749,63	8,74%	4,77
+ 15%	294.659,42	8,17%	4,80
+ 20%	241.569,21	7,60%	4,84
+ 25%	188.479,01	7,03%	4,87
+ 30%	135.388,80	6,46%	4,91
+ 35%	82.298,59	5,89%	4,94
+ 40%	29.208,38	5,32%	4,98
+ 45%	Negative	Lower than discount rate*	Over 5 years

Source: Calculated according to IMP, IAE, 2023.

Gained results indicate that the NPV of observed investment is the most sensitive to changes in sales prices of dried food products, while it is somewhat less sensitive to the increase in overall investment, or the lowest impact on investment has the increase in inputs' (raw material) price.

As the level of NPV is the most sensitive to change in price of dried (final) products and amount of initial investment, there are also observed the combined impact of change in these two components on the level of NPV (figure 3.). So, it was analyzed the level of NPV for decrease or increase in value of both components by 5%, 10% or 15%.

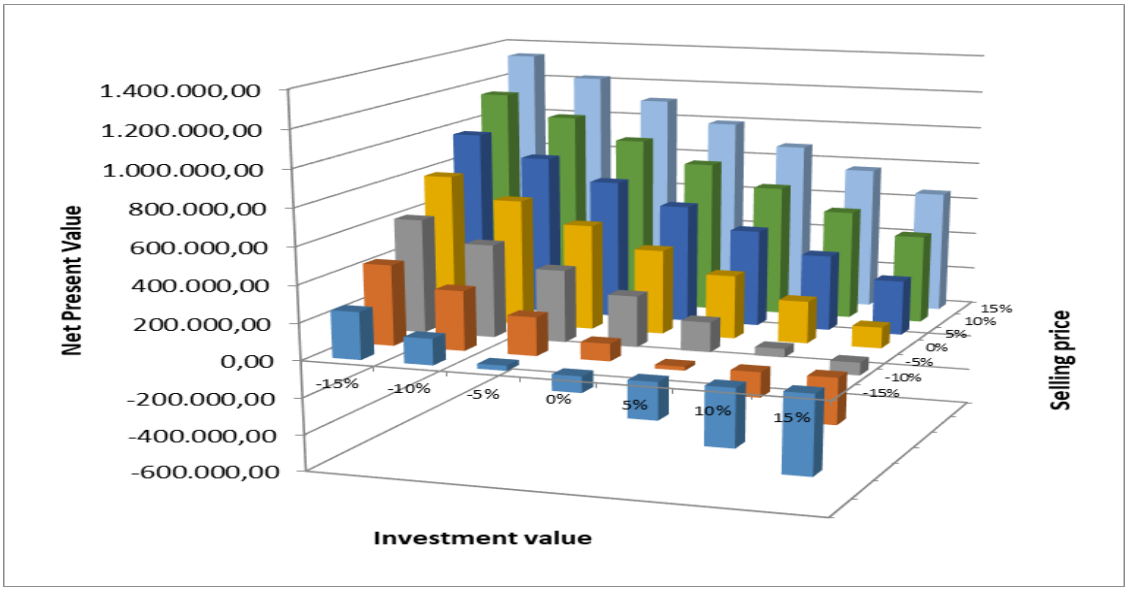

Figure 3. Combined impact of change in initial investment and price of final food products on the level of NPV (in RSD and %)

Source: Calculated according to IMP, IAE, 2023.

Gained results have been showed that just in few combinations of these two factors there comes to the negative NPV.

CONCLUSION

In paper is pointed out the positive trend of the value of total OGA output in EU, which also includes the processing of agricultural products at the farm level. It was also indicated that fruit and vegetable processing on the farm is the second most important agro - food processing segment in Serbia, right after the milk processing. The positive effects of investing in mini digital solar dryer (according to all indicators of the dynamic methods of investment assessment) indicate the justification and importance of implementing the modern systems in agricultural production that are based on the use of renewable energy sources. Besides the investment in solar dryer is being economically justified, in same time it is also liquid. The risk analysis showed that investors must primarily pay attention to achieving acceptable level of selling prices of final food products, as they have the greatest impact on the economic effects of investing. In other words, current state at the food market (including organic products), purchasing power and customer preferences, as well as their awareness regarding the importance of RES use in food production are among key elements for success within the analyzed business activity.

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AGROECOLOGY LIVING LABs IN THE "SOUTH - MUNTENIA" AND "SOUTH-EAST" DEVELOPMENT REGIONS IN ROMANIA *(IDENTIFICATION, CLASSIFICATION, CHARACTERIZATION)*

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Abstract: *The paper refers to the identification and classification of Living Agroecological Laboratories (ALL) and the selection of the most relevant ALL- Organic in the South-Muntenia and South-East development regions of Romania in 2021. Hypotetically, an Agroecology Living Laboratory should be any organic certified farm according to regulations of organic farming of IFOAM & European Comission. Based on the information provided by the "Ecological Agriculture" Department and the website of the Romanian Ministry of Agriculture and Rural Development, as well as in accordance with the concept and categories of business models from the RUBIZMO Horizon project (G.A. 773621, 2018-2021) and classification of farming systems, in this paper is presented: Type and number of operators: farmers, aquaculture producers, food and feed processors, traders, importers, exporters, collectors of wild flora and livestock and beekeepers, as well as the crops and livestock species and their area, respectively animals number in ecological agriculture identified in each county of the studied development regions; The ALL-Organic business models representative of "South-Muntenia and "South-East" regions in Romania 2021;*

Keywords*: Agroecology Living Labs (ALL-Organic), development regions, business model*

JEL Classification: *O11, O12*

INTRODUCTION

Agroecology Living Labs (ALL) is a new concept founded on Living Labs theory and more or less, similar with Agroecosystem Living Laboratories which can increase the relevance and impact of scientific activities; accelerate innovation and adoption; and empower participants to tackle more complex challenges facing agroecosystems (Chris McPhee et al., 2021). Till now, the types of ALL are a few – 3 research initiatives and as many research projects: Canadian government proposal at the G20 Meeting of Chief Agricultural Scientists (G20 MACS) in 2018 to evaluate the potential of "Agroecosystem Living Laboratories"; the project "European Agroecology Living Lab and Research Infrastructure Network (ALL-READY): Preparation Phase (2020-2023), financed by Horizon 2020 "Grant agreement ID – 101000349", and in progress, Agroecology Living Labs (ALL) to promote robust and resilient Organic production systems (ALL-Organic), financed by ERA-NET CORE Organic Cofund project 2021-2024, respectively 3 scientific papers - Chris McPhee et al., 2021 *"The Defining Characteristics of Agroecosystem Living Labs; MDPI sustainability",* Toncea Ion et al., 2022 *"Agroecological living laboratories (ALL-Organic) from Romania. Case Study "Beleza Store SRL, Ecological farm/Vâlcelele Călăraşi"*, and Aurora Ranca and Ion Toncea, 2022 *"The Living Agroecological Laboratories. Case study "Ecological vineyard from SCDVV Murfatlar";* and the

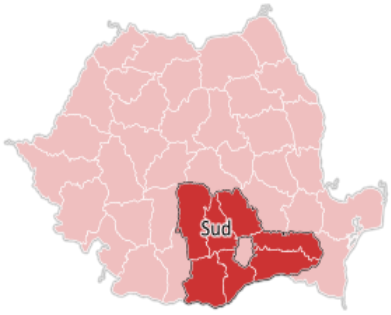
ALL-READY publications: *Accelerating agroecology transition using living labs: policy enablers and barrier*s (https://doi.org/10.5281/zenodo.10001865); *The benefits of a European Network of Agroecology Living Labs and Research Infrastructures* (https://doi.org/10.5281/zenodo.10001815); *Systems thinking: an important competency for agroecology transition* (https://doi.org/10.5281/zenodo.10001836; *Building a FAIR Future in Agroecology: Data Strategy Recommendations for Living Labs and European Research Infrastructures* (https://doi.org/10.5281/zenodo.10001857); *Supporting the sustainable long-term implementation of a European Network of Agroecology Living Labs and Research Infrastructures* (https://doi.org/10.5281/zenodo.10033336)

Agroecology Living Labs in the South–Muntenia and South–East Development Regions in Romania is part of the Milestone 4.3*" Identification of the innovative business models în organic agri-food systems"* of the project" Agroecology *Living Labs (ALL) to promote robust and resilient Organic production systems (ALL-Organic*)". Also, the paper is set up on hypothesis that each organic certified farm is an Agroecology Living Lab (ALL) and on ALL-Organic specific asumtions as: exploitation of biodiversity through balanced and diverse spontaneous flora and soil microbial communities; high-quality and healthier foods by reducing the impact of pests and diseases; reducing wastes and nutrients loss from agroecosystems by efficient use of on-farm resources and by-products and reconsider the use of off-system inputs; mitigate the impact of climate change on organic cropping and farming systems by progressive adaptation to the adverse and erratic environmental conditions guaranteeing the stability of yields; demonstration environmental and socio-economic quality performances of agroecology centred organic farming systems, confirming their pivotal role in the transformative pathways of food systems towards sustainability; promotion of innovations among farmers, technicians and researchers by set up knowledge hubs aimed at enhancing the diffusion of best practices, the socialisation of failures; producing evidence-based recommendations targeting different socio-economic groups at National, transnational and European level by catalyze consumers awareness on the overall advantages of diversified system based organic food (https://projects.au.dk/coreorganiccofund/2021-call-projects/all-organic). The paper refers to the identification and classification of Living Agroecological Laboratories (ALL) and the selection and analysis of the most relevant ALL-Organic. Agroecology Living Labs (ALL) are, according to ALL-Organic proposal: farms certified organic (WFs) and/or other standards of quality e.g. GLOBALG.A.P *(https://www.globalgap.org/export/sites/default/.content/.galleries/Documents_for_Mailings/170712_GG_IntroPPT_EN_Session_KM.pdf)* and/or to contribute, by research and innovation, to reach a quality standard, as Experimental fields of the research stations (EFs) and Organic Long Term experiments (OLTEs).

MATERIALS AND METHODS

The paper is based on the information provided by the Ecological Agriculture Department regarding number of operators and areas in organic agriculture in 2021 in the counties of the South-East and South-Muntenia development regions *(Communication MADR no 239867/07.11.2022) & Communication MADR no. 222673/18.07.2023)* and the website of the Romanian Ministry of Agriculture and Rural Development regarding ecological agriculture in the South-Muntenia and South-East development regions of Romania, in 2021.

The South – Muntenia, a development region of Romania without administrative powers, is located in the South-South-Eastern part of Romania, in the historic region Muntenia, bordering on the North with the Centre Region, on the East with South-East Region, on the South with Bulgaria, the limit being given by the Danube River, and to the West with the South-West Region and consists of seven counties - Argeș, Călărași, Dâmbovița, Giurgiu, Ialomița, Prahova and Teleorman.



Also, the South - Muntenia region includes three major forms of relief: mountain 9.5%, hill 19.8% and plain and meadow 70.7%. The rather rich hydrographic network is dominated by the Danube River, into which the main rivers of the region flow: Olt, Argeș, Dâmbovița, Ialomița and Prahova. This is complemented by a series of natural and man-made lakes *(*https://www.adrmuntenia.ro/despre-sud--muntenia/static/*)*.

South – East is a development region of Romania without administrative powers and covers the Southeast part of the Romania, which includes the old historical regions of Dobrudja, southern Moldavia, and northeastern Muntenia.

The South – East region is made up of six counties: Brăila (Muntenia), Buzău (Muntenia), Constanța (Dobrudja), Galați (Moldavia), Tulcea (Dobrudja) and Vrancea (Moldavia), and is bordering on the North with the North-East and Center Regions, on the East with the Black see and Moldova Republic, on the South with Bulgaria, the limit being given by the Danube River, and to the West with the South-Muntenia Region *(*https://en.wikipedia.org/wiki/Sud-Est_development_region*)*.

The collection of information was done according a template *(Annex 1)*, which is structured on two parts; *Operators types and theirs number* and *Business models categories*, especially arable farms (WFs), mixed farms, commercial farms, agro-technologic scientific activities etc.

Annex 1

Operator types and number & Business Models Categories

Operators ***(Producers and Businessmans)***	**Number**	**Source of information, specify_____** ***(where to find more information; e.g. provide specific links to literature source, policy brief, web site, order address, etc.)***
Organic farmers:		
Aquaculture producers:		
Organic food (feed) processors:		
Organic traders:		

Operators *(Producers and Businessmans)*	**Number**	**Source of information, specify_____** *(where to find more information; e.g. provide specific links to literature source, policy brief, web site, order address, etc.)*
Importers of organic products:		
Exporters of organic products:		
Collectors spontaneous flora:		
Animal and bee breeders:		
Cattle breeders		
Sheep breeders		
Goat breeders		
Breeders of laying hens		
Beekeepers		

Business model categories						
Agricultural production		**Food *(Feed)* production**	**Agricultural & Food (Feed) production**	**Experimental (ICT, EFs, OLTEs)***	**Commercial**	**Others**
Crops	**Area (ha)**					
Cereals						
Legumes						
Industrial crops						
Tuberculiferous and root plants						
Green harvested plants						
Ather crops on arable land						
Fresh vegetables						
Strowbery						
Melons						
Orchards						
Fruit bushes						
Walnuts, almonds, hazelnuts						
Vine						
Seeds and vegetative propagation material						
Pastures and hayfields						
Uncultivated land						
Total Organic land						
Utilised agriculture area (UAA)						
Total area of region:						
Livestock:	*Number*					
Cattle						
Sheep						
Goats						
Laying hens						
Bee families						

∗Information & Communication Technology (ICT), Organic Short-Term Experimental Fields (OEFs) and Organic Long-Term field Experiments (OLTEs).

Also, it was used the proQuantis template/2018 *(Annex 2)* inspired from the RUBIZMO project (DOI10.3030/773621), as well as classifications of farming systems *(e.g.https://digitalagrifarm.com/types-of-farming-systems)* for more detailed characterization of business models , full organics or able to be organics.

Annex 2

Business models categories and Defining characteristics

Business models categories	**Defining characteristics & Source, specify_____**
Agriculture *(the crop and livestock production, aquaculture, fisheries and forestry for food and non-food products)***,**	
Food production ***(****transforming raw materials into edible food products in industrial units)*	
Agriculture and Food production *(producing agriculture products for food and processing and manufacturing of these into edible food products at farm level or household)*	
Technology (ICT, OLTEs, EFs etc.) (*the methods, systems, and devices which are the result of scientific knowledge being used for practical purposes)*, specify____	
Bio-based values chain _ BBVC), *(**Bio-economy approach for waste management)*, specify_____**	
Bio-energy (the ***renewable energy (eg. electricity and biogas) that is generated from organic matter, known as biomass)*** **, specify_____**	
Ecosystem services *(the benefits provided by ecosystems that contribute to making human life both possible and worth living by supporting, provisioning, regulating and ensuring of life wellbeing on earth)*, **specify_____**	
Agro-Tourism (*involves any agriculturally based operation or activity that brings visitors to a farm or ranch)*, **specify_____**	
Rural development services (*the process of improving the quality of life and economic well-being of people living in rural areas)*, **specify _____**	
Other *(that is different or distinct from one already mentioned or known about Business model categories)*, **specify,** e.g. *(e.g. https://digitalagrifarm.com/types-of-farming-systems)*: **- Based on Semi – Commercial system:** *mixed farming, precision farming, intensive farming; specialised farming;* **- Cultivation system:** *extensive farming, intensive farming; conservation farming; regenerative farming; cover farming; dry farming, irrigated farming;* **- Traditional farming:** *subsistence farming, smallholder farming; nomadic farming, pastoral farming, shifting agriculture;* - **Organic farming:** *ecological agriculture, byodinamic agriculture, permaculture, natural farming;* **- Specialised farming:** *Agroforestry, Plantation farming, Urban farming;*	

RESULTS AND DISCUSSION

The paper refers to Organic (ALL-Organic) Agroecological Living Laboratories – farms certified organic (WF) and/or according to other quality standards (eg GLOBALG.A.P (https://www.globalgap.org/export/sites/default/.content), as well as to contribute, through research (EF and OLTE) and innovation (ICT), to the achievement of a quality standard.

1. Identification of ALLs-Organics across South – Muntenia and South – East development region of Romania

The ALLs-Organics are defined by type and number of operators and business models characteristics in organic farming – crops, livestock, processing, trade, research etc.

1.1 Identification of the types and number of operators, crops and livestock in organic farming and organic business model categories in Romanian development region South – Muntenia.

The organic agriculture of South-Muntenia development region in 2021 covered about 31,447 ha (1,293 % UAA), one of the smallest regional organic agricultural area in Romania comparative to UAA (2,432,381.80 ha) and a just as small number of operators – 538 organic farmers or Working organic farms (WFs), 37 food and feed processors, 1 collector spontaneous flora and other businessman categories – 29 organic traders, 1 importer of organic products and 9 exporters of organic products, mainly raw agricultural materials - grains of cereals, legumes and oilseeds *(Communication MADR no 239867/07.11.2022)*. Regarding organic business model categories, from table 1.1 it turns out that in South - Muntenia region the main category is Agriculture production model, characterized by a high diversity and, more or less, accordingly to climate and soils agroecosystems distinctive characteristics. The business agriculture production models in South – Muntenia region are dominated by the cereals, industrial crops, green harvested crops, pastures and hayfields *(Communication MADR no 239867/07.11.2022)*. The organic horticulture business models are also quite well represented in this region, mainly by organic orchards and vineyards. In the South – Muntenia region, the smallest business models, in terms of number and area, are those for the cultivation of legumes, vegetables and for the production of organic seed and vegetative propagation materials. Also, in this region, models of food production and plant cultivation & food production and integrated "crop - animal - food" models are very few and small.

Table 1.1

Operators types and number in organic farming and Organic business categories in" South-Muntenia" region - Romania in 2021

Operators *(Producers and Businessmans)*	Number	Source, specify_____
Organic farmers:	538	Communication MADR no. 239867/07.11.2022 *(2)*
Aquaculture producers:	0	
Organic food (feed) processors:	37	
Organic traders:	29	
Importers of organic products:	1	
Exporters of organic products:	9	
Collectors spontaneous flora: Nuts in the shell;	1	https://old.madr.ro/agricultura-ecologica/2021/ro-eco-007/flora-spontana/AG_SOV%20ADELINA%20ADITION%20SRL.pdf.
Animal and bee breeders		Communication MADR no. 222673/18.07.2023 *(3)*
Cattle breeders	16	
Sheep breeders	6	
Goat breeders	4	
Breeders of laying hens	3	
Beekeepers	137	
Organic business models categories of the "South-Muntenia" region/ Romania in 2021		
Agricultural production		Technology / Commercial

Crops	Area (ha)	Food *(Feed)* production	Agriculture & Food (Feed) production	(OLTEs, EFs)*	
Cereals	12,206.79	√	√	√	√
Legumes	474.36	√	√	√	√
Industrial crops	9,373.685	√	√	√	√
Tuberculiferous and root plants	98.75	√	√		
Green harvested plants	4,421.60				
Ather crops on arable land	0.00				
Fresh vegetables	59.9936		√	√	√
Strowbery	3.94	√			
Melons	34.05	√			
Orchards	337.29	√			
Fruit bushes	219.83	√			
Walnuts, almonds, hazelnuts	232.08	√			
Vine	152.57	√			
Seeds and vegetative propagation material	2.82	√			√
Pastures and hayfields	3,308.20				
Uncultivated land	521.11				
Total Organic land	*31,447.06*				
Utilised agriculture area (UAA)	*2,432,381.80*				
Total area of region:	*3,445,300*				
Livestock:	*Number*				
Cattle	798	√	√		
Sheep	1048	√	√		
Goats	339	√	√		
Laying hens	75250	√	√		
Bee families	19364	√	√		

∗**Short-term Experimental Fields (EFs) and Organic Long-Term field Experiments (OLTEs).**

From a scientific point of view, the South - Muntenia region is served by the Agroecological Center for Research, Innovation and Technological Transfer of the National Institute of Agricultural Research and Development Institute (NARDI) Fundulea by conducting and innovating of the short-term experiments (EFs) as: *Identification of genetically stabilized genotypes of cereals, grain legumes and industrial, fodder, aromatic and medicines plants corresponding to agro-ecological technologies of land cultivation and Breeding of cereals and legumes crops;* and of the long-term (OLTEs) field experiments as: *Interdisciplinary applied research on establishing the particularities and agro-ecological solutions for land cultivating with cereals, grain legumes, industrial crops, fodder, aromatics and medicines and Design of integrated and multifunctional agroecological technologies and Ecological seeds multiplication.* Important is also, the research activity of Beleza Store SRL, the vegetable case study of ALL-Organic project.

The organic livestock in South-Muntenia region in 2021 (*Communication MADR no. 222673/18.07.2023)* was represented by five animal and bee breeder's categories - breeders of cattle (mainly milking cows), sheep, goats, laying hens and bees families, but, excepting Prahova and Teleorman counties which had all these animal species certified organic, in most of the regional counties exist just two or three organic animal species. Also the number of the animal and bee breeders (166), comparative with number of organic farmers (538) is low, but the number of organic livestock

(2060 Livestock units - LSU), comparative with organic area (31,447.06 ha) is very low (0,0655 LSU/ha). It is also more less than Organic regulation (1,00 LSU/ha) which can ensure for consuming of 60% of agriculture production, maintaining the long-term fertility of soils by supply withe manure and contributing to a high level of biodiversity *(Official Journal of the European Union, 14.06.2018 - REGULATION (EU) 2018/848).*

1.2 Identification of the types and number of operators, crops and livestock in organic farming and organic business model categories in South-East Romanian development region.

In South-East region, the organic agriculture covered about 154,756 ha (6.6575 % of UAA) in 2021, one of the biggest regional organic agricultural area in Romania comparative to UAA (2,324,530 ha) and a highest number of operators – 1682 organic farmers or Working organic farms (WFs), 26 food and feed processors, 3 Aquaculture producers, 1 collector spontaneous flora and other businessman categories – 58 organic traders, 5 importer of organic products and 4 exporters of organic products, mainly raw agricultural materials - grains of cereals and legume and oilseeds *(Communication MADR no 239867/07.11.2022)*.

Regarding organic business model categories, from table 1.2 it turns out that in South - East region the main category is, also Agriculture production models, characterized by a high diversity and, more or less, accordingly to climate and soils agroecosystems distinctive characteristics.

The business agriculture production models in South – East region are dominated by the cereals, industrial crops, pastures and hayfields, green harvested crops, uncultivated area and legumes. The organic horticulture business models are also quite well represented in this region, mainly by organic vineyards and orchards. In the South – East region, the smallest business models, in terms of number and area, are those for the cultivation of vegetables and for the production of organic seed and vegetative propagation materials. Also, in this region, models of food production and plant cultivation & food production and integrated "crop - animal - food" models are very few and small. From a scientific point of view, the South – East region is served by the ALL-Organic Vineyard Murfatlar, and Buzău vegetable research-development station, by conducting and innovating of long-term (OLTEs) field experiments, and, respectively, of different short-term (EFs) field experiments.

The organic livestock in South-East region in 2021 (*Communication MADR no. 222673/18.07.2023*) was represented only by four animal and bee breeders categories – breeders of the cattle (mainly milking cows), sheep, goats, and bees families.

Also, excepting the breeders of cattle and bee families which were in all six regional counties, the breeders of the sheep and goats existed only in Buzău, Constanța, Galați and Tulcea counties.

Regarding the number of the animal and bee breeders (331), comparative with number of organic farmers (1682), it is very low, but the number of organic livestock (4457 Livestock units - LSU), comparative with organic area (154,755.83 ha) is extremely low (0,0288 LSU/ha) and it is more less than provisions of the Organic EU regulations (1,00 LSU/ha).

Table 1.2

Operators types and number in organic farming and Organic business model categories in ”South-*East”/Romania in 2021*

Operators *(Producers and Businessmans)*	**Number**	**Source, specify_____**
Organic farmers:	1682	Communication MADR no. 239867/07.11.2022 *(2)*
Aquaculture producers:	3	https://old.madr.ro/agricultura-ecologica/2021/ro-eco-018/acvacultura/CT_SC%20ECO%20DANUBE%20SRL.pdf https://old.madr.ro/agricultura-ecologica/2021/ro-eco-008/acvacultura/TL_S.C.%20DELTA%20SAMITUR%20S.R.L..pdf

		https://old.madr.ro/agricultura-ecologica/2021/ro-eco-018/acvacultura/TL_DANUBE%20RESEARCH%20CONSULTING%20SRL.pdf			
Organic food and feed processors:	26	Communication MADR no. 239867/07.11.2022 *(2)*			
Organic traders:	58				
Importers of organic products:	5				
Exporters of organic products:	4				
Collectors spontaneous flora: Walnuts; Walnut kernels	1				
Animal and bee breeders		Communication MADR no. 222673/18.07.2023 *(3)*			
Cattle breeders	32				
Sheep breeders	42				
Goat breeders	17				
Beekeepers	240				
Organic business model categories of the "*South-East"/ Romania in 2021*					
Agriculture production		Food *(Feed)* production	Agriculture & Food (Feed) production	Technology (OLTEs, EFs etc.)*	Commercial
Crops	Area (ha)				
Cereals	73,255.53	√	√		
Legumes	2,358.53	√	√		
Industrial crops	47,475.85	√	√		
Tuberculiferous and root plants	58.69	√	√		
Green harvested plants	5,947.98				
Other crops on arable land	54.28				
Fresh vegetables	167.07	√			
Strowbery	0.30	√			
Melons	12.40	√			
Orchards	508.23	√			
Fruit bushes	289.18	√			
Walnuts,almonds, hazelnuts	724.71	√			
Vine	1088.99	√		√	√
Pastures and hayfields	18,443.14				
Uncultivated land	4,370.95				
Organic land	154,755.83 *(6.6575 % of UAA)*				
Utilised agriculture area (UAA)	2,324,530.0				
Total area of the region:	3,576,200.0				
Livestock:	*Number*				
Cattle	2073	√	√		√
Sheep	9672	√	√		√
Goats	6224	√	√		√
Bee families	37465	√	√		√
Aquaculture: freshwater fish and sturgeons		√	√		√

2. ALL-Organic business models categories in organic farming of the South - Muntenia and South-East development regionst

The ALL-Organic farming is present in each county of both development regions:

2.1 The relevant ALL-Organic business models in South-Muntenia region.

According to table 2.1, the representative ALL-Organic business models in South-Muntenia/ Romania in 2021 were:

- **In Collecting spontaneous flora:**

*SOV ADELINA ADITION SRL/AG *(*https://old.madr.ro/agricultura-ecologica/2021/ro-eco-007/flora-spontana/AG_SOV%20ADELINA%20ADITION%20SRL.pdf *)*, as collecting Nuts in the shell, certified by the RO – 007 ECOCERT.

- **In Agriculture production:**

* Agro-ecological Research, Innovation and Development Centre of I.N.C.D.A. Fundulea/Călărași (https://old.madr.ro/agricultura-ecologica/2021/ro-eco-008/producatori/CL_I.N.C.D.A.%20_FUNDULEA.pdf *)* as production of Organic Vegetative propagation material and seeds for cultivation: Winter wheat *(2,00 ha)* and Milk thistle (Silybum marianum) *(0.80 ha)* and adequate organic crops in rotation - Soybean *(2.20 ha),* Oats *(1.00 ha)*, Maize *(1.00 ha)*, Sunflower (*1,00 ha)* and Camelina *(0.83 ha)* , as well as OLTEs and EFs in an organic 4 year crops rotation – annual legumes *(1,10 ha)*, and cereals *(1,10 ha)*, industrial crops *(0.80 ha)* and alfalfa *(1,5 ha)* with oldest and newest varieties, including CCPs and Dynamic populations, certified by the RO-ECO 008 ”ECOINSPECT”.

*SC ECO FRUCT SRL, Stefan cel Mare/Călărași (https://old.madr.ro/agricultura-ecologica/2021/ro-eco-018/producatori/CL_SC%20ECO%20FRUCT%20SRL.pdf) as production of Organic Sunflower *(27.15 ha)*, Winter wheat *(21,65 ha)*, Canola *(15,43 ha)*, Maize *(7,60 ha),* Soybean *(5,15 ha)*, Field peas *(2,90 ha)*, Flax *(2,20 ha)*, Alfalfa (*4,00 ha),* certified by the RO-ECO 018 ”AUSTRIA BIO GARANTIE”.

*BELEZA STORE SRL, Valcelele/Călărași *(*https://old.madr.ro/agricultura-ecologica/2021/ro-eco-007/producatori/B_BELEZA%20STORE%20SRL.pdf *)* as production of Fresh vegetables (3,77 ha): *Sweet potato (1.27 ha) + Pepper (1,25 ha) + Eggplants (1,25 ha),* Potatoes *(1,00 ha),* annual Clover (0.70 ha), Strawberry *(0.30 ha)* and Alfalfa (8.55 ha), certified by the RO – 007 ”ECOCERT”;

- **In Agriculture and Food production:**

*NOVALACT SRL, Ileana/Călărași *(*https://old.madr.ro/agricultura-ecologica/2021/ro-eco-025/ producatori/ CL_SC%20NOVALACT%20SRL.pdf*),* as feeds production – Maize *(7.28 ha)*, Barley *(2.57 ha),* Alfalfa *(16.70 ha),* permanent Pasture *(15.00 ha)* and Goats breeding (235) & Manufacture of dairy products - Goat fresh milk, Goat fresh cheese, Goat yogurt and Goat kefir, certified by the RO-ECO 025 ”BIO CERT TRADITIONAL”.

Table 2.1

ALL-Organic business models representative in” South-Muntenia”/ Romania in 2021

AREAS	Operators
Total area (ha): 3,445,300	Organic farmers: 538
Utilised agriculture area – UAA (ha): 2,432,381.8	Aquaculture producers: 0
Organic land (ha): 31,447.06 (1,29285 % of UAA	Organic food and feed processors: 37
	Organic traders: 29
	Importers of organic products: 1
	Exporters of organic agricultural products: 9
	Collectors spontaneous flora: 1
Sources: Sud – Muntenia (development region) ; Communication MADR no. 239867/07.11.2022	

Business models categories	Source, specify_____
Collectors spontaneous flora: *Nuts in the shell;	https://old.madr.ro/agricultura-ecologica/2021/ro-eco-007/flora-spontana/AG_SOV%20ADELINA%20ADITION%20SRL.pdf
Agriculture production, specify: WFs – Plant and plants products: * Vegetative propagation material and seeds for cultivation: Winter wheat and Milk thistle (*Silybum marianum)*; * Winter wheat, Corn, Soybeans, Field peas, Lentils, Canola, Flax, Alfalfa; * Strawberries, Potatoes, Fresh vegetables, Alfalfa, Clover;	https://old.madr.ro/agricultura-ecologica/2021/ro-eco-008/producatori/CL_I.N.C.D.A.%20FUNDULEA.pdf https://old.madr.ro/agricultura-ecologica/2021/ro-eco-018/producatori/CL_SC%20ECO%20FRUCT%20SRL.pdf https://old.madr.ro/agricultura-ecologica/2021/ro-eco-007/producatori/B_BELEZA%20STORE%20SRL.pdf
Food production, specify_____	
Agriculture and Food production, specify: WFs: Alfalfa, Barley, Corn and Pasture & Goats breeding & Manufacture of dairy products and Cheeses.	https://old.madr.ro/agricultura-ecologica/2021/ro-eco-025/producatori/CL_SC%20NOVALACT%20SRL.pdf
Technology (ICT, OLTEs, EFs etc.), specify: OLTEs and EFs - Plant and plant products: 4 year crops rotation *(annual and perennial legumes, cereals, industrial crops)* with oldest and newest varieties, including CCPs and Dynamic population.	https://old.madr.ro/agricultura-ecologica/2021/ro-eco-008/producatori/CL_I.N.C.D.A.%20FUNDULEA.pdf

2.2 The relevant organic business models in" South-East" Romanian region.

According to table 2.2, the representative ALL-Organic business models in South-East/ Romania in 2021 were:

- **In Collecting spontaneous flora:**

*RASMERITA VIOLETA-Elena I.I./GL *(*https://old.madr.ro/agricultura-ecologica/2021/ro-eco-018/flora-spontana/GL_RASMERITA%20VIOLETA-ELENA%20I.I.pdf*)*, as collecting walnuts and walnut kernels, certified by the RO-ECO 18 AUSTRIA BIO GARANTIE.

- **In Aquaculture:**

*SC DELTA SAMITUR SRL/TL *(*https://old.madr.ro/agricultura-ecologica/2021/ro-eco-008/ acvacultura/TL_ S.C.%20DELTA%20SAMITUR%20S.R.L..pdf *)*, as aquaculture production of freshwater fish - carp species, zander, catfish, pike etc., certified by the RO-ECO 008 ECOINSPECT.

*DANUBE RESEARCH CONSULTING SRL/TL *(*https://old.madr.ro/agricultura-ecologica/2021/ro-eco-018/acvacultura/TL_DANUBE%20RESEARCH%20CONSULTING%20SRL.pdf*)*, as aquaculture production of fresh meat and caviar from different sturgeon species: Beluga, Bester, Osetra, Sevruga, Sterlet Albino and Sterlet, certified by the RO-ECO 018 AUSTRIA BIO GARANTIE.

- **In Agriculture production:**

*SC ADAFLOR SRL/TL *(*https://old.madr.ro/agricultura-ecologica/2021/ro-eco-25/producatori/ TL_SC%20ADAFLOR%20SRL.pdf *)*, as production of Organic Winter wheat *(164.92 ha)* and Spelt *(7.05 ha)*, Sunflower *(103.58 ha)*, Flax *(64.38 ha)*, Maize *(28.43 ha)*, Vegetables *(24.67 ha)*, Canola *(19.13 ha)*, Field peas (15.19 ha), Alfalfa (5.00 ha), certified by the RO-ECO 025 BIO CERT TRADITIONAL.

* SC AGRANOLAND SRL/VN *(*https://old.madr.ro/agricultura-ecologica/2021/ro-eco-16/producatori/ VN_SC%20AGRANOLAND%20SRL.pdf*)*, as production of Organic Maize *(169.51*

ha), Canola *(112.55 ha)*, Winter wheat *(104.87 ha)*, Barley *(60.94 ha),* Rye *(16.15 ha)*, Soybean *(5.00 ha)*, Alfalfa *(4.22 ha)* and permanent Pasture *(3.6056 ha),* certified by the RO-ECO 16 BIOAGRICERT SRL ITALIA.

- **In Agriculture and Food production:**

* SC V&G OIL 2002 SRL/VN *(*https://old.madr.ro/agricultura-ecologica/2021/ro-eco-016/comercianti/ VN_SC%20V&G%20OIL%202002%20SRL.pdf *)*, as Organic production of Spelt *(382.12 ha)*, Canola *(225.47 ha)*, Winter wheat *(220.16 ha)* and Maize *(133.76 ha)*, as well as Producing organic flour and bran of winter wheat, spelt, and maize, as well as organic bread of wheat, wholemeal bread and multi-cereal bread, which are sold through the own stores ”Băcănia Fermierului”, certified by the RO-ECO 16 BIOAGRICERT SRL ITALIA. .

* Research-Development Station for Viticulture and Winemaking Murfatlar/CT *(*https://old.madr.ro/ agricultura-ecologica/2021/ro-eco-008/producatori/CT_STATIUNEA%20DE%20CERCETARE% 20SI%20 DEZVOLTARE%20PENTRU%20 VITICULTURA%20SI%20VINIFICATIE% 20MURFATLAR.pdf*)*, as organic production of wine grapes & Processing, storage, bottling of organic wines, as well as organic EFs and OLTEs with oldest and newest varieties and wildflower strips for the weeds, pests and diseases control.

Table 2.2

ALL-Organic business models representative in ”South-East” region/ Romania in 2021

Total area (ha): **3,576,200**	Organic farmers: **1682**
Utilized agriculture area – UAA (ha): **2,324,530**	Organic aquaculture producers: **3**
Organic land (ha): **154,755.84** ***(6.6575 % of UAA)***	Organic food and feed processors: **26**
	Organic traders: **58**
	Importers of organic products: **5**
	Exporters of organic products: **4**
	Collectors spontaneous flora: **1**
Sources: Sud – Est (development region) ; Communication MADR no. 239867/07.11.2022	

Business models categories	**Source, specify_____**
Collectors spontaneous flora: *Walnuts and Walnut kernels;	https://old.madr.ro/agricultura-ecologica/2021/ro-eco-018/flora-spontana/GL_RASMERITA%20VIOLETA-ELENA%20I.I.pdf
Aquaculture producers: Freshwater fish Sturgeons: caviar and meat	https://old.madr.ro/agricultura-ecologica/2021/ro-eco-008/acvacultura/TL_S.C.%20DELTA%20SAMITUR%20S.R.L.pdf https://old.madr.ro/agricultura-ecologica/2021/ro-eco-018/acvacultura/TL_DANUBE%20RESEARCH%20CONSULTING%20SRL.pdf
Agriculture production, specify: **WFs** – Plant and plants products: * Organic Winter wheat, Spelt, Maize, Field peas, Sunflower, Canola, Flax, Alfalfa; * Organic Winter wheat, Barley, Rye, Maize, Soybean, Rapeseed, Alfalfa, Meadow;	https://old.madr.ro/agricultura-ecologica/2021/ro-eco-025/producatori/TL_SC%20ADAFLOR%20SRL.pdf https://old.madr.ro/agricultura-ecologica/2021/ro-eco-016/producatori/VN_SC%20AGRANOLAND%20SRL.pdf
Food production, specify:	
Agriculture and Food production, specify: *Cultivation of Spelt, Winter wheat, Canola and Maize and Producing organic flour and bran of winter wheat, spelt, and maize, as well as producing of organic wheat bread, whole meal	https://old.madr.ro/agricultura-ecologica/2021/ro-eco-016/comercianti/VN_SC%20V&G%20OIL%202002%20SRL.pdf

bread and multi-cereal bread, which are sold through the own store "Băcănia Fermierului". * Organic *wine grapes & Processing, storage, bottling of organic wines;*	https://old.madr.ro/agricultura-ecologica/2021/ro-eco-008/producatori/CT_STATIUNEA%20DE%20CERCETARE%20SI%20DEZVOLTARE%20PENTRU%20VITICULTURA%20SI%20VINIFICATIE%20MURFATLAR.pdf
Technology (ICT, OLTEs, EFs etc.), specify:	

CONCLUSIONS

1. The Agroecology Living Labs Organic (ALL-Organic) is any Agroecology Living Lab (ALL) certified organic (ecologic).

2. The South-Muntenia development region in 2021 covered the smallest organic agricultural area in Romania (1.293 % UAA), comparative to UAA (2,432,381.80 ha) and a just as small number of operators – 538 organic farmers.

3. The South – East development region in 2021 was number one in Romanian organic farming as organic crops diversity and surface (6.6575 % of UAA), with Tulcea and Constanța two champions counties;

4. Identification of the business models/cases is the first step used by the entrepreneurs for generation of innovative ALLs business cases and models.

5. The business agriculture production models in South – Muntenia region are dominated by the cereals, industrial crops, green harvested crops, pastures and hayfields. The organic horticulture business models are also quite well represented in this region, mainly by organic orchards and vineyards. From a scientific point of view, the South - Muntenia region is served by the Agroecological Center for Research, Innovation and Technological Transfer of the National Institute of Agricultural Research and Development Institute (NARDI) Fundulea by conducting and innovating of the short-term experiments (EFs). In this region, the smallest business models, in terms of number and area, are those for the cultivation of legumes, vegetables and for the production of organic seed and vegetative propagation materials. Also, in this region, models of food production and plant cultivation & food production and integrated "crop - animal - food" models are very few and small.

6. In South – East region, the organic business models are dominated by the cereals, industrial crops, pastures and hayfields, green harvested crops, uncultivated area and legumes. The organic horticulture business models are also quite well represented in this region, mainly by organic vineyards and orchards. From a scientific point of view, the South – East region is served by the ALL-Organic Vineyard Murfatlar, and Buzău vegetable research-development station, by conducting and innovating of long-term (OLTEs) field experiments, and, respectively, of different short-term (EFs) field experiments. The weak points of organic farming in South-East region are: seeds and vegetative propagation material production zero, low area of legumes, low diversity and small number of livestock comparative with natural potential and organic arable area in the region, mainly with the low resources of organic nutrients.

7. Agroecology Living Labs (ALL-Organic) business models diversity is low in both development Romanian regions, the main categories being agriculture production and, quite rarely - agriculture & food production, collecting spontaneous flora, short-term (EFs) and long-term organic experiments (OLTEs), and aquaculture, especial in the region" South-East";

8. The relevant ALL-Organic business models in development regions studied are:

- ***in the South-Muntenia region, în agriculture production (WFs)*** - **SC ECO FRUCT SRL**, Stefan cel Mare/Călărași as producer of organic sunflower, winter wheat, canola, maize, soybean, field peas, flax and alfalfa*;* **Agro-ecological Research, Innovation and Development Centre** of I.N.C.D.A. (NARDI) Fundulea/Calărași as producer of organic seeds at winter wheat, peas, soybean, camelina, sunflower and maize, as well as the EFs OLTEs and in an organic 4 year crops rotation –

annual legumes, and cereals, industrial crops and alfalfa with oldest and newest varieties, including CCPs and Dynamic populations ; **BELEZA STORE SRL**, Valcelele/Călărași as production of fresh vegetables: *sweet potato + Pepper + Eggplants,* annual clover, strawberry and alfalfa; ***in agriculture and food (feed) production***: **NOVALACT SRL**, Ileana/Călărași, as feeds production – maize, barley, alfalfa, permanent pasture and Goats breeding (235) & Manufacture of dairy products - Goat fresh milk, Goat fresh cheese, Goat yogurt and Goat kefir;

- ***in the South-East region, in agriculture production (WFs)*: ADAFLOR** Zebil/Tulcea as producer of organic winter wheat and spelt, sunflower, flax, maize, vegetables, canola, field peas and Alfalfa; and **AGRANOLAND SRL,** Vrancea as producer of organic maize, canola, winter wheat, barley, rye, soybean, alfalfa and permanent pasture; ***in agriculture & food (feed) production:*** **V&G Oil SRL,** Vrancea as producer of organic spelt, canola, winter wheat and maize, as producing organic flour and bran of winter wheat, spelt, and maize, and of organic bread of wheat, wholemeal and multi-cereal bread, which are sold through the own stores "Băcănia Fermierului" *and* **SCDVV Murfatlar,** Constanța, as organic producer of wine grapes & processing, storage, bottling of organic wines, as well as organic EFs and OLTEs with oldest and newest varieties and wildflower strips for the weeds, pests and diseases control, ***in aquaculture*: DELTA SAMITUR SRL,** Constanța as producer of freshwater fish - carp species, zander, catfish, pike etc and **DANUBE RESEARCH CONSULTING SRL** Tulcea as producer of fresh meat and caviar from different sturgeon species: Beluga, Bester, Osetra, Sevruga, Sterlet Albino.

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25. https://old.madr.ro/agricultura-ecologica/2021/ro-eco-025/producatori/TL_SC%20ADAFLOR%20SRL.pdf
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THE IMPACT OF ENERGY CRISIS ON THE MEAT PRODUCTION PROFITABILITY

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Abstract: *The purpose of this paper is to evaluate the impact that energy crisis which has debuted in 2022, had on the level of beef, pork and poultry meat production profitability. The methods used in the study are comparative analyzes of the evolution of some technical-economic and profitability indicators, calculated for the years 2018 and 2022. The research results show that indicators such as variable expenses, energy and fuel expenses, fixed expenses, production cost, the different income rates, etc., recorded higher values in 2022 compared to 2018, in some of them even by more than 50%, and the economic results obtained by farmers went from profit to loss. In conclusion, the impact of the energy crisis in the period under study was a negative one, demanding for carrying out the activity flows, affecting the entire meat production sector.*

Keywords: *impact, meat, energy crisis, profitability*

JEL Classification: Q12, Q13

INTRODUCTION

The economy of the European Union countries, in the post-pandemic period, was affected by a new crisis, the energy one, in the context of the Russian-Ukrainian conflict: record energy prices, high inflation rates, supply shortages, rising debt levels, rising costs of production, all of which negatively influencing production activities and diminishing the purchasing power of consumers (https://ec.europa.eu/commission/presscorner/detail/ro/ip_22_7072). This crisis has shown its consequences in all economic fields, both in large companies and at the level of small and medium-sized economic agents, in livestock farms, processors, or consumers. In this context, ways are being sought to address rising inflation and energy prices (Siksnelyte-Butkiene, I., 2022).

Energy markets are volatile, so there is a need for measures and programs to support consumers when prices are high. Likewise, the diversification of energy sources, such as renewable ones, can be a viable alternative for mitigating the vulnerability of activities (Gilbert, A. L. E. X., Bazilian, M. D., & Gross, S., 2021). The main challenges are determined by ensuring the availability of energy to the various fields of activity and consumers at a price level that affects production cycles and the competitiveness of productions (Smal, T., & Wieprow, J., 2023).

In this context, meat production is also found, with a series of increases in different categories of expenses to ensure inputs. Both cattle, pig and poultry breeders encountered problems in this period of energy crisis regarding the maintenance of production cycles against the background of increased prices for all categories of inputs.

MATERIAL AND METHOD

Within this paper, a series of technical-economic and profitability indicators were calculated for beef, pork and poultry products, for the years 2018 and 2022, respectively (before and after the pandemic crisis, respectively):variable expenses (feed, biological material, energy and fuels, medicines, other material expenses), fixed expenses (labor, general expenses, depreciation, etc.),

production cost, different rates of income, etc., achieving a comparative analysis of them, in the time period under study.

RESULTS AND DISCUSSIONS

Beef

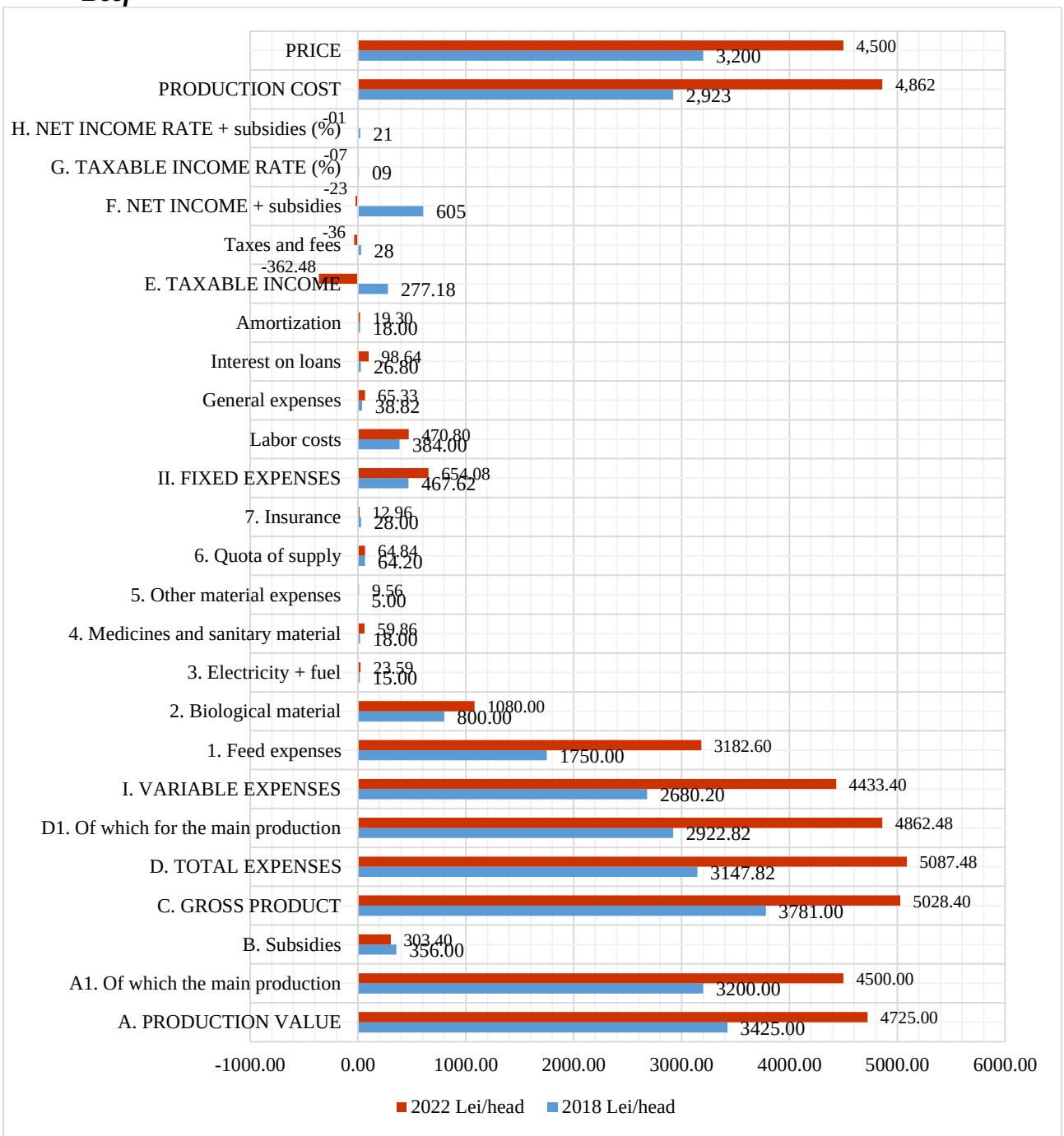

Figure 1. Technical economic and profitability indicators for beef
Source: Own calculations

In Figure 1, the main technical-economic and profitability indicators at the farm gate are presented, for the beef product, comparing the year 2022 to 2018. If the energy expenses experienced a 31% increase, the total expenses were higher by over 61%, this because other expenditure categories had increases of over 80%. Thus, the cost of feed was 82% higher in 2022 compared to 2018, other material expenses by 91%, and the biggest increases were those with medicines and loan interest

(more than 2.3 times). In total, the production cost at the farm gate was higher by 66%, but the price by only 41%, the result being the transition from profit to loss: from 20.7% to -1.2%.

Pork

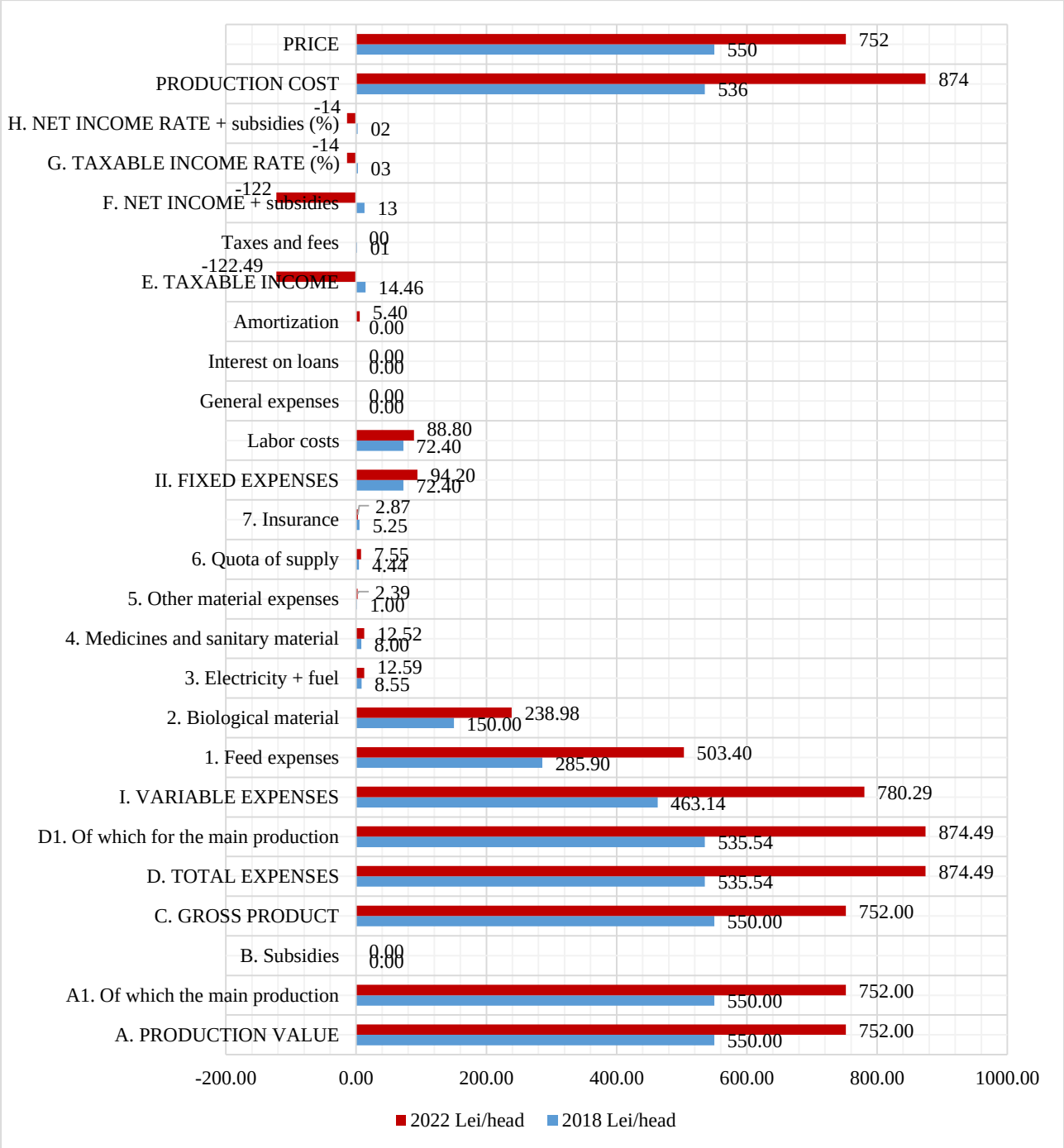

Figure 2. Technical-economic and profitability indicators for pork
Source: Own calculations

Figure 2 illustrates the technical-economic indicators at the farm gate for the pork product, compared for the years 2022 and 2018. Thus, energy expenses increased by 47.3% in the analyzed interval, and total expenses by 63.3%. Referring to the expenditure category that occupies the largest share in the cost of the product, feed, they were 76% more expensive in 2022 compared to 2018. Biological material, respectively piglets introduced for fattening, were also more expensive by 59.3%.

The farm gate price of fattened pigs increased by 36.7% and the net income rate decreased from 2.4% to -14%, with farms recording an economic loss.

Poultry

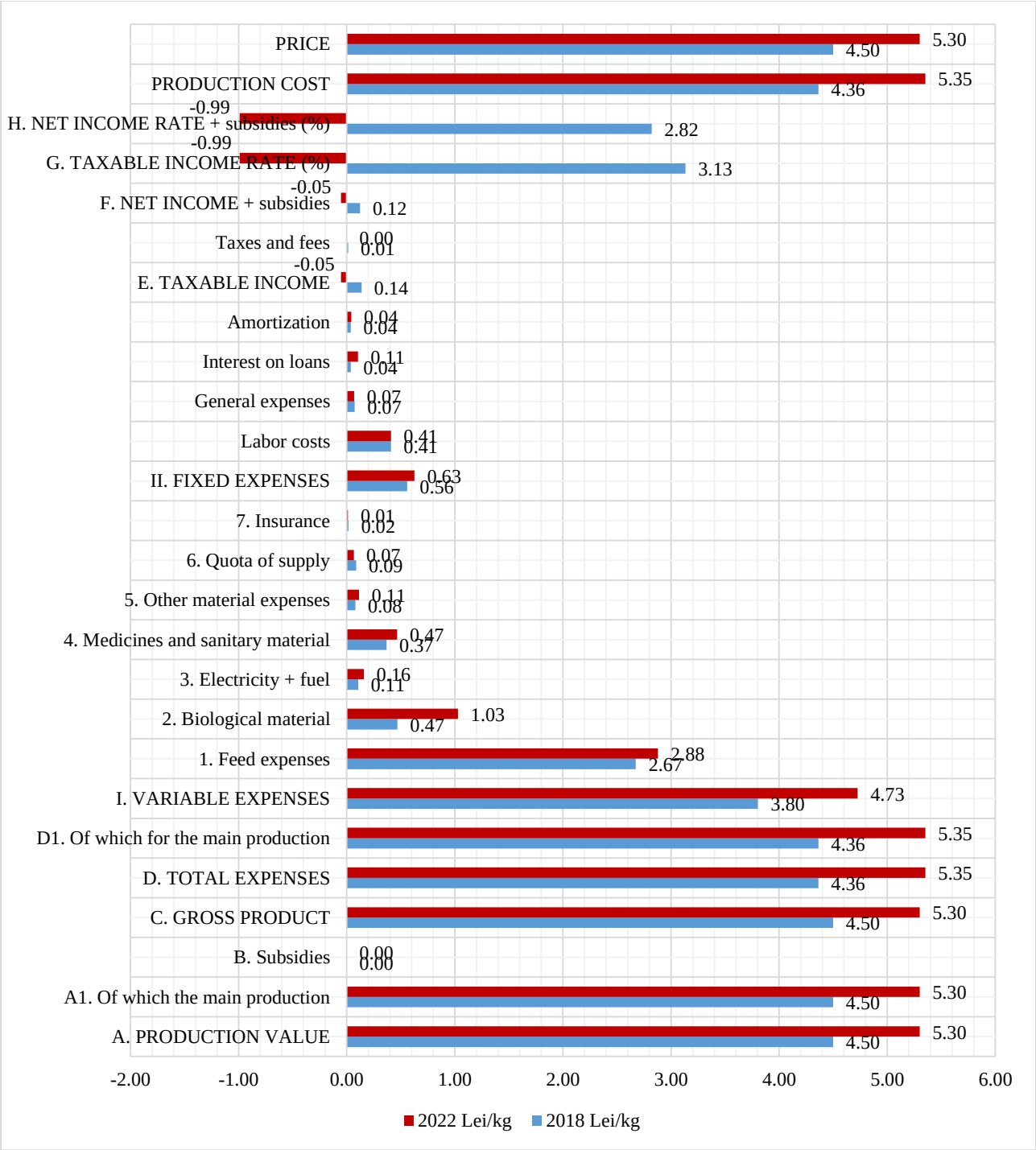

Figure 3. Technical-economic and profitability indicators for poultry

Source: Own calculations

In Figure 3, technical-economic indicators for the poultry product indicate that energy and fuel expenses increased by 45.5%, feed expenses by 7.9%, but the significant increase was that of biological material, which became more expensive by 119% in 2022, compared to 2018.

Total cost increased by 22.7% and the price by 17.8%, so the net income rate went negative, from 2.82% to -0.99%.

Therefore, meat production was significantly affected during the energy crisis, as shown in Table 1:

Table 1. Profitability of meat production at the producer, before and after the energy crisis

Specification	Years	Production cost, lei/kg life weight	Producer price, lei/kg life weight	Net income rate, %
Beef	*2018*	6.50	7.11	20.7
	2022	**10.81**	**10.00**	**-0.5**
	2022/2018	*1.66*	*1.41*	*-21.2*
Pork	*2018*	5.36	5.50	2.4
	2022	**8.74**	**7.52**	**-14.0**
	2022/2018	*1.63*	*1.37*	*-16.4*
Poultry	*2018*	4.36	4.50	2.82
	2022	**5.35**	**5.30**	**-0.99**
	2022/2018	*1.23*	*1.18*	*-3.81*

Source: Own calculations

On beef farms, energy and fuel expenses influence all other expenses; along with other categories such as feed, biological material, labor, other costs, their supply at affordable prices is essential for running production cycles (Xu, J., Akhtar, M., Haris, M., Muhammad, S ., Abban, O. J., & Taghizadeh-Hesary, F., 2022).

With the outbreak of the Russian-Ukrainian conflict, global economic conditions suddenly changed in early 2022 and prodution activities were put under pressure, especially due to rising energy prices (Hutter, C., & Weber, E., 2022). Various factors have contributed to the increase in the price of energy - low stocks of natural gas available to European countries, affected transportation, generators and plants with reduced activity (Ozili, P. K., & Ozen, E., 2021). That is why it is necessary to evaluate the costs and risks of agricultural production in this context, so that the world food situation does not suffer more (Pimentel, D. et. al, 1973).

The big challenges of the decades, such as energy or climate, require decision-makers to interact without taking into account borders and spheres of influence and take into account the complexity of socio-economic challenges (Coyle, E. D., & Simmons, R. A., 2014).

CONCLUSIONS

The energy crisis that followed the pandemic period, against the background of the conflict near our country, affected all economic sectors, including the production of beef, pork and poultry. The technical-economic indicators show the fact that, from a certain level of profitability, economic losses have been reached in production farms. Producers were anyway affected by the consequences of the crisis generated by the COVID-19 pandemic, with all its syncopes and disturbances of a social and economic nature. In any case, the pressure is very high on the livestock sector in general, and the general trend is downward, both in terms of livestock and production. The succession of crises of any nature is a critical factor for economic activities, but as long as there are constructive wills for recovery, the course of events can be rebalanced.

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REFORMING THE AGRICULTURAL SECTOR OF THE REPUBLIC OF MOLDOVA – A VITAL IMPERATIVE IN THE CONTEXT OF THE AMPLIFICATION OF GEOPOLITICAL AND CLIMATIC CRISES IN THE REGION

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Abstract: *The negative impact of climatic order (critical insufficiency of atmospheric precipitation) from 2022, as well as the military conflict in Ukraine, continue to exert extraordinary pressure on the economic efficiency of the agricultural sector of the Republic of Moldova. At the same time, the massive reorientation of agricultural products from Ukraine to the markets of the European Union, executed also through the transit of the territory of our country, created favorable conditions for domestic economic agents to re-export agricultural products of Ukrainian origin. Consequently, this fact further reduced the export capacity of Moldovan agricultural production. Adding to these factors the traditional low level of productivity but obtained at quite high costs, we have reached a situation where the given sector requires a radical reformation, a change to face the current challenges as well as those of the future.*

Keywords. *Agricultural sector, economic efficiency, reformation.*

JEL classification: R23, Q15, Q18.

INTRODUCTION

The economic reforms, implemented in the agrarian sector of the Republic of Moldova during the last three decades, did not fully fulfill the initial objectives. This fact was fueled by a number of factors, such as: the long duration of the transition period from collective enterprises to private ownership (12-14 years); building new market relationships; economic and political pressures from the main importer of Moldovan agricultural products - the Russian Federation.

At the same time, the negative impact of climate change further reduced the effectiveness of the respective reforms. The accumulation of these elements exerted and still have a major influence on the evolution of the national agricultural field, imposing, in turn, a major degree of economic vulnerability on agricultural entrepreneurial activity.

The gravity of the given situation is fueled by factors related to the managerial capacity of local agricultural entrepreneurs. The low level of agricultural and economic knowledge, the lack of capacities to develop medium-term and long-term strategic development plans, favored the development of an economic sector with insufficient diversification represented by a limited variety of cultivated agricultural crops. As a result, the structure of sown agricultural land is dominated by cereal and technical crops.

The obtained production exceeds two to three times the domestic demand, the surplus being exported as raw material. In the context of the crisis in Ukraine, the avalanche of grain in this country practically amplified even more the economic vulnerability of local farmers.

MATERIAL AND METHOD

When preparing the given report, general research methods (empirical and theoretical methods) were used, the analysis of statistical data reflecting economic indicators from the agrarian field of the Republic of Moldova was applied. Primary documents represented by specialized

literature, as well as secondary documents (statistics by field) were used as sources for the research. The information provided by the National Bureau of Statistics of the Republic of Moldova and relevant international organizations was used.

RESULTS AND DISCUSSION

Initially, the reform of the agricultural sector of the Republic of Moldova, started in the mid-90s of the last century, aimed to redistribute agricultural land and patrimony from the possession of the state to the members of the collective agricultural enterprises. The given action resulted in the appearance of more than 600 thousand owners of arable land quotas. The respective quotas were small in size, within the limits of 1-1.5 ha.

The next stage of the reform envisaged the consolidation of these lands and the formation of new production associations based on private property. However, due to the administration or sharing and faulty administration of the patrimony of the former collective households, the massive migration of the rural population to the cities or abroad, the given reform started to train harder and harder. In the end, however, the consolidation of these households succeeded, only that these economic entities had to form their technical-material base from scratch.

The insufficiency of financial resources and limited investments did not allow obtaining a high level of mechanization and automation of agriculture, a fact that led most domestic agricultural producers to opt for the cultivation of a restricted group of agricultural species, especially cereal and technical crops.

Currently, cereal and technical crops are cultivated on 80% of the total agricultural area of the Republic of Moldova. Compared to the period when the reforms were started, the current areas cultivated with autumn and spring wheat have increased by 30%, corn - by 90%, sunflower - by 190%. The given structure favors obtaining a global production that exceeds 2 times the domestic demand for cereals, 1.5 times – for corn and 3 times – sunflower seeds. The production surplus is exported as raw material, Romania being the main importer [1].

Thus, in 2022, 45% of the total volume of cereal and oilseed products of Moldovan origin were exported to the Romanian market. Romania is followed by Turkey, with a share of approximately 25%. At a long distance with shares of about 5% are Bulgaria and Switzerland, followed by Great Britain - with 4%, and Italy, Cyprus and Greece each have about 3%.

The main destination of sunflower seeds are the markets of: Romania - with a 46% share, Turkey - with 21.5% and Bulgaria - with 21%. Maize reached the market of Romania - 38.9%, Turkey - 26.8%, Switzerland - 6.8%, Great Britain - 5.6% and Italy - 5.5%.

In the case of wheat, over 62% of exports were to Romania, 18.7% to Turkey and 10.8% to Greece. At the same time, 76% of barley exports and 86% of rapeseed exports went to Romania [2].

From a quantitative point of view, these results are excellent, but the marketing of these products as raw material significantly reduces their economic value. This fact, together with the low productivity, severe droughts and the low diversification of the cultivated agricultural crops risk totally compromising the domestic agricultural business, but also the agricultural sector as a whole.

The gravity of the situation is also fueled by the geopolitical crisis in Ukraine. The disruption of export logistics forced the Ukrainian authorities to redirect the export of cereals by land routes, the Republic of Moldova being one of the transit countries of the respective production. This action created serious dissensions between farmers' associations and the authorities, including in Romania. The colors allowed, on the one hand, the transit of products on the territory of Romania for intra-

community trade, as well as the import from Ukraine to Moldova. Later, this cargo originating from Ukraine and appearing in documents originating from Moldova, arrives in Romania [3].

Ukraine is one of the main exporters of agri-food products in the Republic of Moldova. According to statistical data, in 2022 the main category of goods exported by the Ukrainian state to Moldova were seeds and oleaginous fruits - about 76 million dollars, increasing 21 times compared to 2021. Among the agricultural products exported from Ukraine to our country are vegetable oil and other fats - 57 million dollars (2.4 times increase), milk and dairy products - 48 million dollars (+26%), preparations based on of grain – 28 million dollars (-9%), grain – 20.6 million dollars (5.2 times increase). We mention that, in the case of some products, such as dairy products, Moldova imports up to 50% of its needs, while we produce enough vegetable oil and sunflower seeds.

The large volume of cereals and oilseeds exported without a rigorous record from this country, further reduced the selling price of domestic products. As a result, Moldovan agricultural producers were put in a position to sell their harvest at a price lower than the cost of production, thus recording considerable financial losses.

The given situation required the Government of the Republic of Moldova to take certain measures to protect the internal market. Thus, according to the new regulation, the right to import will belong exclusively to processors in the field of oil production, milling, animal feed or those who own farms. The regulation only covers wheat, corn and sunflower and can only be done under a permit issued by a licensing board [4].

In the given context, the respective actions, as well as the increase in the volume of subsidies granted to local agricultural producers, aim to overcome the current crisis. But in the long term, measures are needed to increase the degree of resistance of the national agricultural field to political, economic and climatic shocks. The fulfillment of this imperative depends both on the efficiency of the relevant bodies' intervention on the processes in the agricultural field, but also on the ability of each entrepreneur to comply with the new economic realities. Therefore, it is necessary to carry out a series of actions aimed at the efficiency of production processes and the transition to sustainable and sustainable agriculture.

A first factor that needs to be addressed is the diversification of agriculture, a measure that includes both the production of agricultural production with a high added value and the implementation of innovative production technologies, a qualitative and flexible management approach, the development of genuine supply and production logistics chains, the transfer from traditional to sustainable agriculture, based on the conservation of ecological systems.

A rational use of mechanized machinery and equipment is necessary, because the purchase by domestic agricultural producers of high-performing but expensive agricultural machinery, as well as not using it to its maximum capacity, contributes to increasing the costs of producing final products.

The development of the horticultural sector simultaneously with the development of the processing industry will increase the diversification of products of agricultural origin that can be exported. The varied range of fruits, vegetables and berries that can be grown in our country and exported both fresh and in the form of various processed products, with a much higher economic value compared to the raw material from the cereal group.

The increase in the volume of subsidies awarded by the state to entrepreneurs who will expand the areas of agricultural land cultivated with fodder crops will have economic effects, but will also contribute to improving the quality of the soil, which, due to the practice of monoculture, is subject to an advanced process of degradation. The given action needs to be coordinated with the

simultaneous creation of modern livestock farms. The livestock sector is an important consumer of grain, this product, as previously stated, is found in abundance on the local market

An essential factor is increasing the productivity and quality of agricultural products to become competitive in foreign markets. This fact will allow potential buyers to be assured of the quantity of agricultural goods requested.

The application of digital solutions that increase the productivity, competitiveness and sustainability of agricultural enterprises. According to the most recent survey carried out by the central authorities, 65% of farmers in the Republic of Moldova do not consider themselves well informed about new digital technologies, and over 40% consider the lack of attractive financing programs, including grants, as major constraints on the way to adopting technologies digital. At the same time, over 73% of farmers want to participate in agricultural modernization programs, such as automation, drones, weather stations, traceability and digital solutions for traceability and resource management [5].

The efficient use of financial resources intended for the development of the national agricultural sector depends on the development and implementation of the relevant subsidy policies. Currently, the financial resources offered to local entrepreneurs only allow them to survive as economic agents, without offering a clear development perspective. It is necessary to give priority to agricultural sectors that produce agricultural goods with the highest economic value, such as viticulture, fruit growing and vegetable growing. The Republic of Moldova imports large quantities of vegetables, although it is considered an agrarian country, and you can hardly find local products on the supermarket shelves, especially in the cold period of the year. Tomato imports, for example, were in 2022 90 times higher than exports [6].

CONCLUSIONS

The geopolitical situation in the region, the evolution of the economic situation at the local and external level, as well as the obligations of the central authorities to connect the technological processes in the given sector to European standards, require a radical reformation of the given field. And with the support of external partners, the probability of implementing a qualitative and relevant change is much higher, which makes us optimistic about the expected results.

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THE INFLUENCE OF WEEDS ON SOYBEAN YIELD

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Abstract: *The research was carried out at the Turda Agricultural Research and Development Station (ARDS), located in the hilly area of Transylvania and followed the influence of weed infestation on the Felix soybean variety yield, grown in two tillage systems (CS-conventional-plow, NT- unconventional-direct seeded). Sowing was done at 65 bg/m^2, the distance between rows being 18 cm. From the results obtained, in six experimental years (2017-2022), it was concluded that, in the climatic and soil conditions of Turda, soybean is less suitable for cultivation in the NT system, noting an increase in the infestation of the soil with weeds, especially with perennial species, but also a significant reduction in yield compared to the conventional system (CS*).

Keyword: *weeds, tillage system, clime, soybean, yield.*

Classification JEL: Q 01, Q 15, Q 16

INTRODUCTION

Soybeans are one of the most important oleoproteaginous plants worldwide, this plant uses the full amount of biomass, especially seeds rich in protein substances, unnitrogenous extractives, fats, vitamins and mineral salts (L.S. Muntean et al., 1995; Chețan et al., 2016). „World soybean yield is heavily concentrated in the US, Brazil and Argentina, which hold 80% of the world surface cultivated with this „miracle plant“ (https://www.agro-business.ro). For obtaining higher crops in terms of quantity but also quality, along with all other technological links and biological material used, weed control in a culture is particularly important (Chețan, 2015; Chețan et al., 2013). Efficient weed control is essential for the success of the crop because soybeans have low competitive power against weeds due to slow development in the early stages (Berca, 2004). Ciorlăuș (1983, 1998), Ulinici (1983) considered integrated weed control to be an elevated technology for the purpose of obtaining large yield, of good biological quality by capitalizing on the main components of the agroecosystem in order to avoid or decrease the ecological degradation and the profitability increase (Chețan et al., 2015). Weeds compete with soy for resources such as water, light and nutrients, according to some authors, weeds in the crop can cause yield losses of up to 80% (Braz et al., 2021) or even 90% (Imoloame, 2014) if no control is performed in culture.

The research undertaken at the Agricultural Development Research Station (ADRS) Turda, in the period 2017-2022, aimed at knowing the influence of soil work systems on train and soybean yield.

MATERIAL AND METHOD

The experiment at SCDA Turda includes two ways of working the soil, a conventional system (CS- with autumn plowing, preparing the soil in the spring with rotary harrow, sowing + fertilized), in parallel with the non-conventional system (NT- „no tillage”, with a direct sowing + fertilized) in a three-yearrotation, soy-winter wheat-maize. The biological material is represented by the Felix soybean variety, the sowing was made with the Gaspardo Directa 400 seed drill in aggregate with the John Deere 6630 tractor, at the sowing depth 65 bg/m^2 and 18 cm distance between rows.

The experience was located on a vertical Faeozem soil, with a slightly alkaline pH, a medium humus content and good supply of nitrogen, phosphorus and potassium.

Table 1. Experimental factors

No.crt	The factor	Graduations
1.	A, tillage system:	a_1, conventional-plow (CS)
		a_2, unconventional-ditect sowing (NT)
2.	B, fertilization level	b_1, 200 kg/ha NPK 20-20-0 complex fertilizer applied concomitantly with sowing
		b_2, 200 kg/ha NPK 20-20-0 complex fertilizer applied concomitantly with sowing + 100 ammonium nitrate (NH_4NO_3) in soy phenophase of 2-4 tripholated leaves
3.	C, year (clime conditions)	c_1-2017, c_2-2018, c_3-2019, c_4-2020, c_5-2021, c_6-2022

The application of weed control treatments was performed in two stages: pre-emergence with 0.35 l/ha Sencor (metribuzin 600 g/l) + 1.5 l/ha Tender (960 g/l S-metolachlor) and post-emergence with 1.0 l/ha Pulsar 40 (40 g/l imazamox) + after 4 days with 1.5 l/ha Agil 100 EC (100 g/l propaquizafop).

The degree of weeding of the crop was made visually and numerically with the metric frame with sides of 0.5 m before the herbicidation on the vegetation and before the soybean harvest. The determinations were performed in three points (on the plot diagonal) after which calculated the average number and species of weeds/variant. At pest alert, a treatment of 0.8 l/ha acaricide based on 570 g/l was performed to control *Tetranychus urticae* and a treatment with 0.2 l/thiacloprid insecticide 240 g/l for *Vanessa cardui*.

After harvesting the soybeans and weighing each experimental variant, samples were taken to determine the moisture content of the grains (with the Granomat PERTEN) laboratory humidometer. Based on the momentary moisture of the grains, the yield was calculated, after which it was recalculated to the STAS humidity (13%) using correction factors (at 87% dry matter) and then related to the surface of 1.0 hectare. Experimental data were processed by analyzing the variant (PoliFact, 2015) and setting the limit differences (LDS, 5%, 1%, 0.1%).

RESULTS AND DISCUSSIONS

The evolution of the thermal and rainfall regime at ADRS Turda (Turda Meteorological Station) is shown in Figure 1 and 2. The research area is characterized by an average multiannual temperature of 9.3 ° C and average multiannual rainfall of 532.4 mm.

If we analyze the six experimental years (2017-2022) we can see that each year was warmer than the multiannual average of 65 years (9.3ºC).

The highest air temperature values were recorded in 2019 (11.4ºC) and 2018 (11.2ºC), with deviations of + 1.9ºC and + 2.1ºC. Significant deviations were recorded in the other four years: + 1.2ºC in 2017 (10.5ºC), 0,6ºC in 2021 (9,9ºC) and +1,6ºC în 2022 (10,9ºC).

It should be noted that in June 2022 there were five days with heat (Tmax ≥ 32ºC) and one day with heat temperature (Tmax ≥ 35ºC) and in July were 16 days with heat and six days with heat temperatures (Șimon, 2022).

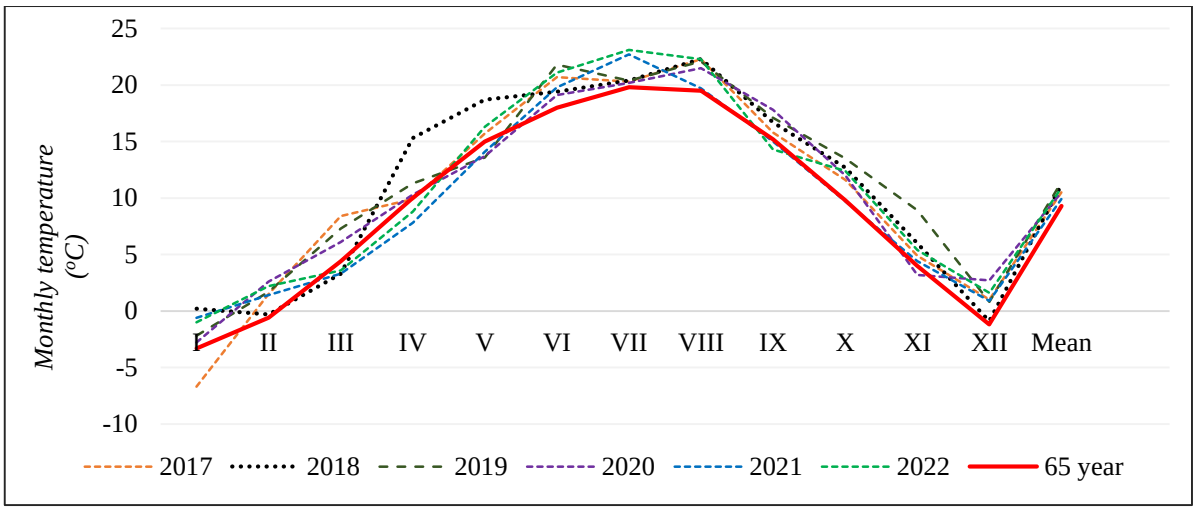

Figure 1. Thermal regime in Turda, 2017-2022

Regarding the evolution of the rainfall regime, if we refer to the multiannual average for 65 years (532.4 mm), from the six years studied, only the year 2020 was rainy (606 mm). In two years (2018, 2019) rainfall was slightly above multiannual values, the differences being 8.3 mm and 10.8 mm respectively, 2021 by 530 mm and 2017 by 532.3 mm were almost equal to the multiannual average (deviation only 2.4 and 10.9 mm respectively) but the lowest rainfall values were recorded in 2022 (514.4 mm) with a deviation of 28.8 mm.

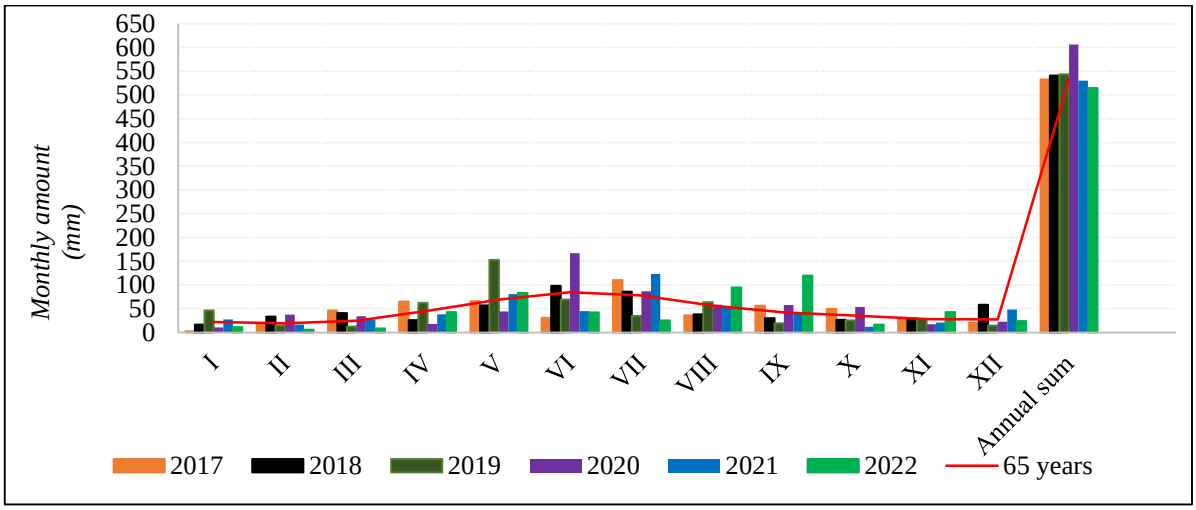

Figure 2. Rainfall regime in Turda, 2017-2022

The weeds spectrum identified before post-emergency treatment (Table 2) consists of 24 species as follows: three species of annual monocotyledonous (AM), one perennial monocotyledonous species (PM), five perennial dicotyledonous species (PD) and 15 annual dicotyledonous species (AD). The AD species are in first place in terms of participating in the soaking of soybean crop on the lands of the ADRS Turda unit. There was an increase in weeds in both soil work systems, especially in the NT system (from 29 to 41 weeds). This increase may be due to the fact that in recent years spring has been less favorable to this culture (from sowing-racing-the first stages of soybean development), temperatures between day and night fluctuated a lot and rainfall had an uneven distribution, but these climate changes favored the emergence and rapid development of weeds. Over all in the period 2017-2022 in the plowing system (CS) there were an average number of 22 weeds/m^2 and 33 weeds/m^2 in the NT version. In 2022 the presence of species was also found,

Bromus tectorum, Tragopogon dubius, Taraxacum officinale, Portulaca oleracea, Anagallis arvensis and *Anthemis cotula.*

Table 2. Weed species present in soybean culture before post-emergency treatments, Turda 2017, 2022

No. crt	Species (no/m^2)	Group d.p.d.v. agrotechnical	2017		2022	
			CS	NT	CS	NT
1	*Bromus tectorum*	AM	0	0	1	2
2	*Setaria glauca*	AM	1	0	2	0
3	*Echinochloa crus- galli*	AM	2	1	1	2
4	*Agropyron repens*	PM	0	2	1	1
5	*Xanthium strumarium*	AD	3	4	1	1
6	*Chenopodium album*	AD	1	1	1	3
7	*Polygonum convolvulus*	AD	0	1	1	1
8	*Tragopogon dubius*	AD	0	0	1	2
9	*Sonchus asper*	AD	0	2	0	1
10	*Hibiscus trionum*	AD	1	0	2	3
11	*Anthemis cotula*	AD	0	0	1	1
12	*Viola arvensis*	AD	1	2	3	2
13	*Amaranthus hybridus*	AD	1	1	1	2
14	*Datura stramonium*	AD	0	1	1	1
15	*Galeopsis tetrahit*	AD	1	0	2	1
16	*Polygonum lapathifolium*	AD	1	2	0	1
17	*Convolvulus arvensis*	PD	1	3	2	4
18	*Rubus caesius*	PD	1	2	2	3
19	*Cirsium arvense*	PD	0	1	1	3
20	*Lathyrus tuberosus*	PD	0	2	1	3
21	*Taraxacum officinale*	PD	0	0	0	2
22	*Bifora radians*	AD	1	0	1	0
23	*Portulaca oleraceea*	AD	0	0	2	0
24	*Anagallis arvensis*	AD	0	0	1	2
Total			**15**	**25**	**29**	**41**

Before the soybean harvest, the weed crop was re-infestation, the data presented in Table 3 show as predominant species the annual dicotyledonous (AD) in both soil work variants. It should be noted that in the CS version in which the deep mobilization of the soil (28 cm deep) was achieved in autumn and in spring the processing of the germination bed with rotary harrow, the number of weeds was reduced compared to the NT version. The herbicides applied in post-emergence was effective in combating weeds that were not eliminated after pre-emergency treatment but drought and high temperatures in the summer months (July, August) 2022 adversely affected soybean cultivation, stagnating its development and forcing its ripening, which is beneficial for the growth and development of weeds by providing them with more light and nutrition. In climate-friendly years, soybean cultivation developed very well and weeds sprouted after chemical treatment on vegetation, are suppressed by soybeans and have a lower development, showing a low competitive capacity compared to soybean crop (Simon et al., 2023).

Weeds have a good adaptability to withstand negative growth and development factors (https://www.cotidianulagricol.ro) fact found after our research. Daramola et al. (2019) states that „ the re-infestation of a culture is influenced by the degree of coverage of the crop and the

environmental conditions, the rainfall regime of this period affecting the distribution of weed species and their competitiveness within the weed community".

Table 3. The crop re-infestation with weeds with weeds before harvest, Turda 2017, 2022

Classification d.p.d.v. agrotechnics		Species (no/m^2)	2017		2022	
			CS	NT	CS	NT
1	AM	*Bromus tectorum*	0	0	0	3
2		*Setaria glauca*	0	1	1	1
3		*Echinochloa crus- galli*	1	0	1	0
4	PM	*Agropyron repens*	1	2	1	4
5	AD	*Xanthium strumarium*	1	2	1	2
6		*Polygonum convolvulus*	0	1	0	0
7		*Tragopogon dubius*	0	1	1	1
8		*Hibiscus trionum*	1	0	2	1
9		*Galeopsis ladanum*	0	0	1	0
10		*Portulaca oleraceea*	0	0	1	0
11		*Polygonum lapathifolium*	0	0	0	1
12	PD	*Convolvulus arvensis*	0	1	2	5
13		*Rubus caesius*	1	1	1	2
14		*Cirsium arvense*	0	2	0	2
15		*Taraxacum officinale*	0	0	0	1
Total			**5**	**11**	**12**	**23**

The spectrum and density of weeds are influenced by the nutrient space and the favorability of clime conditions for emergence and development. Weed infestation until the development stage of the first clogged leaves of soybean cultivation does not have a negative influence on yield if a proper control is achieved, but it can significantly reduce yield if the reduction in weeding is not achieved properly (Șimon et al., 2023).

Soybean cultivation is very profitable, as long as it is properly cared for and here we refer first of all to the correctness of the execution of the treatments for combating the harmful agents: weeds, diseases and pests (Chețan et al., 2016; https://www.agro.basf.ro). The yield reduction in the NT version is primarily due to the larger number of weeds present in this variant, especially perennial weeds. It is known that plowing is one of the agrotechnical methods of control of weeds. Crop rotation and soil work system remain one of the most effective measures in weed control (Rusu et al., 2013).

Regarding the yield obtained, from the data presented in Table 4, the major influence of the environment (clime conditions) is observed. The highest yield was obtained in 2017 (2434 kg/ha) and the yield with the lowest value was achieved in 2022 (1100 kg/ha), the difference being 1109 kg/ha compared to the average of the years considered as a control (2209). Of the six years, only 2017 had a very significant positive influence on culture and implicitly in yield. In 2018 and 2019 there were no significant increases in yields, the differences from the control being insignificant and between 3-21 kg/ha. The last three years (2020, 2021 and 2022) had a negative influence in the harvest with differences of 67-1109 kg/ha.

Soy cultivation in the conventional version (CS) brings a yield increase of 421 kg/ha compared to the NT version in which only 2016 kg/ha was achieved (very significantly negative influence). As expected, higher yields values were obtained in the additional fertilization version (2317 kg/ha) compared to the single fertilization variant where the average yield achieved was 1752 kg/ha, the difference being statistically ensured as a very positive significance (565 kg/ha).

Table 4. The influence of the experimental factors on soybean yield, Turda 2017-2022

The factor	Yield kg/ha	Differences kg/ha
C, year- clime conditions		
Years average	2209	0^{mt}
2017	2434	226***
2018	2187	-21^{ns}
2019	2205	-3^{ns}
2020	2072	-135^{00}
2021	2141	-67^{0}
2022	1100	-1109^{000}
LSD (p 5%) = 118, LSD (p 1%) = 492, LSD (p 0.1%) = 798.		
A-tillage system		
Convențional (CS)	2437	0^{ct}
No till (NT)	2016	-421^{000}
LSD (p 5%) = 104, LSD (p 1%) = 144, LSD (p 0.1%) = 199.		
B- fertilization		
200 kg/ha NPK 20-20-0 complex fertilizer applied concomitantly with sowing	2317	0^{ct}
200 kg/ha NPK 20-20-0 complex fertilizer applied concomitantly with sowing + 100 ammonium nitrate (NH_4NO_3) in soy phenophase of 2-4 tripholated leaves	1752	565***
LSD (p 5%) = 123, LSD (p 1%) = 345, LSD (p 0.1%) = 659.		

CONCLUSIONS

The tillage system and climatic conditions differently influenced the degree of soybean culture, in a dry year such as 2022 the weeding degree was higher. This year, the *Portulaca oleraceea* species (also was identified in the CS system), species that in previous years was not found in soybean crops in the area of experimentation.

In the NT system, before post-emergency treatments, an increase in weeding from 25 weeds was recorded/m^2 in 2017 to 41 weeds in 2022 compared to the number of weeds present in the CS system where the increase in the number of weeds was lower, from 15 weeds/m^2 in 2017 at 25 weeds/m^2 in 2022. The difference between the numbers of weeds present in the two variants of soil work was 12 weeds/m^2.

The NT soil work system has significantly influenced the yield obtained at soybean, which is reduced by about 450 kg/ha compared to the CS version.

Soybean yield is influenced by the climatic conditions of the agricultural year, so that compared to 2022, a dry year with a yield of 1100 kg/ha, in 2017 which was a rainy year, yield is very significantly positive, with 2434 kg/ha.

ACKNOWLEDGEMENTS

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GENERATIONAL DYNAMICS IN THE LABOR MARKET - GLOBAL TRENDS AND LOCAL REALITIES IN ROMANIA

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Abstract: *The world is constantly changing, which leads to changes in the labor market. Both* globally *and in Romania, the labor market is currently in an extremely difficult phase, but at the same time it offers many opportunities for reshaping, reinventing and optimizing. Globalization, automation, development, population growth, aging and organizational structures all contribute to an unpredictable labor market. Technological development and training adapted to digitalization have influenced the characteristics of each generation entering the labor market. Although there is consensus on the name and general time period of each designated generation, there is no agreement on the exact years each generation begins and ends. To understand how and why generational conflict occurs, it is important to know what characteristics distinguish each generation. Because of the specific characteristics of each generation, conflict can occur in the workplace. Challenges that have arisen in the labor market in recent years, such as the need for flexible and/or remote work have imposed adaptation to new technologies. This has led to an increase in demand for personnel familiar with the use of digital skills. Although there is a general trend toward digitization and adaptation to new technologies, Generations Y and especially Z use the Internet to a greater extent than the other generations, making them the most important source of workers in the IT sector.*

Keywords: *generations, labor force, inequalities, ages, labor market, digitization.*

JEL classification: J80, F82, J70.

INTRODUCTION

Generations in the labor market refer to the various cohorts of workers who belong to different age groups and have experienced distinct economic, social, and technological conditions during their formative years.

These generational groups often exhibit unique characteristics, values, work preferences, and challenges that can impact the labor market in various ways (Gursoy, Chi, & Karadag, 2013). These characteristics give rise to differences in opinion and attitude that lead to misunderstandings in the workplace. The uniqueness and distinctiveness of each generation is determined by the events that produce the fundamental values. (Lewis, 2013). They affect everyone involved equally, both the leaders who seek solutions to these situations.

The changing demographics in the workforce, marked by the coexistence of multiple generations, have significantly impacted human resource management. Managing these generational differences has become one of the foremost challenges for employers (Prund, 2021). The dynamics of having Baby Boomers, Generation X, Millennials, and Generation Z working together have raised concerns for organizations.

Divergences are approached differently in each generation of managers, depending on the fundamental values specific to that time (Jennings, 2016). Although these core values may influence how managers view conflicts, they do not influence the methods used to resolve them. In this sense, conflict resolution strategies can be used by both organizations and managers.

In a study analyzing „The impact of a multigenerational workforce on HR practices" (Prund, 2020), it is noted that understanding the differences between generations in the workplace is essential

for organizations and HR departments to effectively manage their workforce and adapt to the changing dynamics of the labor market.

Each new generation entering the workforce is different from the previous generation due to education, technology, and the environment in which they developed (Raiu, 2021).

Differences in communication preferences (use of technology versus face-to-face meetings), attitudes toward work (a work-centered perspective versus a balanced perspective), and career aspirations represent aspects that define generational conflict, or upward mobility versus the desire for it to make a difference (Harris, 2015).

This article aims to analyze the differences and similarities of the new generations entering the labor market compared to the previous generations, what skills they have and how they can be supported.

MATERIAL AND METHODS

General context. Generational differences have grown quite a bit lately within organizations, as there are more generations in the labor market than ever before who working together. According to Dimock, M. (2019), the current generations are defined as follows (Table 1):

Table.1 Widely accepted generational model

The generation	Period
Silently Generation	1928-1945
The Baby Boomer generation	1946-1964
Generation X	1965-1980
Generation Y Millennials / Nexters	1981-1996
Generation Z Mobile	1997-2012
The Alpha Generation	2013-until now

Source: Information collected from the specialized literature.

Globally, people between the ages of 15 and 24 represent approximately 22% of the working-age population (Gomis et al, 2020), where the age limits used internationally for this indicator are 15 and 64, respectively (NIS, 2021), while the share of young people in Europe is falling rapidly (Eurostat, 2020).

These are the most commonly discussed generations in the labor market:

• Traditionalists (Silent Generation) (1928-1945): This generation, also known as the Silent Generation, experienced the aftermath of World War II and the Great Depression. They tend to value loyalty, stability, and traditional work ethics. Many traditionalists have retired, but some are still in the workforce in their later years.

• Baby Boomers (1946-1964): The Baby Boomers were born in the post-war period, and their generation saw significant social and economic changes. They often value job security, hard work, and hierarchical structures. As they reach retirement age, there's a concern about the aging workforce and potential skills gaps.

• Generation X (1965-1980): Gen Xers grew up during the rise of technology and witnessed significant changes in family structures. They tend to be pragmatic and value work-life balance. They were the first generation to embrace computers and the internet in the workplace.

• Millennials (1981-1996): Also known as Gen Y, Millennials are often associated with the digital age. They value flexibility, diversity, and meaningful work. Their arrival in the labor market

has led to discussions about work culture changes, such as remote work and a focus on purpose-driven careers.

• Generation Z (1997-2012: The youngest generation in the labor market, Gen Z, has grown up in the era of smartphones and social media. They tend to be tech-savvy, entrepreneurial, and socially conscious. As they enter the workforce, employers are adapting to their unique communication and work style preferences.

• Generation Alpha (2013-until now): The demographic cohort born after Generation Z. This generation is the first to be fully raised in the 21st century and has grown up in a world characterized by rapid technological advancement, digital connectivity, and globalized information.

These generational differences can affect the labor market in several ways:

- Each generation may have different expectations regarding work culture, leadership styles, and career progression, leading to potential conflicts and the need for adaptable management strategies.

- Different generations may possess varying skill sets and knowledge, which can impact workforce development and training needs.

- The retirement of older generations like Baby Boomers can lead to skill shortages and the need for succession planning in certain industries.

- The pace of technological change can influence how different generations adapt to and utilize new tools and systems in the workplace.

- Generations may have varying perspectives on work-life balance, which can shape workplace policies and benefits.

- Employers may need to tailor their recruitment and retention strategies to attract and retain talent from different generational cohorts.

Although mobility for profit is perceived as a phenomenon of contemporary society with the tendency to increase labor mobility, it is seen as a form of ensuring efficient allocation of production factors (Vasile et al., 2019). The trend that is emerging with the entry of new generations into the labor market and, last but not least, through digitalization, is changing workplaces, organizational structures, and work models in which work is increasingly flexible (Nezami et al., 2021). This trend will continue to have a global impact in the coming years. The pandemic has contributed to the acceleration of these changes, requiring the presence of jobs with "physical proximity" on the one hand, while on the other hand the obligation to comply with certain distancing measures has led to a change in the work regime (Chivu & Georgescu, 2020), and the increase in the number of people working remotely in most sectors has accelerated automation and online shopping (EURES, 2021). Automation and other technological advances have the capacity to replace both routine and cognitive tasks, while increasing the need for new skills and creating unprecedented challenges and opportunities. In summary, digital skills are increasingly required to thrive in the new world of work (European Commission, 2017).

Taking into account the previously mentioned aspects, we emphasize the importance of the European Environmental Pact, which aims to change the way we live, work and produce in the EU, known as the green transition, through actions in the areas of climate, energy, agriculture, industry, environment, transport, in the field of finance and regional development and, last but not least, in the field of research (European Commission, 2019).

National context.An acute problem in the case of Romania is the high deficit of labor force, which affects economic growth and development. The mismatch between the demand and supply of labor can lead to an increase in the level of tension in the labor market (Chivu et all, 2020).

For the first time in history, four generations are currently working together, creating huge pressure on the labor market (Figure 1).

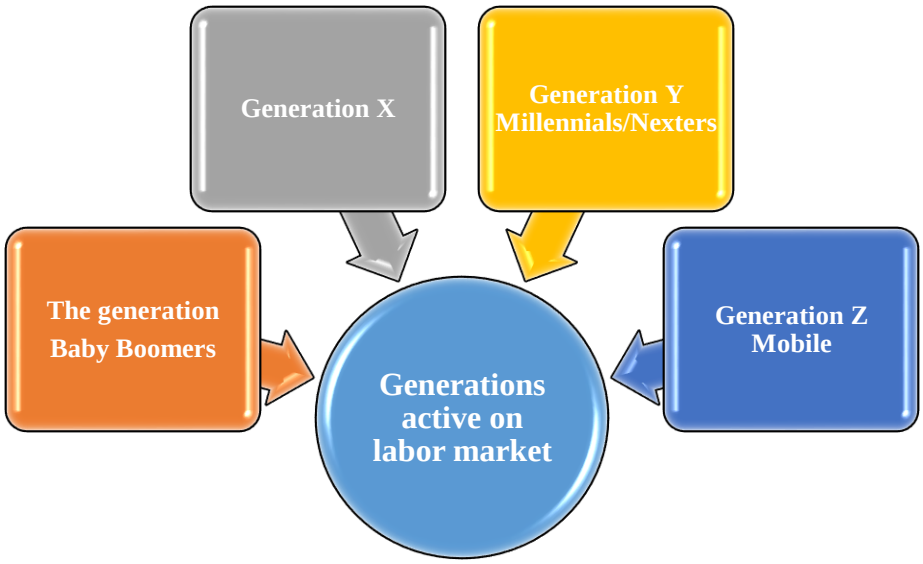

Figure 1. Generations active on the labor market

Source: Information collected from the specialized literature

At the level of 2022, according to INS data, Romania had a resident population of over 19.04 million people (figure2), with approximately 2.21 million people less than in 2006, the year before Romania's entry into the European Union. Considering this significant difference recorded over 16 years, we will specify the main causes that led to the decrease in the number of the population: the decrease in the birth rate but also the right to free movement obtained in 2007.

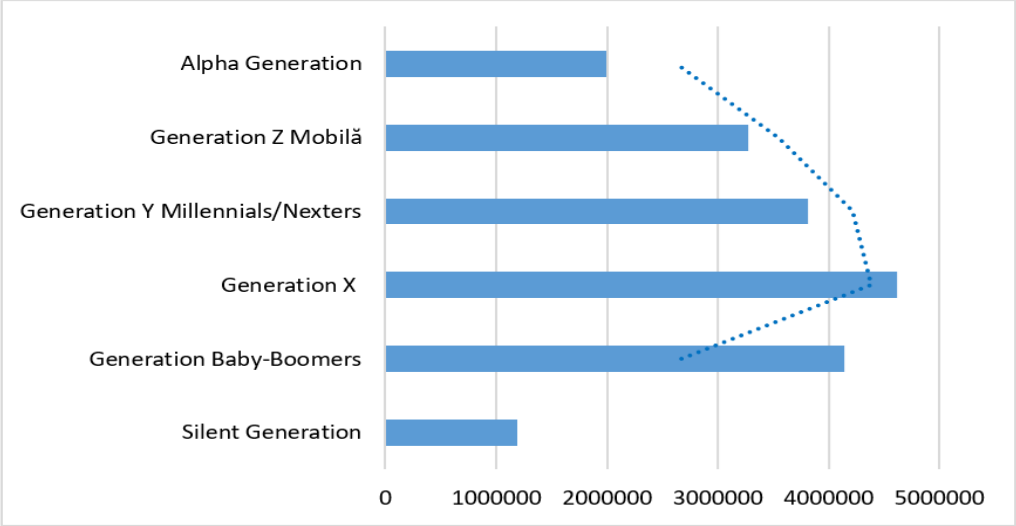

Figure. 2 Resident population on 1 January 2022 (persons)

Source: NIS data processed by the author. Note: The Silent Generation includes people over 94, as the available data did not allow us to delimit them.

It is important to mention that, according to the data from INS, the number of resident population in Romania increased by more than 9 thousand people in 2023 compared to the previous year. The population increase is exclusively due to immigration, in which case for the first time the number of immigrants was higher than the number of emigrants.

The Alpha generation consists of 61% of Generation Z and 43% of Generation X, which means that the number of people in the current and future generation is gradually decreasing and as a result the workforce is shrinking.

Members of Generation Z are also called right "mobile generation", being recognized as “the Internet generation […] and the first one navigator mobile" (Iorgulescu, 2016). Into the compared to Generation Y, Generation Z places a greater emphasis on growth professional than on stability financial and has an entrepreneurial spirit higher (Farrell, & Phungsoonthorn, 2020).

With into the view that members Generation Y (Millennials), had access to technology, them treats information into the ways differently compared to generations precedents. These prefer to build the information in the form of the network model, in time what Baby Boomers think linear. Generation Z and Millennials communicate through various social media platforms (Table 2), substituting so the interactions face into the face preferred by Baby Boomers (Hart, 2017).

Table 2. Weight to people aged 16-74 who accessed Internet in the last 3 months, after age group, on purpose accessing Internet 2022 (%)

The goal accessing Internet	Age group		
	16-34 years	35-54 years	55-74 years
Sending/receiving emails	63,1	51	28,6
Finding information about goods or services	61,9	61,2	45
Online reading of news sites/newspapers/magazines	49,1	54,1	45,8
Searching for information about health (eg: injuries, diseases, nutrition, health maintenance, etc.)	29,9	36,4	34,5
Participation in social networks (creating a user profile, posting messages or other contributions to Facebook, Twitter, etc.)	88,6	81,9	67,4
Participating in online consultations or voting to support civic or political issues (eg: town planning, signing a petition)	7,8	5,8	3,5
Posting opinions on civic or political matters through Websites (eg: blogs, social networks, etc.)	19,9	15,3	9,1
The sale of products and services, for example, by auction (eg: eBay)	7,5	5,4	1,7
Internet banking	25,8	26,2	10,8
To make an appointment at a hospital or a health care center, via the Internet	8,9	11,6	6,1
To play or download games	41,5	19,7	9,2
To listen to or download music (eg: online radio, online music, YouTube)	63,8	39,7	19,8
Internet viewing of TV broadcasts (live or recordings from televisions)	28,2	20,4	10,7
Viewing video files through online video streaming services (e.g. Netflix, Mubi, Amazon, HBO GO, FILM BOX, etc.)	25,9	17,3	7,4
Viewing video content from sharing services (eg You Tube)	36,4	24,2	12,3
Making voice or video calls over the Internet, e.g. via Skype, Messenger, WhatsApp, Face Time, Viber.	79,7	72,5	64,9
Use of instant messaging e.g. via Skype, Messenger, WhatsApp, Viber (communication via SMS is not included).	74,9	66,1	52,8
Accessing personal health records online (eg: results of medical tests)	8,3	12,4	7
Using other health services through a website or an application, instead of having to go to a hospital or visit a doctor (eg: receiving a prescription or an online consultation)	3,7	5,2	2,2
To listen or download podcasts	19,3	11,1	3,2

Source: INS data, TEMPO_TIC111B_11_10_2023.

In the above table can be observed in most cases that the values are inversely proportional to age in the indicator percentage of older people between 16 and 74 years included, who accessed the Internet in the last 3 months. After analyzing the above data regarding the purpose of accessing the Internet, we have identified three situations that can lead to interesting conclusions:

- Searching for information about health (e.g.: wounds, diseases, nutrition, health care, etc.) was found in the preferred age category 55-74 years compared to the 15-34 age group.

- During the period, Internet banking and online reading of news sites/ newspapers/ magazines were found to be in the preferences of the 35-54 age category.

Each generation is characterized by values, goals, education levels, and different work styles. Skills and adaptability have become extremely important for working in the marketplace. The rapid advancement of technology, global and economic changes have led to a reconfiguration of the structure of jobs.

Over time, digitization has become an essential part of the society we live in, providing new opportunities for growth and innovation to achieve the 2030 Agenda for Sustainable Development goals.

Recently, researchers have drawn attention to the fact that technological development has led to the emergence and inclusion of some occupations in the nomenclature of professions. Although, according to NIS, Romanian universities train more than 7,000 professionals annually in the field IT, our country has a workforce deficit of about 15,000 people annually.

However, experts point out that the desire of young people to work in areas such as IT and digitalization is leading to a lack of interest in older professions and, at the same time, to their disappearance. (Dumitrescu & Prisecaru, 2020).

CONCLUSIONS

Since it is such a wide-ranging and complex phenomenon, a thorough analysis is needed to help understand the causes and outline the measures and strategies to reduce its magnitude and impact. Research conducted over time shows that intergenerational conflict still exists, but its dimension is often exacerbated.

Even though there are inter- and intragenerational differences in the labor market, each generation has its role in the development of society. For example, the existing generations on the labor market (especially the employers of the new generations) are trying to adapt to the challenges posed by young people through digitization and technology. Another important aspect is the professional experience of baby boomers and Generation X, which can make an important contribution to the training of new generations in the labour market.

It's important to note that while differences between generations can provide insight into workforce dynamics, individual differences within each generation are significant and stereotypes should be avoided. Successful companies recognize the diversity of their workforce and strive to create an inclusive environment that meets the needs and preferences of all generations.

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STRENGTHENING SCIENTIFIC COOPERATION: REDUCING MARINE POLLUTION BY AT LEAST 10% BY 2030 IN LINE WITH THE 2020 - 2030 AGENDA ON THE SUSTAINABLE USE OF OCEANS, SEAS AND MARINE RESOURCES

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Abstract: *The paper presents, with examples, the steps through which scientific cooperation has laid the foundations for the adoption of measures of great importance for a sustainable development that ensures a sustainable future for future generations and a sustainable life based on security. "The Ecological Initiatives and Sustainable Development Group" Foundation has set up the first national and international forums on sustainable development, sustainability and environmental protection. The meetings organized over time have raised interest for collaboration at the level of civil society, academia and socio-political environment. Romania, together with the Member States, respecting the principle of subsidiarity of the European Union, is committed to the implementation of both the 2030 Agenda and the 17 Sustainable Development Goals, as well as the Green Deal Agenda with its 8 major pillars. The strategy aims to prevent and reduce marine pollution, sustainably manage and protect marine ecosystems, conserve coastal areas and ensure sustainable fisheries. To reduce pollution, the 2030 targets are achievable, but stronger action is needed*

Keywords: *cooperation, sustainable development, sustainability, strategies*

JEL Classification: Q00, Q01, Q58, Q59

INTRODUCTION

In 2006, May 17, The "Ecological Initiative and Sustainable Development Group" (EISDG) Foundation, founded on August 30, 2005 on the initiative of Mr. Ion Iliescu - former President of Romania and Mrs. Dr. Ing. Cristiana Sîrbu, laid the foundations for the first national and international forums on sustainable development, sustainability and environmental protection, followed by the organisation of numerous debates on these topics

Thus, an institutional framework was created for the responsible debate of sustainable development issues in Romania, as well as at the European level and even worldwide.

MATERIAL AND METHOD

This has triggered interest in these major projects in Europe and on other continents for the care and support of sustainability and sustainable development, implemented in dozens and dozens of documents debated with civil society, academia and universities, socio-economic and political environment.

We have set up a tool called responsible citizenship after hundreds of meetings in the Forum for Sustainable Development and Environmental Protection (bringing together leading figures in sustainable development and environmental protection from around the world).

Figure 1. First national forum sustainable development, sustainability and environmental protection, source: The "Ecological Initiative and Sustainable Development Group" (EISDG) Foundation

RESULTS AND DISCUSSIONS

On 17 May 2020, the EISDG Foundation had as its guest of honor Mr. Lester Brown, President and Founder of the World Watch Institute and the Earth Policy Institute, two global, non-profit, service-based research organizations on climate change and projects to restore natural terrestrial and marine ecosystems destroyed by massive over-industrialization and enthronization.

Lester Brown was the first person in the world to advocate the introduction of the concept of the eco-economy in 2001, according to the book Eco-Economy: Building a future for the Earth.

In 2010, it was the first official visit to Romania, on the occasion of the 17 May forum and the first World Watch Institute and Earth Policy conference organised in a Central and South-Eastern European country. Thus, the EISDG Foundation has signed a partnership with the prestigious World Watch Institute and Earth Policy, succeeding for over 18 years to translate numerous books by Lester Brown, as well as Earth Policy's journals, part of the data processed by his teams concerning the planet's seas and oceans.

I strongly affirm that part of the scientific contributions of the Earth Policy Institute and the World Watch Institute, as well as part of the actions undertaken by civil society, of which the GIEDD Foundation is a part, have contributed to the foundation of the Green Deal policies and the 2020 - 2030 Agenda.

Today, we are stepping forward with increased hope after the signing of the Green Deal Treaty of the 2020 - 2030 Agenda at the UN General Assembly and subsequently at the 74th anniversary celebration of the UN General Assembly on 26 September 2019.

Romania, together with the Member States, respecting the principle of subsidiarity of the European Union, is committed to support the European Union as a leader in the implementation of

both the 2030 Agenda and implicitly the 17 Sustainable Development Goals, and the Green Deal Agenda with its 8 goals (major pillars).

Figure 2. Lester's Brown official visit in Romania, 17 May 2010 Forum, Source: The "Ecological Initiative and Sustainable Development Group" (EISDG) Foundation

The 2030 Agenda provides the enabling policy framework for change to inform the international community on global sustainable development challenges and trends.

Ensuring a balance between the economic and social situation must take into account the essential aspects of governance and civil society, inclusiveness and recognition of the necessary interconnections between its goals and targets, make the Agenda 2020 - 2030 and the Green Deal a precise guide to reducing the pressures posed by global warming worldwide.

The 2030 Agenda for Sustainable Development and the Green Deal have set 17 targets for sustainable development and climate change, from reducing global poverty to adopting a sustainable circular economy that reduces pollution on land and in the world's oceans and seas by at least 10%.

Addressing the health of the seas and oceans by reducing wetland and marine pollution has become a priority in seriously addressing climate conditions over the past 20 years.

Sea and ocean temperatures have risen alarmingly, causing immense damage to the socio-economic system aimed at predictably raising the living standards of people living in these areas.

The 17 goals of the 2030 Agenda for Sustainable Development (SDGs) are universal and apply to all countries regardless of their stage of development, based on national ownership and shared responsibility.

The 17 SDGs are a long series of consultations that led to today's form, agreed in 2019 at the G20 Summit in Osaka.

The Addis Ababa Action Agenda, as an integrated part of the 2030 Agenda, sets a new paradigm for implementation through the effective use of financial and non-financial means, putting domestic activation and sustainable policies at the forefront, the Sendai Framework for Disaster Risk Reduction, the Paris Agreement on Climate Change providing a legally binding framework and being

the next steps towards a sustainable global future. These are regulations that are based on a world order whose foundation is the rules of multilateralism within which the United Nations is situated.

Figure 3. European Green Deal Source: EU ASEAN- Association of Southeast Asian Nations (2022); EC (2019)

Romania, under the rotating Presidency for the Council of the European Union (January 2019 - June 2019) also provided the Working Group for Agenda 2030 (represented at that time by Lorincz Csilla - Head of the Permanent Bureau of the Department for Sustainable Development).

The conclusions of the EU Council were also included in the discussions that formed the basis of the European Commission's Strategic Agenda which includes an important part dedicated to sustainable development.

The future of Europe and the planet through the Green Deal and Agenda 2020 - 2030, cannot be sustained without it:

- Improving competitiveness to invest in sustainable development;
- Engaging governments, institutions and citizens to become a model for the rest of the world.

The 17 goals of the 2030 Agenda for Sustainable Development (SDGs) are universal and apply to all countries regardless of their stage of development, based on national ownership and shared responsibility.

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The 17 Sustainable Development Goals (SDGs) of the 2030 Agenda have been accepted by all countries present at the UN. These objections relate to:

1. No Poverty - Eradicate poverty in all its forms and in all contexts;
2. Zero Hunger - Eradicate hunger, ensure food security, improve nutrition and promote sustainable agriculture.
3. Health and well-being - Ensuring healthy lives and promoting well-being for all at all ages.

4. Quality education - Ensuring quality education and promoting lifelong learning opportunities for all.
5. Gender Equality - Achieving gender equality and empowering all women everywhere;
6. Clean water and sanitation- Ensure availability and sustainable management of water and sanitation for all;
7. Affordable and clean energy - Ensuring access to affordable energy for all in a secure, sustainable and modern way;
8. Decent work and growth - Promoting sustained, inclusive and sustainable economic growth;
9. Industry, innovation and infrastructure - Building resilient infrastructure, promoting sustainable industrialization and encouraging innovation;
10. Reduced inequalities - Reducing inequalities within and between countries;
11. Sustainable cities and communities - Develop cities and human settlements to be inclusive, safe, resilient and sustainable.
12. Responsible consumption and production - Ensuring sustainable consumption and production patterns;
13. Climate action - Take urgent action to combat climate change and its impacts;
14. Aquatic life - Conservation and sustainable use of oceans, seas and marine resources for sustainable development;
15. Terrestrial life - Protecting, restoring and promoting the sustainable use of terrestrial ecosystems, managing forests sustainably, combating desertification, halting and repairing land degradation and halting biodiversity loss;
16. Peace, justice and effective institutions - Promote peaceful and inclusive societies for sustainable development, access to justice for all and effective, accountable and inclusive institutions at all levels;
17. Partnerships to achieve the goals - Strengthening the means of implementation and revitalizing the global partnership for sustainable development;

Figure 4. Sustainable Development Goals, Agenda 2023

CONCLUSIONS

Sustainable development must ensure a sustainable future for future generations and a sustainable life based on security.

Romania has made a major contribution to all chapters of scientific consultation over the years, and was able to bring its voice to the 74th session of the United Nations General Assembly in New York through President Klaus Iohannis' speech at the Political Forum on "Accelerating the implementation of the 2030 Agenda for Sustainable Development".

The progress of the 2030 Agenda through the 17 Sustainable Development Goals gave the first UN Summit dedicated to sustainable development since the adoption of the 2030 Agenda in September 2015.

The 17 Sustainable Development Goals, informally also referred to as the Global Goals, aim to protect the planet, water resources, fight extreme poverty and inequality, and protect and secure food security over the next 15-20 years.

Measures to conserve and sustainably use the oceans and seas and marine resources for a sustainable future of the planet will also ensure clean food resources for people in every corner of the world.

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STUDY ON THE MAIN OILSEED PRODUCTION, PROCESSING AND STORAGE CAPACITIES IN ROMANIA

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Abstract: *The purpose of the work is to analyze the main production, processing and storage capacities of rapeseed, sunflower and soybean boxes in Romania, starting from general information such as cultivated areas, productions, the number and capacity of storage spaces, the analysis is based on statistical data from the period 2013-2022 collected from INS and MADR. Considering their wide use, it is opportune to analyze them based on the bibliometric, bibliographic, statistical-mathematical data analysis and the cause-effect diagram. The analysis showed that the county with the largest area cultivated with sunflowers is Dolj, with Călărași rape and Brăila soybeans, the calculated yields being 2,725 tons/ha for sunflower, 3,022.89 tons/ha for rape and 3,422 tons /ha for soybeans. In the pessimistic scenario, the forecasted productions for the period 2023-2026 for sunflower could vary between 1,937-2,089 thousand tons, and in the optimistic one between 3,866-4,018 thousand tons. For rapeseed, in the pessimistic scenario, the predicted productions for the period 2023-2026 could vary between 331-450 thousand tons, and in the optimistic one between 1,946-2,166 thousand tons. For soybeans in the pessimistic scenario, the forecasted productions for the period 2023-2026 could vary between 74-130 thousand tons, and in the optimistic scenario between 415-535 thousand tons. Knowing the production potential for oilseeds in irrigated and non-irrigated systems, we appreciate that the forecast values are plausible, considering that the forecast was made taking into account the calculated multi-year averages.*

Keywords: *sunflower, rapeseed, soybean, processing, storage*

JEL classification: Q10, Q15

INTRODUCTION

Oilseeds are used in the production of food, animal feed and fuel, but also for industrial purposes. Oil and flour are obtained by crushing the seeds. Vegetable oil is generally used in the food industry or to produce biodiesel, while oilseed meal is an important component of animal feed (European Commission, 2018). Given the importance and multiple uses of these crops, they were studied by researchers so that on July 27, 2023, there were 767 articles related to sunflower, 590 to rape and 294 to soy in the Scopus database. The sunflower appeared, it seems, since 3000 BC, being brought to Europe by a Spanish explorer around 1569, its role being an ornamental plant and much later it was exploited in human and animal nutrition, as well as medicinal (Mureșan et al., 2013). Turek-Rahoveanu, in 2018, addressed the issue of land used for sunflower cultivation as a raw material for the seedoil industry. Consumption of new and improved products such as cold-pressed oils can improve human health and prevent certain diseases (Siger et al., 2008). China's edible oil industry has developed very rapidly, being one of the largest producers, consumers and exporters of oilseeds and vegetable oils in the world (Wang,2011). Rapeseed oil can be used for food consumption, as a raw material for the manufacturing industry and in the production of biodiesel. A by-product of processing is rapeseed meal, which contains valuable feed properties (Tanasiichuk et al.,2021). Watson et al. 2017, claims that there is a high demand for protein-rich animal feed materials in Europe, and European agriculture has a deficit of about 70% in terms of them, of which 87% is covered by imported soybeans and soybean meal.

MATERIAL AND METHOD

Several methods of data analysis and processing were used in the paper, the first research method used to be "bibliometric analysis" which was based on the SCOPUS database for searching, filtering and extracting scientific articles relevant to the topic addressed, having as reference period 1971-2023, by studying identified scientific articles, filtered by title, abstract and keywords. The second research method used is the "bibliographic analysis" which aimed to extract the official data existing in the research scope of the work. The data was collected by accessing the MADR and INS databases. The third method used was the statistical-mathematical analysis, this studying the phenomena and processes from a quantitative point of view, in order to describe them and to discover the laws that govern their manifestation, by calculating the statistical parameters: mean, variance, standard deviation of the mean, coefficient of variability etc.

RESULTS AND DISCUSSION

Out of the 93 countries where sunflowers are grown, Romania ranks 4th worldwide and first in Europe, having a share between 19.94% and 22.69% of the area cultivated with sunflowers in the EU countries. At the national level, in the period 2013-2022, there are counties where the average area cultivated with sunflowers was below 1,000 ha and they were no longer represented on the map (made according to the data collected from the INS database, calculating multi-year averages) and counties such as those in the SE of the country where the average areas have reached close to 80,000 ha. The calculated average was 27,097 ha. The county with the smallest average, which was represented on the map, is Vâlcea with 1,388 ha and the one with the largest area is Dolj with 89,464 ha. Although they are adjacent, the climatic and soil characteristics are totally different, those of Dolj being categorically more favorable for sunflower cultivation.

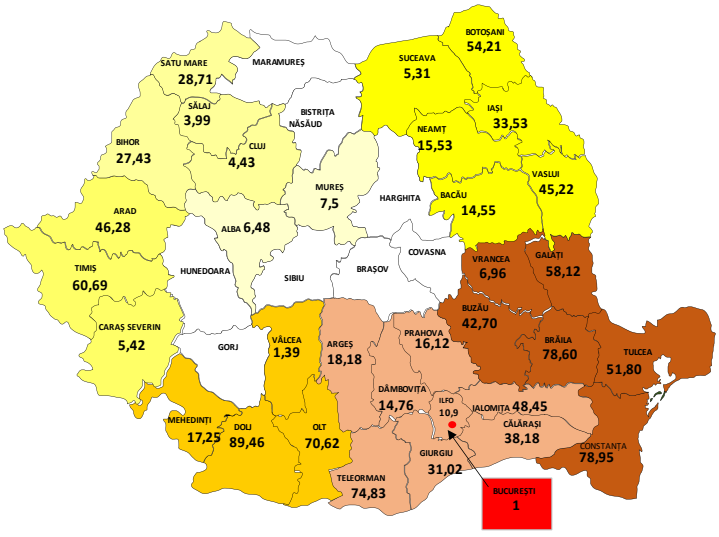

Figure 1 - Distribution by county of the surface areas cultivated with sunflowers - thousand ha

Source: INS data processing

Rapeseed is one of the most common oilseed crops, being a sustainable crop, with major producing countries considering it a strategic crop. This is due to the importance of rapeseed oil as a

food product, as it can compete with olive oil. Canola oil lowers blood cholesterol and can prevent heart attacks and strokes. It is widely used in industry as a biofuel. Green plant material, hay and meal are the feed for cattle. This crop is an excellent green manure and an excellent honey plant. Rapeseed is grown in 60 countries around the world, Romania ranking 12th worldwide and 4th in Europe, having a share between 4.47% and 9.52% of the area cultivated with rapeseed in European countries. At the national level, there are counties such as those in the SE of the country where the average areas have reached close to 37,000 ha. The calculated average was 11,668.5 ha. The county with the smallest average represented on the map was Cluj with 1,290 ha, and the one with the largest Călărași with 50,600 ha.

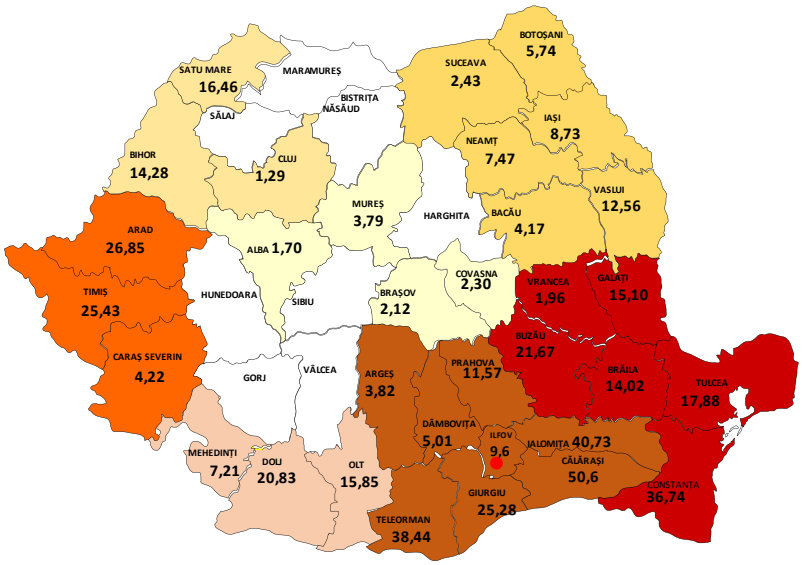

Figure 2 - The distribution of rapeseed crops by county - thousand ha

Source: INS data processing

Soybean is as important as wheat, rice and corn, being a drought tolerant crop. Southeast Asia is its natural habitat, where they have a long frost-free period, humid and hot summers.

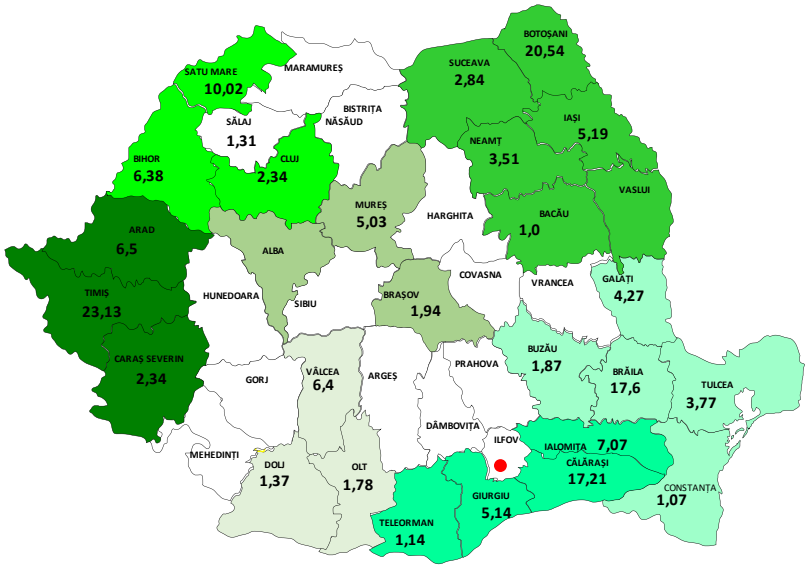

Figure 3 - The distribution by county of the surfaces cultivated with soybeans -thousand ha

Source: INS data processing

Out of the 118 countries around the world where rapeseed is grown, Romania ranks 22nd worldwide, while at the European level it ranks 2nd, having a share between 13.47% and 17.23% of the area cultivated with soybeans in European countries . At the national level, there are counties such as those in the West of the country where the average areas have reached close to 23,000 ha (Timiș). The calculated average was 11,668.5 ha. The county with the lowest average was in Constanța County with 1,074 ha, and the largest in Timiș County with 23,129 ha.

In terms of productions and yields, multi-year averages were calculated for the analyzed period, resulting in Romania taking the 4th place in the world with 2,760 thousand tons of sunflowers, the 12th place in the world in rapeseed with a calculated average production of 1,255 thousand tons, and in soybean ranks 18th in the world with a calculated average production of 383 thousand tons. From the point of view of calculated yields, Romania ranks 11th in the world with 2,514 tons/ha in sunflower, 9th in the world in rape with an average calculated yield of 2,614 tons/ha and 5th in the world in soybeans with an average calculated yield of 2,473 tons/ha.

At the national level, the average production of sunflowers varied between 234,789 tons in Dolj county and 10,537 tons in Caraș-Severin. Counties with production below 1,000 tons were not represented on the graph (Graph 1).

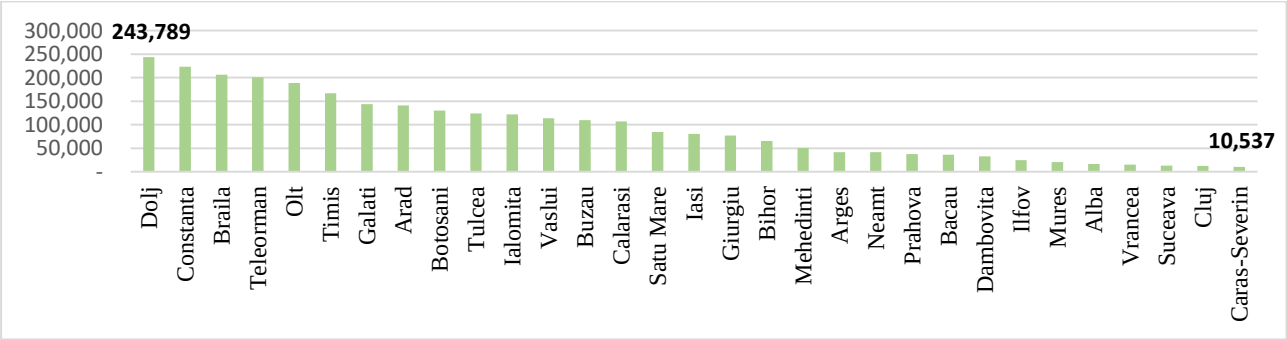

Figure.4- Average sunflower production by county (tons)

Source: INS data processing

Taking into account the analyzed data, a forecast can be made for sunflower productions using the Forecast function. In the pessimistic scenario, the forecasted productions for the period 2023-2026 for sunflower could vary between 1,937-2,089 thousand tons. In the optimistic scenario, productions could vary between 3,866 – 4,018 thousand tons (figure 5). Knowing the production potential for sunflower in irrigated and non-irrigated systems, we consider that the forecast values are plausible, considering that the forecast was made taking into account the calculated multi-year averages.

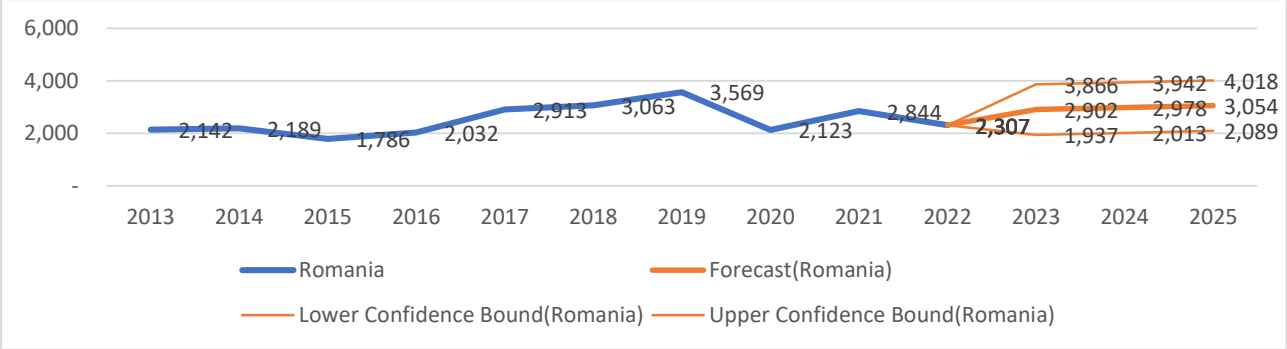

Figure 5- Sunflower production forecast for 3 years

Source: INS data processing

In rapeseed, the average production varied between 152,965 tons in Călărași County and 1,458 tons in Sălaj County. Counties with production below 1,000 tons were not represented on the graph (figure 6).

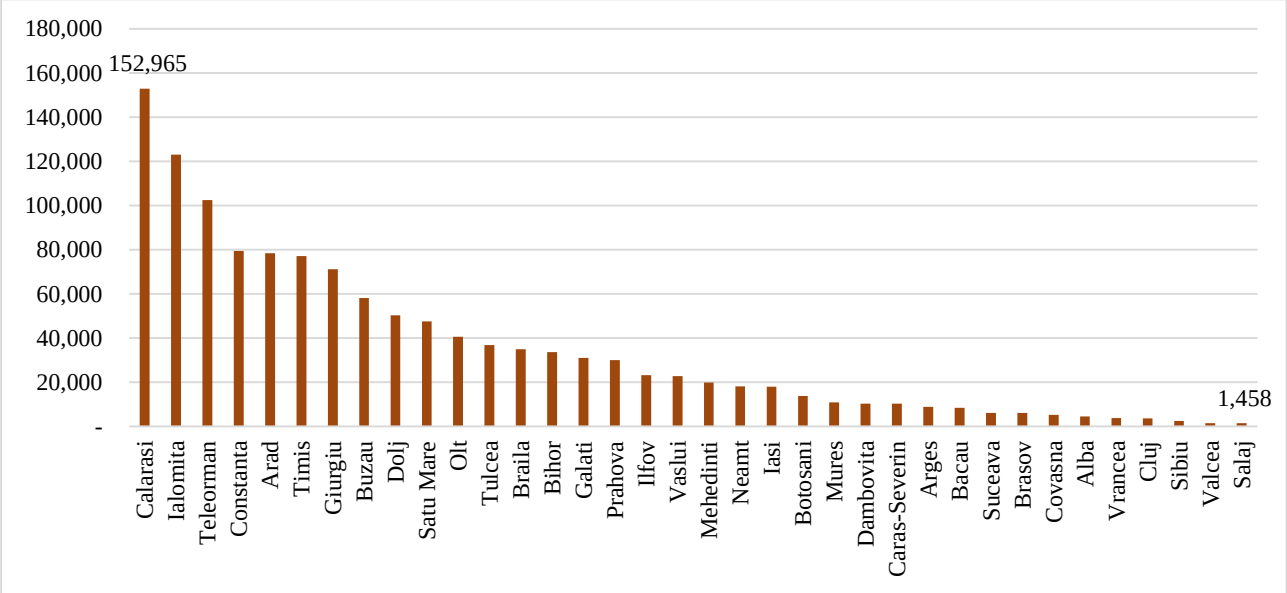

Figure 6. - Average rapeseed production by county (tons)

Source: INS data processing

Taking into account the analyzed data, a forecast can be made for rape production using the Forecast function. In the pessimistic scenario, the forecasted productions for the period 2023-2026, for rape could vary between 331-450 thousand tons. In the optimistic scenario, the productions could vary between 1,946-2,166 thousand tons, and in this case we appreciate that the forecasted values are plausible, considering that the forecast was made taking into account the calculated multi-year averages (figure 7).

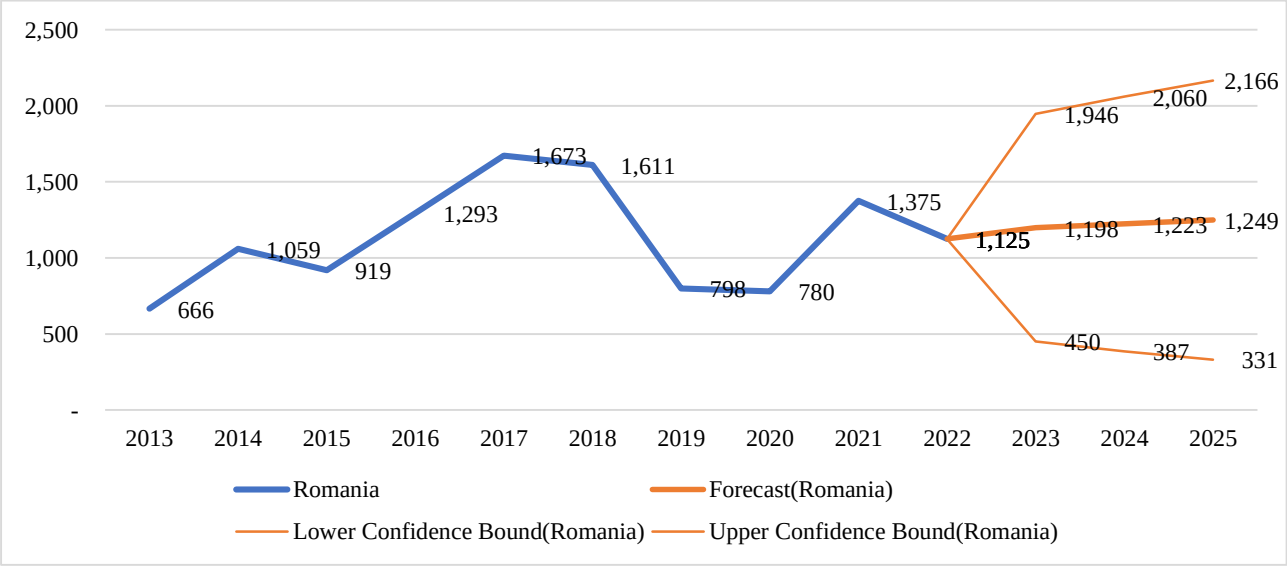

Figure 7. Rapeseed production forecast for 3 years

Source: INS data processing

For soybeans, the production average varied between 60,247 tons in Brăila county and 1,143 tons in Vaslui county. Counties with production below 1,000 tons were not represented on the graph (figure 8).

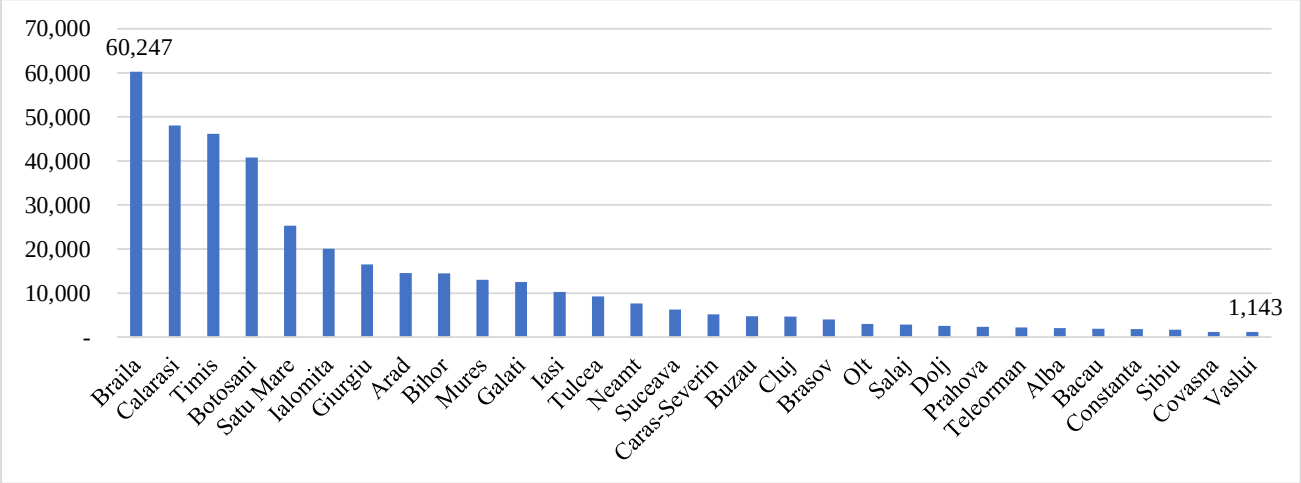

Figure 8. Average soybean production by county (tons)

Source: INS data processing

Taking into account the analyzed data, a forecast can be made for soybean production using the Forecast function. In the pessimistic scenario, the forecasted productions for the period 2023-2026 for soybeans could vary between 74-130 thousand tons. In the optimistic scenario, the productions could vary between 415-535 thousand tons, and in this case we appreciate that the forecast values are plausible, considering that the forecast was made taking into account the calculated multi-year averages.

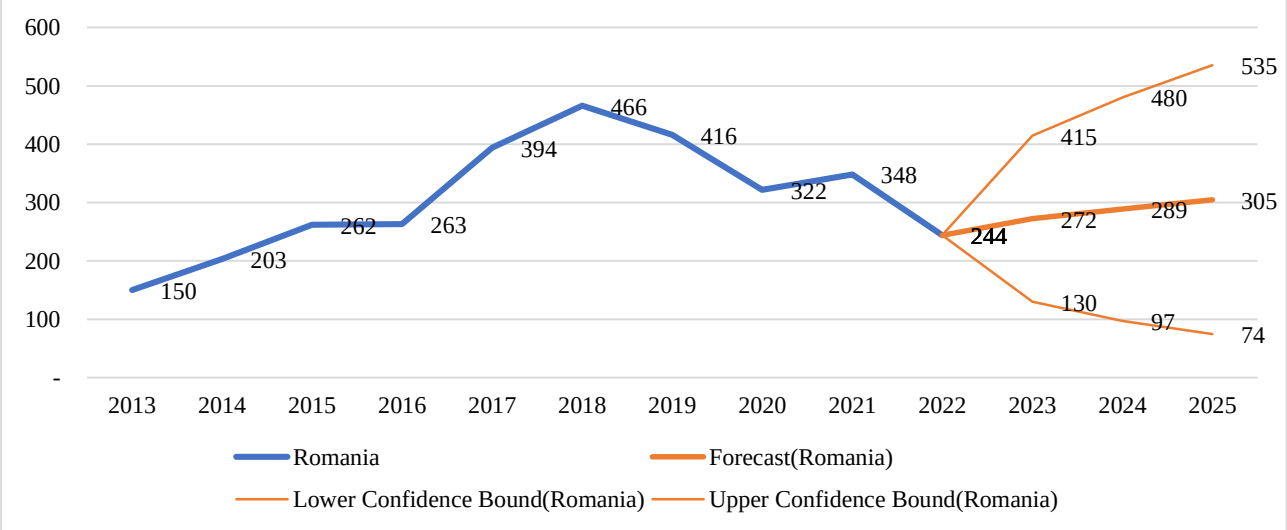

Figure 9. - Soybean production forecast for 3 years

Source: INS data processing

On the website of the Ministry of Agriculture, the list of authorized spaces for the storage of agricultural products, for each individual county, is available. In Romania, there are 5,541 authorized operators operating storage facilities, most of them being located in Muntenia, Banat-Crișana and Moldova (3,904), representing 70.46% of the total number at country level. The 22 counties in the mentioned regions are located in plain or meadow agricultural areas, mainly storing cereals. The total

authorized capacity in these 3 regions is 19.3 million tons, representing 65% of the total per country (Table no. 1).

Table 1. The situation of operators who exploit storage spaces, by geographical region

No crt	Region	No. economic operators operating storage facilities	Total authorized capacity (tonnes) of which:	Silo	Storage	Average number of operators	Capacity average/ operator
1	Maramureș	201	1,071,790	615,000	456,790	101	5,332
2	Banat-Crișana	1132	5,467,038	2,184,749	3,282,289	283	4,830
3	Oltenia	534	2,882,442	1,360,036	1,522,406	107	5,398
4	Transilvania	413	1,205,855	592,719	613,136	41	2,920
5	Moldova	838	3,942,996	1,606,463	2,336,533	105	4,705
6	Muntenia	1934	9,944,625	5,228,018	4,716,608	176	5,142
7	Dobrogea	489	5,070,091	2,331,618	2,738,473	245	10,368
TOTAL COUNTRY		**5,541**	**29,584,837**	**13,918,603**	**15,666,235**		

Source: processing according to the List of authorized spaces for the storage of agricultural products, MADR https://www.madr.ro/lista-spatii-autorizate-pentru-depozitarea-produselor-agricole.html

By county, the number of operators operating storage spaces varies from 513 in Timiș County to 5 in Sălaj County. In the Municipality of Bucharest there are two operators that exploit storage spaces, one based in Berceni and one in the Obor area. Regarding the storage capacity, it varies between 4,100,945 tons in the Jud. Constanța and 6,300 tons in Jud. Bistrita-Năsăud. The first 10 counties (Constanța, Timiș, Calarasi, Ialomița, Dolj, Teleorman, Arad, Brăila, Satu-Mare and Olt) totaling 18,941,135 tons, i.e. 63.67% of the country's storage capacity.

Constanța County ranks first with a total storage space of 4,100,945 tons and an average of 12,503 tons/warehouse, followed by Timiș County with a total storage space of 3,181,764 tons. Analyzing and comparing the data shows that in the counties of Caraș-Severin, Ialomița, Bacău, Călărași, Brăila the storage spaces are fewer but larger, and in Timiș they are more and smaller. The average storage capacity per country was calculated at 5,369 tons/storage space.

According to the information on the website of the Ministry of Finance regarding the companies, we have compiled a list of the main oilseed processing companies.

Tabel 2. Oil processing plants

TOWN	PRODUCT	TRADE NAME
Buzău	sunflower oil	Floriol Unisol Raza soarlui Ulvex Kaliakra pt export Bulgaria
Lehliu	rapeseed oil, sunflower processing of soybeans biodiesel production	
Traian	processes rapeseed sunflower and soybean seeds	
Iași	processes rapeseed sunflower and soybeans	
Slobozia	sunflower and rapeseed oil sunflower and rapeseed meal biodiesel	Bunica Marisol Ulcom
Galati	sunflower oil	Spornic

TOWN	PRODUCT	TRADE NAME
	sunflower meal sunflower pellets	
Țăndărei	sunflower oil imported from Moldova	Ultex
Carei	oil and sunflower rapeseed and soybean meal	Ardealul
Constanța	oilseeds srots and pellets of sunflower and rapeseed	Argus Sorica Tomis

Source: Ministry of Finance data processing, company websites

CONCLUSIONS

The informational system provided by this study provides an overview of the production, processing and storage capacity of oilseeds in Romania, its realization being up-to-date in the conditions where consumers are increasingly demanding regarding the quality of the seeds and the products obtained. The adaptation capacity of Romanian structures (producers, processors, warehouses, sellers) was analyzed with the help of a system of resulting value indicators, which were calculated on the basis of data taken from established databases.

The 2022 agricultural year began for Romania with a prolonged drought and very high prices for fertilizers and energy that affected especially spring crops, in this case sunflower. The start of the conflict between Russia and Ukraine upset Romanian producers, as they were not prepared to face the new socio-economic conditions. However, the sunflower situation became quite serious following the drought that continued long into the summer. According to the latest data updated by MADR (November 1, 2022), the total area affected by drought was 1,017,358 ha, and the areas affected by drought were reported nationally in 38 counties. Of the affected area, 22% (224,112 ha) were sunflowers, where productions lost at least 30% due to drought and soil dryness.

At this moment the association seems to be the solution for the adoption of coherent measures at the level of the entire sector, at the level of the county and the country. Unfortunately, this relies heavily on interpersonal relationships and capital of trust in a community, not being rooted in a contractual approach. Agricultural associations with a representative role predominate, and associative forms with an economic purpose are very little developed. Small producers must mobilize their resources, form their administrative capacities and the infrastructure necessary to access the market, and all these desired are more easily achieved within structures that allow the coordination of efforts and the division of tasks.

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THE ROMANIAN CONSUMER'S PERCEPTION ON THE WHOLE GRAINS MARKET - OPPORTUNITIES AND BARRIERS CONSUMPTION

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Abstract: *Within the internal research plan of the Research Institute for Agrarian Economy and Rural Development, runs the project entitled "Marketing studies for sustainable agri-food products and consumption behavior analysis, in the European Strategy from farm to Fork objectives context". This paper presents the main results obtained in phase 4 of the mentioned project, phase in which the whole grain market was analyzed, through specific marketing, qualitative and quantitative research methods. In order to fulfill the objectives of the research, a questionnaire was applied to a sample of 126 respondents, with the aim of determining the preferences of Romanian whole grains consumers. During the interpretation of the obtained results, similarities with other studies in the field carried out on this market were highlighted, but also particularities, specific to the Romanian market, depending on the socio-demographic characteristics of the consumer. With a slow growing specific products consumption in the reference market, it is observed that the traditional consumption habits formed since childhood constitute the main barrier to the replacement of conventional products obtained from the grains processing with whole grains products, for each of us. Moreover, regardless of the product, consumption habits and consumer perception represent consumption coordinates that are difficult to change, no matter how effective the marketing strategy is implemented.*

Keywords: *marketing, From Farm to Fork, consumer behavior, whole grain market*

JEL classification: M31, C12

INTRODUCTION

The European Commission's "From Farm to Consumer" strategy, the core of the European Ecological Pact, aims to change the current agri-food system into a fair, healthy and environmentally friendly one (EC, F2F, 2020). In this sense, one of the objectives is to promote sustainable food consumption and facilitate the transition to healthy and sustainable diets,

There are numerous publications dealing with the subject of whole grains and the health benefits of consuming this food category. The number of profile publications has increased systematically, reaching a maximum in 2021, with 410 papers, compared to the year 2000, when this indicator reached below 50 papers. In Europe, Italy is the country with many publications in the field of whole grains and the benefits brought by their consumption (Xun Xei, 2022).

The importance of the whole grains consumption and its impact on the population health o is not overlooked by the world health organizations. Thus, the Swedish National Food Agency (Swedish Food Agency, 2015), the Norwegian Dietary Guidelines (The Norwegian Dietary Guidelines, 2014), the US Department of Agriculture (2015) support the whole grains consumption recommending to community members that at least half of the daily amount of specific grains and products should be represented by whole grains.

Specialized studies also emphasize the importance that whole grains and derived products choice is sustainable and suitable not only for the health of the population but also for the environment. Thus, the whole grains production has a low impact on the environment, with specific crops requiring less water compared to other field crops, recording a high yield. Also, the cultivation of whole grains generates a low level of greenhouse gas emissions (Nordic Council of Ministers, 2023).

According to the latest report published by Market Data Forecast, an increase in the whole grain market is expected up to 5 billion USD, by the year 2027. In Romania, the consumption of whole grains remains low according to FAO statistical data and other specialized studies.

MATERIALS AND METHODS

This paper presents the results of the quantitative research carried out within the project "Marketing studies for sustainable agri-food products and analysis of consumption behavior, in the context of the objectives of the European Strategy From farm to Fork", in order to outline the profile of the consumer of whole grains.

The research methodology is represented through a qualitative analysis of the whole grain market, from the supply, demand, price point of view, both in the agricultural and industrial production stage. World trade in the whole grains market was studied in order to identify the degree efficiency degree of the interest market. Also, official documents, European directives and studies carried out by specialists were analyzed. The analysis of these documents was useful for substantiating the objectives and hypotheses of the research.

The instrument used at the level of quantitative research is a survey, which includes 26 questions, in which 126 respondents participated (93 women and 33 men), aged between 18 and 65 years. Consumers residing in Bucharest, Timisoara, Craiova, Neamţ, Teleorman, Cluj, Otopeni, Călăraşi, Ploiesti, Vaslui, Arad, Suceava, Brăila, Sibiu, Braşov, Constanţa, Pitesti, participated in the research. The questionnaire includes filter questions, questions with one or more answer options, open questions, questions with different measurement scales as answer options. The collection of responses from interviewed consumers was carried out online, using the Google Forms platform, between February and March 2023. Regarding the centralization stage (database creation), coding and interpretation of consumer responses, the analysis program was used SPSS statistics.

RESULTS AND DISSCUSION

In order to achieve the whole grains market research purpose and determining the opportunities and barriers to the development of this market in Romania, a series of objectives (O) and hypotheses (I) were identified, such as:

• **O1:** Identifying the awareness degree of the whole grains meaning: the advantages offered by the consumption of profile products compared to products on the same market, obtained from conventional grains, the types of known whole grains and their frequency of purchase;

H1: According to other reference studies (Prodanovic et al., 2023), most of the respondents are aware of the high content of whole grains in essential antioxidants as well as vitamins and are very interested in the positive aspects that the consumption of whole grains brings it to the level of the respondents' health status. ***Thus, a higher proportion of respondents aware of the benefits brought by the consumption of whole grains is estimated, compared to respondents who are not aware of these benefits.***

Following the centralization and interpretation of the results obtained from the conducted research, the respondents know to a high extent the meaning of the concept of whole grains, complete or not: 37,1% of them correctly identified the answer variants according to which whole grains are richer in carbohydrates, fiber healthy, vitamins, minerals compared to conventional cereals and I know that these products are mainly recommended by nutritionists. 20% know the lower degree of

processing of whole grains, while 5.7% of respondents mistakenly chose the option according to which whole grains are as healthy as classic grains (question Q6). Respondents know most of the whole grains offered as answers to the reference question, as follows:19.9% oats, 13.7% brown rice;14.4% buckwheat and barley; 12.3% quinoa, 9.6% millet; 7.5% bulgur; 8.2% all. A correlation can thus be deduced between the types of whole grains known and their frequency on the supermarket/hypermarket shelf, as such or in the composition of some gourmet products (question Q7). Thus, hypothesis 1 of the present research is validated.

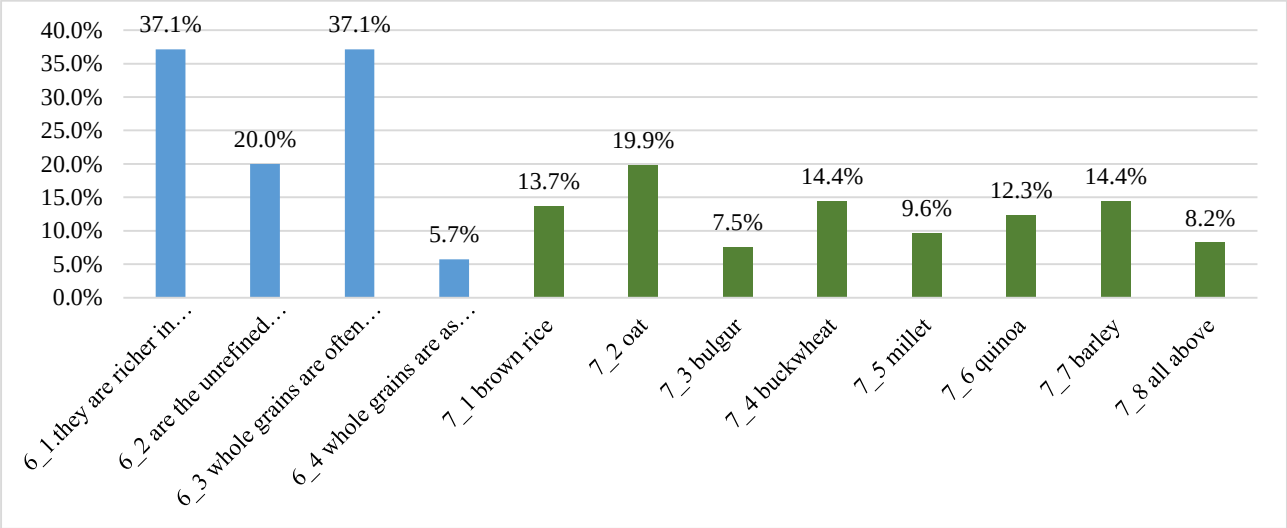

Figure 1. H1 – Whole grains concept and types awareness

• **O2:** Estimation of the frequency of consumption of the main products obtained from the processing of whole/conventional grains (flour, sorghum, breadcrumbs, bread, pasta, rice, quinoa, etc. snacks) and the ways of using these products;

H2: According to the data of the National Institute of Statistics, time series Average monthly consumption (kg/inhabitant) in the main industrial categories on the whole grains market, in Romania, in the period 2011-2021, bread and bakery products are still the most consumed category of products preferred by consumers, along with sorghum and flour. However, slight changes are observed in profile consumption trends. ***Thus, a higher share among respondents of those who purchase products from conventional cereals is estimated, compared to those who choose whole grains. Among respondents who choose whole grains, they prefer pasta and rice.***

The results of the present research show the average score calculated for each individual product category. Thus, a higher average score is observed for refined grain products (question Q10) such as flour, bakery products, spread and snacks. In other words, the identified products are the products that are easily accessible to consumers, both in terms of distribution strategy and prices, on the one hand, but also intensively promoted, if we refer to bakery products, not so much recommended by nutrition specialists, but with an obvious presence, both by the number of specialized units (patisseries, bakeries) and on store shelves. On the other hand, at the level of products obtained from whole grains, we observe a high average score for pasta and rice (question Q11). At the opposite pole, there are products such as wholemeal breadcrumbs and wholemeal snacks, categories whose price is significantly higher compared to the price of commercial variants or whose provenance is not local (graph 2). Thus, hypothesis 2 is validated.

Figure 2. H2 – Consumption frequency of products obtained from conventional cereals vs. whole grains

•O3: Identification of some main product characteristics from the perspective of which consumers differentiate whole grains from conventional ones (price, taste, texture, intake of vitamins, fibers, minerals, etc.);

H3: According to other relevant publications, following research carried out on the whole grains market, it is shown that the respondents differentiate whole grains from conventional ones in terms of the degree of processing, fiber and mineral intake, but also in terms of of taste (Foster et. al, 2020). Also, following an analysis of the prices charged on the profile market, a fluctuation of them is observed, especially depending on the manufacturer and brand, and less depending on the type of grain used (conventional or whole). ***Thus, it is estimated that the respondents believe that whole grains differ from conventional ones at the level of product characteristics such as: fiber intake, minerals and vitamins, taste.***

Following the answers analysis, provided by consumers to question Q9 in the questionnaire, in the respondent's opinion, whole grains differ from refined ones in terms of: high content of fibers, minerals, vitamins (25.20%), taste (19, 4%), the price (16.50%) but also the degree of satiety obtained (14.60%) (graph 3). At the level of the research sample, hypothesis 3 is validated.

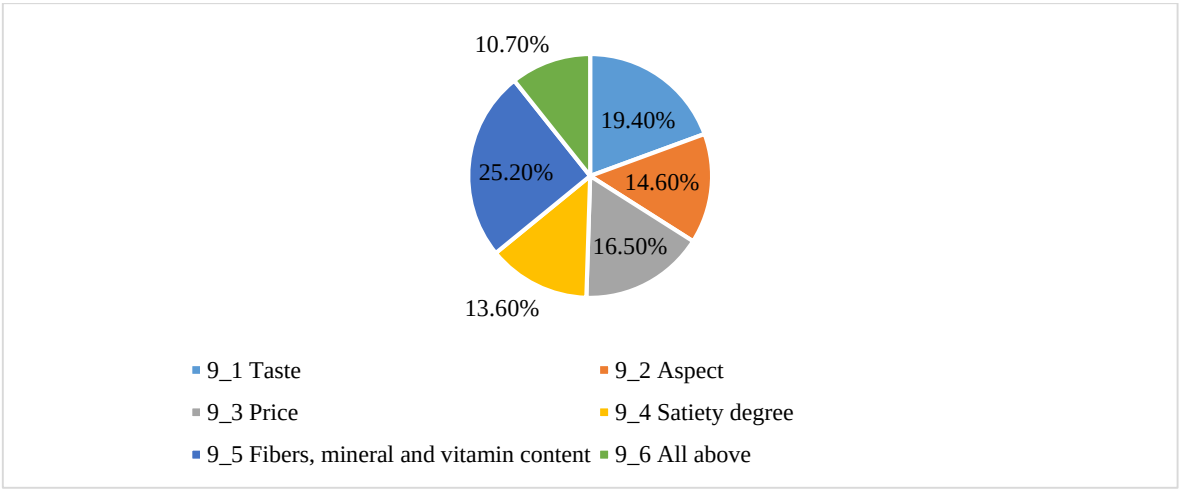

Figure 3. H3 – Respondents' perception of the difference between conventional vs. whole grains

• **O4:** Estimation of the optimal price range from the respondents' perspective for the whole grains products purchase, depending on the type of the product;

H4: Analyzing the average prices of the main categories of products obtained from the processing of whole grains, it is observed that there are no major differences between whole grain and conventional grain products. For example, regarding the bread category, depending on the brand chosen by the consumer, there are no significant differences between the products of the same manufacturer, with the same characteristics. Moreover, with our own brands we encounter situations where the price of black or rye bread ends up costing 0.85 lei/piece less than classic bread; The price varies in this market depending on the manufacturer and the brand in particular. The lowest prices are recorded in industrial categories such as: bread, flour and products obtained from whole grains with a low degree of processing (flakes, bran). The highest prices are recorded in industrial categories such as: breadcrumbs and wholemeal, wholemeal pasta, wholemeal rice. Other studies in the field show that more than the price, inflation is an external factor that determines the purchase decision on the whole grains market (51%). According to the same sources, 37% of younger consumers consider price as a barrier to consumption in the niche market (Gelski J., 2023). ***Thus, it is estimated that a majority of respondents write the optimal price for profile products in the existing range on the whole grain products market. It is mentioned that in the first part of the present research we analyzed the price level of products processed from whole grains.***

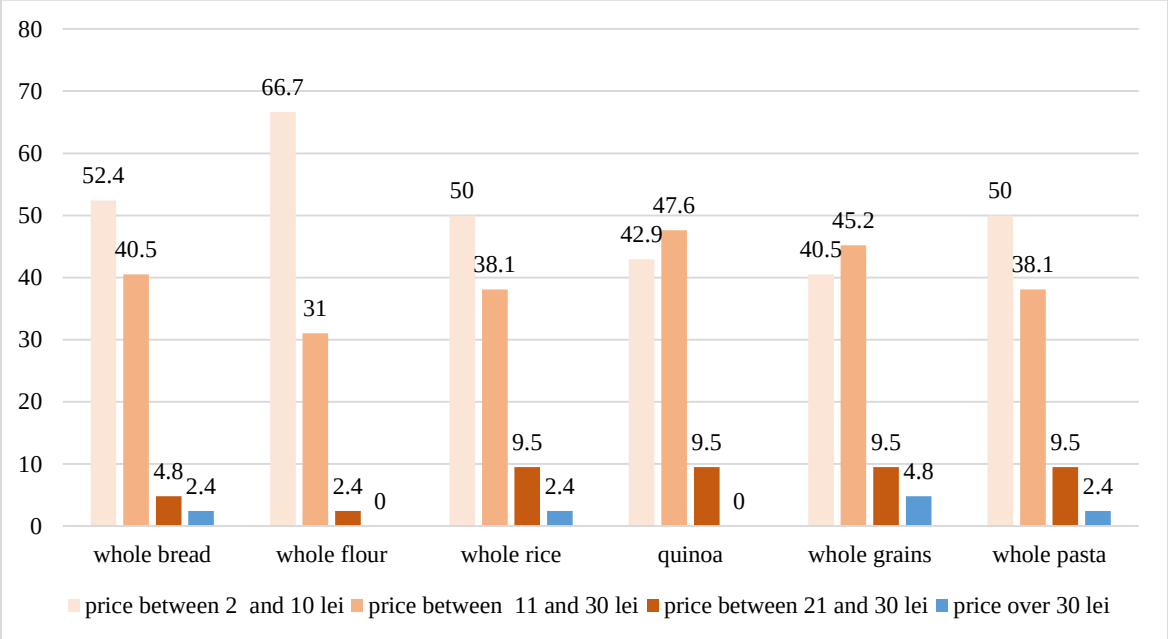

Figure 4. H4 – Respondents' perception regarding the optimal price for the main categories of whole grain products

Regarding the research results, it can be observed that the majority of respondents are willing to pay to purchase wholemeal bread between 2 and 10 lei for the purchase of wholemeal bread (52.4%), wholemeal flour (66.7%), wholemeal pasta (50%), in other words the respondents chose the first price range. There are also categories for which they are willing to pay a higher price, respectively, between 11 and 30 lei, for quinoa (47.6%) and whole grains (45.2%), i.e. for products they do not buy so often, according to the responses recorded to question Q11 (figure 4). At the level of the research sample, hypothesis 4 is validated.

• **O5:** Establishing the main sources of information regarding the coordinates of the cereal market, as well as of a balanced food style;

H5: According to other studies published in the field, 43% of the respondents choose to look for information about the benefits of whole grains online, while only 14% of the sample obtain information by consulting a specialist in the field (nutritionists, medical specialists, etc.) (Foster et al, 2020). ***Thus, a high frequency of responses related to the "internet" or "health experts" variants is estimated.***

At the interest sample level, the Internet, including social networks, is the main source of information, for a percentage of 40.50%. This shows the undeniable usefulness of campaigns or short articles on the ways of using and the benefits of said profile applications, possibly on communication channels such as Facebook or Instagram, social networks more accessible to consumers, regardless of age or education level. An important weight declares the fact that the source of information is represented by health experts (27%), something positively appreciated. Hypothesis 5 is validated at the level of the present research (figure 5).

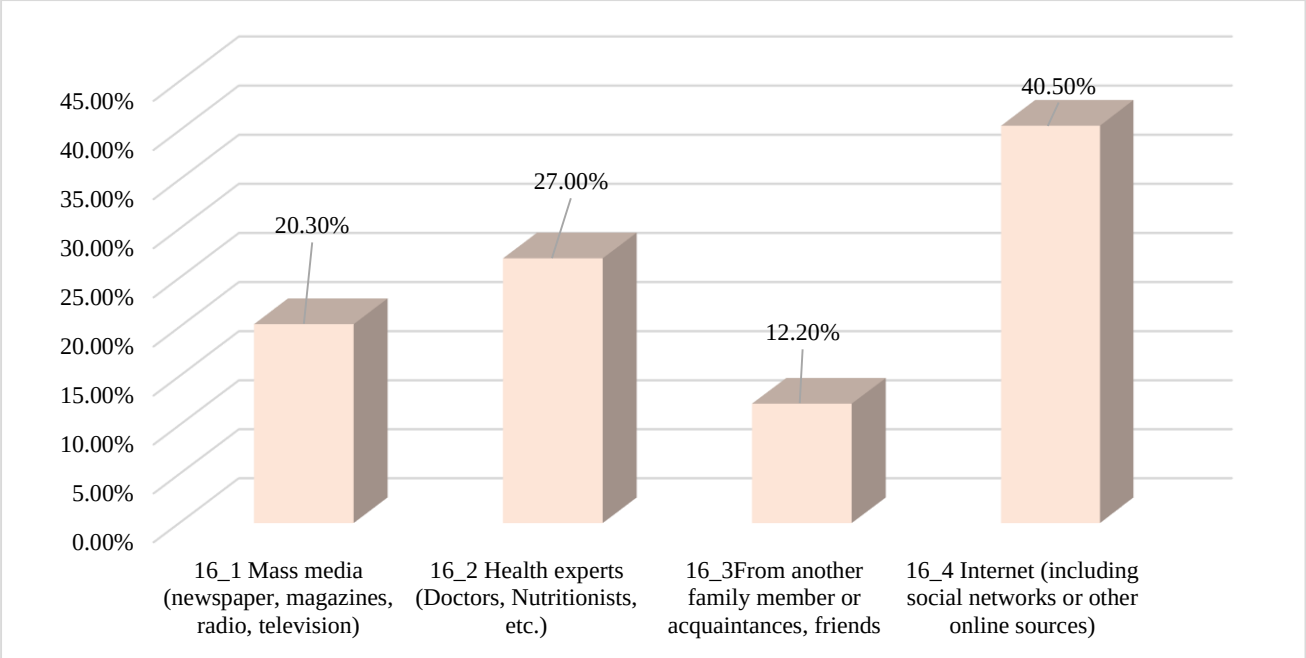

Figure 5. H5 – Respondents' main sources of information for a healthy eating style

• **O6:** Identifying the socio-demographic characteristics of consumers who choose to purchase whole grain products, with a higher frequency (age, social status, level of income and education)

H6. Research in the field shows that younger respondents, aged between 35 and 44, as well as those aged over 60 more often choose to consume whole grain products three times a day. It also shows a higher share of those who consume whole grain products more often from the middle social class (non-manual), compared to those enrolled in other social classes, with an activity that requires more physical than intellectual effort (Lang B., Jebb S.A., 2003). ***Thus, a higher share of women between the ages of 35 and 44, graduates of a form of higher education is estimated among those who purchase whole grain products with a higher frequency.***

Following the centralization of consumer responses to reference question Q8, as a central tendency, whole grains are consumed by the studied community occasionally (54.8%), with only 11.9% of respondents choosing to consume these types of products daily.

Regarding the above hypothesis, following the calculation of some reference statistical parameters (table 1), the chi square test (a value lower than 0.005 shows the existence of the correlation between the variables) and the contingency coefficient (shows the intensity of the link between the variables, where it is the case). Thus, age, income level and professional status influence the frequency of consumption of whole grains. Thus, respondents aged between 18 and 35 years consume whole grain products more often than respondents aged between 35 and 49 years, who usually occasionally consume profiled products. Also, respondents with a better financial situation, with incomes above 4,500 lei, show a higher frequency of consumption of whole grains, this being weekly or daily. Those with incomes between 1500 and 3000 lei occasionally consume reference products.

Table 1. Tested correlations through Hypothesis 6

Independent variable	Dependent variables Consumption frequency	
	Test hi^2	Contingent coefficient
Gender	0,750	-
Age	0,000	0,471
Education level	0,492	-
Income level	0,004	0,369
Professional status	0,000	0,431

Source: SPSS model results

Last but not least, the professional status influences the consumption of whole grains, in the sense that people registered in the retired category purchase products from this category less often, compared to those who are employed. Following the calculations, the value of the hi2 test shows that the gender of the respondents and the level of education do not significantly influence the frequency of consumption of whole grains (values above the threshold of 0,005), while the professional status and age of the respondent's influence with a medium to high intensity the variable studied (values of the contingency coefficient between 0,431 and 0.471). Thus hypothesis 6 is not validated in terms of socio-demographic characteristics of the respondents such as gender or level of education, but it is confirmed for other characteristics, such as age, income level or professional status.

CONCLUSIONS

The present work presents, using a varied methodology, the whole grain market in Romania, at the global, European and national level, as well as the results of the quantitative research obtained with the aim of determining the preferences of whole grain consumers in Romania.

It is concluded that Romanians are generally informed about the meaning of the concept of whole grains, the differences between conventional and whole grains, their particularities in terms of the health benefits brought by consumption, but also the representative types of grains for the category of integral It is also recognized by the respondents that the intake of minerals, vitamins and fiber, as well as the taste, are the main differences between refined and whole grains. In general, whole grains are occasionally consumed by the 126 respondents who make up the current sample, they remain traditionalists, especially regarding the consumption of bakery products, white flour or spelt. When

they choose to purchase profile products, whole grain pasta or whole grain rice are among consumers' preferences. Most respondents choose whole grain products for breakfast or snacks and do not take into account when cooking whether the raw material is based on whole or refined grains. They choose whole grain products to diversify their diet when fasting or dieting. Most of the respondents do not use smart apps to shape their dietary lifestyle, although some of them would be willing to use them in the future, and a lower share of the sample uses them. This shows the fact that although at the level of European society, including in Romania, we are in the midst of a digitalization process, the tools related to information technology currently represent another barrier at the level of the interface between the consumer and the equipment. The Internet and health professionals are two sources of information regarding the benefits of including whole grains in the daily diet identified among respondents. From the price point of view, the respondents believe that the purchase of whole grain products involves a higher cost, compared to conventional products. However, following the analysis of the market at the price policy level, it is shown that this statement reflects an erroneous perception, rather than the reality, as there are whole grains on the market produced at a price even lower than those in the whole grain category. As for the category of bread preferred by the respondents, the leading positions in the ranking are occupied by whole wheat or rye sliced bread, ready-packaged white sliced bread and black bread. Therefore, there is an inclination towards products that comply with hygiene standards, ready-packaged, consumption behavior that has intensified with the Covid-19 pandemic. Also, from the point of view of easy access to the profile products, it is more convenient for consumers to buy their bread from the supermarket or hypermarket, with their other purchases, when they finish the working hours, than to go to other profile units, of the "bread on the hearth" type. Bakeries are fewer in number than grocery stores and typically do not have extended hours of operation like convenience stores do.

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STUDY ON CONTINUING VOCATIONAL TRAINING FOR RURAL ACTIVITIES

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Abstract: *The study aims to analyze the modalities of vocational training in rural areas in order to identify systematic contents that are relevant to define the perception of the general role of continuing vocational training in the economic and social development of rural areas, the functions of continuing vocational training in the complex process of transformation of the agri-food economy, and the position of vocational training in Romania. For the study, the qualitative analysis method was used to establish the terms of the concept of continuing vocational training, to identify other researches that have investigated continuing vocational training of adults, to identify priority areas of analysis for capturing training needs for rural activities. The results highlight that lifelong learning should be addressed as an objective need, especially in the field of agriculture, leading to increased labour productivity, reduced vulnerability and not necessarily job creation.*

Keywords: *vocational training, agriculture, productivity, skills, occupational standard*

JEL classification: I20, I25, J20, J24, J43, O52, Q10, R10

INTRODUCTION

The rural environment refers to the practice of agricultural activities (crop farming: field crops, vegetables, fruit, vineyards, etc.; animal husbandry: livestock farming) and non-agricultural activities (industry, crafts, rural trade, etc.).

From an economic perspective, agricultural activities are predominant in rural areas compared to non-agricultural activities. The existence of a relevant percentage of inactive people in rural areas compared to the employed population, the low level of education in rural areas compared to urban areas, and the existence of unemployed people in rural areas in higher numbers than in urban areas, demonstrate that rural business environment has a low capacity to create jobs, *although rural areas are not lacking in resources*. (Project POSDRU/135/5.2/S/129054, 2015).

Structural transformation processes in the economy due to the health crisis, the energy crisis, climate change, changes in the labour market (ageing population, changes in supply chains, freedom of movement of labour), etc., also require transformations in the development of skills to adapt to these challenges. (Council of the European Union, 2021)

For the present study we will address continuing vocational training of adults for specific agricultural activities, due to the role that agriculture has in providing agricultural goods and services to the population, in the economy and the role it plays towards the environment. "*Societal, technological, digital, economic and environmental challenges"* require a *"high number of professional transitions"* (Council of the European Union, 2021).

MATERIALS AND METHODS

The approach to the theme of continuing vocational training of adults aims to promote vocational education and training for maintaining and developing competitiveness in rural Romania, but also to highlight the need for vocational training of adults in agriculture and rural areas due to

societal, economic, climate change and other challenges, in order to ensure "sustainable competitiveness, social equity and resilience" (European Commission, (2021).

For the present research we will use as research methods quantitative analysis of EUROSTAT statistical data to highlight the participation of the Romanian population in education and training compared to other EU-27 countries; INS statistical data to reveal the importance and necessity of vocational training for those working in agriculture through the calculation of income indicators, etc. The analysis starts from the relevance of some context indicators for the period 2014-2022, in order to justify the approach undertaken in this paper.

For the topic addressed, information available from studies, European documents, legislation, strategies, etc. was used.

RESULTS AND DISSCUSION

The rural environment in which about 46% of Romania's population lives is increasingly becoming a priority for raising education levels. Romania's rural areas have substantial gaps to make up in the field of adult vocational training compared to the European Union countries. The fact that we achieve only 25% of the European average level of agricultural factor income (income from agricultural factors in relation to annual work units (AWU)) is also due to the deficient vocational training of those now working in agriculture.

The socio-economic context: employment, education and unemployment in rural areas

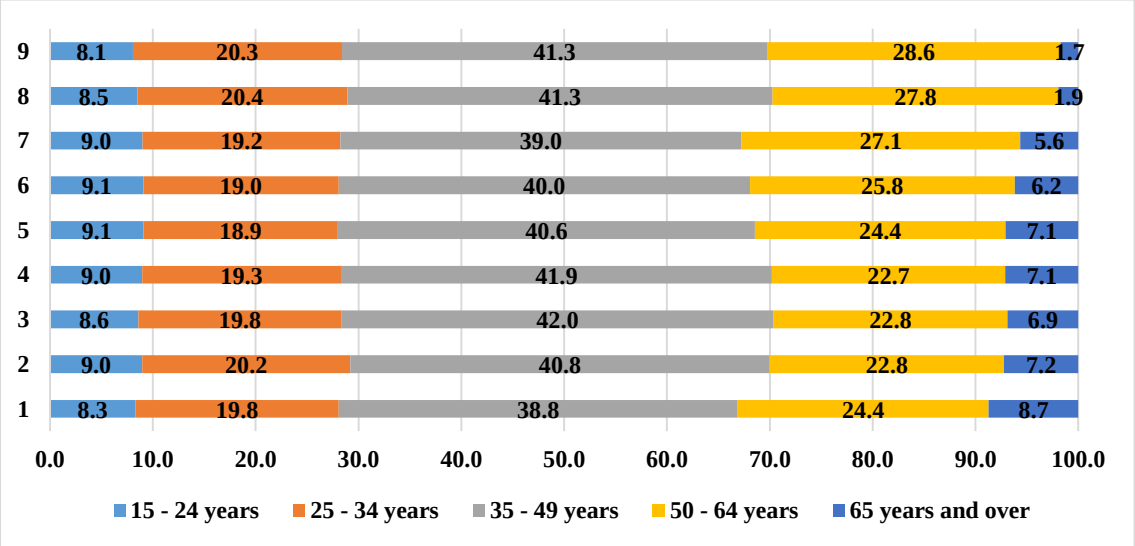

Figure 1. Employed population by age group in rural areas (%)

Source: INSSE, Tempo-online data, AMIGO - Employed population by age group and residence background, (Tempo_AMG110T_23_5_2023)

Occupied population by age group in rural areas during 2014-2022: the occupied population in rural areas decreased by 746 thousand people (-18.9% in 2022 compared to 2014), and the changes in the age group structure are as follows:

- age group 15-24 years: reduced by 60 thousand people, (-18.3%);
- age group 25-34: reduced by 130 thousand persons (-16.7%);
- age group 35-49 years: decreased by 238 thousand persons, (-15.5%);
- age group 50-64 years: decreased by 28 thousand persons, (-2.9%;
- age group 65 and over: reduced by 290 thousand persons, (-84,4%).

In this age group in 2021 compared to 2020 the population decreased by 153436 persons (-71,4%). Figure 1.

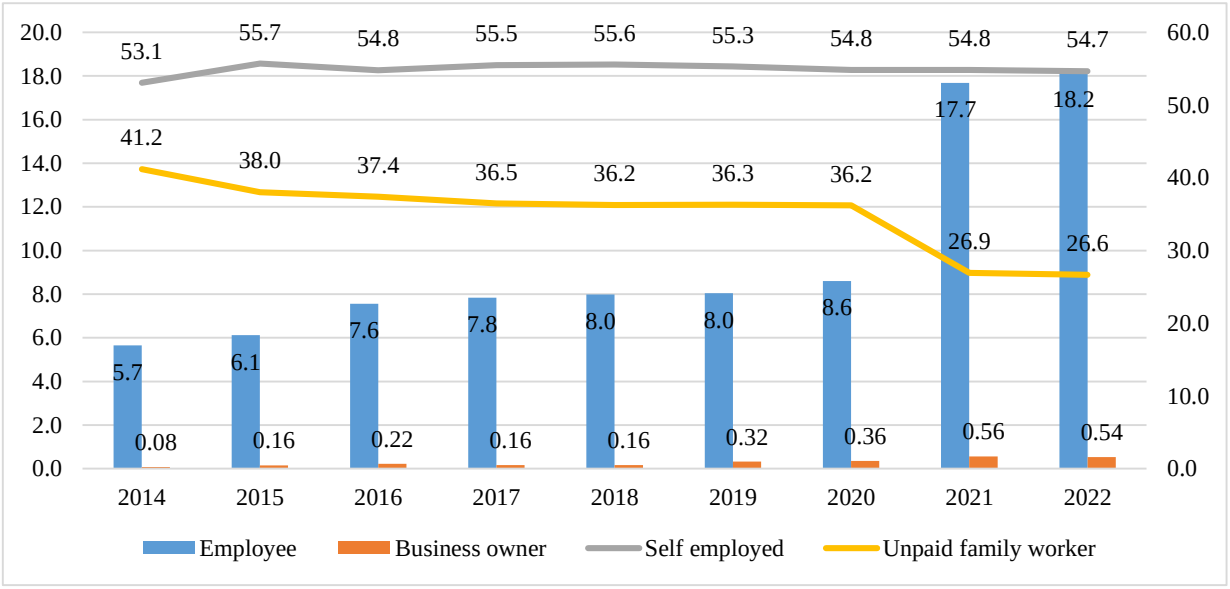

Figure 2. Population employed by occupation by occupational status in rural areas (%)

Source: INSSE, Tempo-online data, AMIGO - Population employed by activity, by occupational status and residence background, (Tempo_AMG110T_23_5_2023)

Rural population employed in agriculture by occupational status in 2022 compared to 2014: the changes that occur in the structure of the employed population are as follows:

The rural population employed in agriculture decreased by 1526 thousand persons (- 66.0%). The structure of the rural population employed in agriculture is made up of employees, their number increasing by 12 thousand (+ 9.2%), an increase of 2 thousand persons (+120%) in the category of employers, a decrease of 797 thousand (-65%) in the category of own-account workers and a decrease of 743 thousand persons (-78%) in the category of unpaid family workers. Figure 2

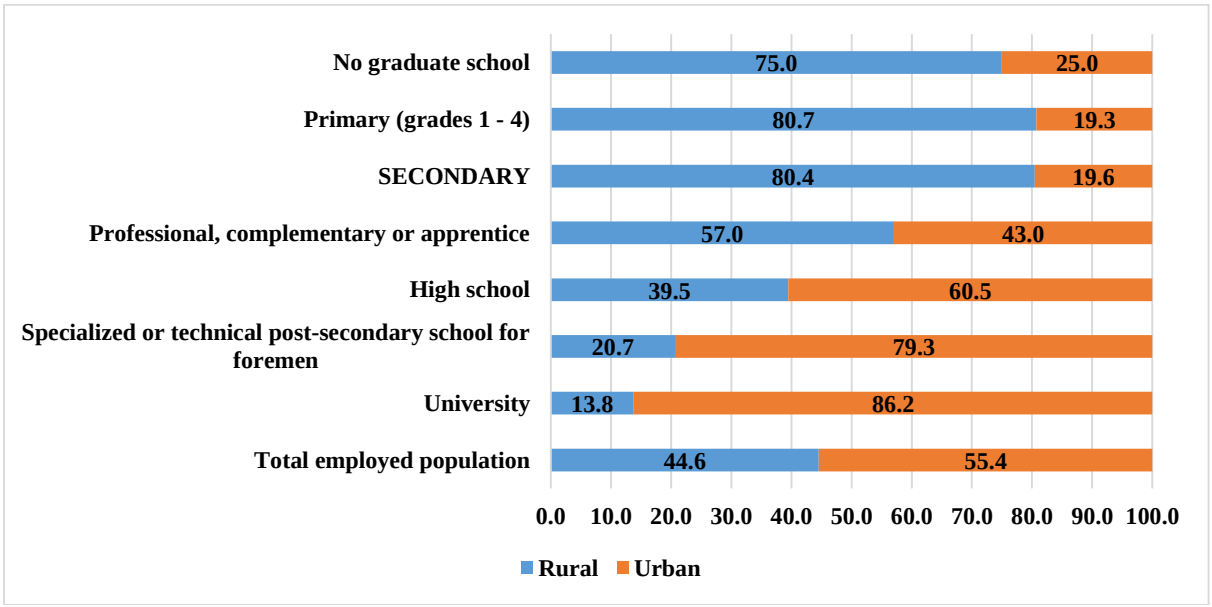

Figure 3. Employed population by occupation group, education level and residence background, average 2014-2021 (%)

Source: INSSE, Tempo-online data, AMIGO - Employed population by occupation, education level and residence background, (Tempo_AMG110T_23_5_2023)

Education level in rural areas: the rural employed population for the period 2014-2022 is on average 44.6%. Compared to urban areas, in rural areas 75% of the employed population has no schooling, 80.7% has completed primary school, 80.4% secondary school and 57% of the employed population has completed vocational or apprenticeship school. As the level of education increases, the proportion of the rural employed population participating in education decreases. In this respect 39.5% of the population graduated from secondary school, 20.7% from post-secondary education and about 13.8% of those with tertiary education, employed in rural areas. Figure 3.

Income from agricultural factors: compared to the EU-27 average, the income of agricultural factors per annual work unit (AWA), for the period 2014-2022, was on average 4983 Euro compared to 18576 Euro as the EU-27 average, with Romania ranking last compared to the other countries. Income from agricultural factors is the income generated by agriculture, which is used to remunerate borrowed/rented factors of production (capital, wages and land rents) and own factors of production (own labour, capital and land). (European Commission, 2022).

Unemployment in rural areas: according to ANOFM data on 30 September 2023 the number of unemployed registered in rural areas was 161248 people of which 73387 women and 87861 men, compared to urban areas where out of a total of 68041 people 37893 were women and 30148 men. ANOFM has proposed for 2023 the organization of 1849 vocational training programs. Vocational training programs are organized for the unemployed, programs for key skills (literacy and numeracy, digital skills), etc. Training programs are organized for the following occupations: commercial worker, digital skills for using information technology as a learning and knowledge tool, security agent, cook's assistant, data entry, processing and validation operator, green spaces caretaker, human resources inspector/reporter, barber, communication skills in Romanian, cook, manicurist, baker, baker, baker, maid, maid, cleaning woman, etc. (ANOFM, 2023).

Participation in education and training: Compared to the EU-27 countries, in Romania participation in education and training is 7.6 percentage points lower than the EU-27 average (1.9% in Romania compared to 9.5% in the EU-27). In Romania the participation rate of women in training is lower than that of men, compared to the other EU countries. The participation rate of women is, on average, 10.3% compared to the participation rate of men of 8.7%. Figure 5 and Figure 6.

Romania (1.9%) and Bulgaria (1.9%) have the lowest participation rates in education and training compared to the other EU-27 countries. Significant participation rates in education and training, for the age group 25-64, are found in Denmark (28.5%), Switzerland (28.5%), Sweden (28.3%), Finland (25.6%), Iceland (25.1%), Norway (19.4%), the Netherlands (19.4%), Austria (14.2%), France (12.6%), Spain (11.2%), etc. Figure 5 and Figure 6.

In the project *"Models for encouraging investment in continuing vocational training at firm level"*, carried out by the National Institute for Scientific Research in Labour and Social Protection, a number of factors are identified which explain the development of vocational training. According to the study, the determining factors for the evolution of vocational training in Romania are: the level of economic development, technological and competitiveness developments, the level of skill shortages and gaps, the existing cultural model, the legal and institutional framework, etc. (INCSMPS, 2014).

European and national policies

The European Commission defines the European Education Area through six components which relate to quality of education and training, inclusion, the double digital and green transition, teachers and trainers, higher education and the geopolitical dimension (2021-2030), and as targets it states that "*by 2025 at least 47% of adults aged 25-64 should have participated in learning activities*

in the last 12 months. Romania has set a target that 17.4% of adults should have been involved in learning activities in the last 12 months, which is 3 times higher than in 2016" (European Commission, 2023).

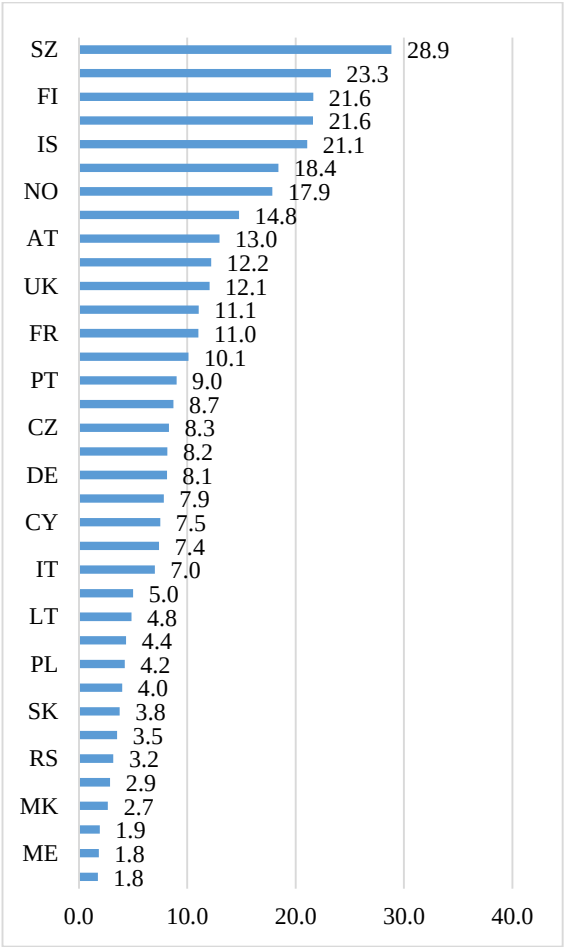

Figure 5. Education and training participation rate of men, 25-64 years (%), average 2007-2022

Source: EUROSTAT, Participation rate in education and training (last 4 weeks) by sex and age [TRNG_LFSE_01__custom_6779398] (accessed 26/04/2023 23:00)

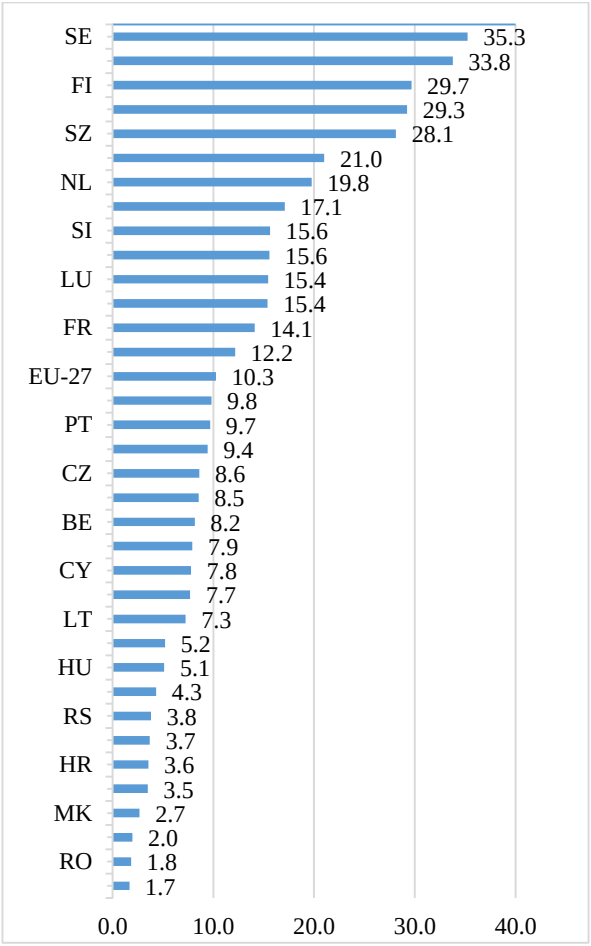

Figure 6. Education and training participation rate of women, 25-64 years (%), average 2007-2022

Source: EUROSTAT, Participation rate in education and training (last 4 weeks) by sex and age [TRNG_LFSE_01__custom_6779398] (accessed 26/04/2023 23:00)

In the National Strategy for the professional training of adults, a project developed by the Ministry of Labor and Social Solidarity, is established a level of participation in the lifelong learning process of 12% until the end of 2027 (compared to 5.9% in present), increasing the adult participation rate throughout life by "intensifying and improving formal, non-formal and informal learning opportunities". (MMSS, 2023).

The main institutions with a role in the implementation of the National Employment Strategy for Agriculture, with a focus on green transition, digitalization, modernization of work activity, promotion of lifelong learning, increasing the resilience of the workforce to risk situations are: the Ministry of Labor and Social Solidarity (MMSS), the Ministry of National Education (MEC), the National Authority for Qualifications (ANC), Ministry of Agriculture (MADR), National Agency for Employment (ANOFM), Sectoral Committees (SC) Social Partners (SP), etc. (MMSS, 2023).

Systematic contents: Continuing education and adult education are forms of lifelong learning, as stipulated by the Romanian National Education Law. The terms found in various publications, legislative documents, etc., defining adult education are basic education, lifelong learning, continuing education, etc. (National Education Law, 1/2011; European Commission, 2023).

The need for vocational training for agricultural activities is due to the place of agriculture in the economy and in the European Union; due to the development of science and technology, which has led to a number of necessary changes in the professional skills of farmers *("digital transition");* due to the diversification of agricultural products and activities; due to the modernization of the agricultural sector, the processing and marketing sectors for agricultural products; development of entrepreneurship, market-oriented business, which requires economic, management and marketing skills in agriculture; sustainable land management and environmental protection; application of environmentally friendly technologies and use of renewable energy, *("transition to an environmentally sustainable, circular and climate neutral economy")* etc. (Council of the European Union, 2021)

Active and inactive people in rural areas, who practice agriculture, vegetable growing, fruit growing, wine growing, animal husbandry, etc., have acquired knowledge in the family, at work or by learning from others (internet). Their assessment and certification can be based on occupational standards.

Agriculture, fish farming and fishing includes 32 occupations for which the following occupational standards exist: farmer, organic field crop farmer, agricultural combine, agricultural business manager, livestock production farmer, horticultural production farmer, vegetable production farmer, vegetable grower, qualified irrigation worker, agri-tourism farm worker, agricultural mechanic, large crop farm mechanic, farm mechanic in animal husbandry, farm machinery mechanic, agricultural tractor driver, agribusiness consultant, technical consultant in cereal, technical plant and fodder production, vine grower, fish worker, vegetable grower, fruit grower, agro-zootechnical farm manager, cattle breeder, pig breeder, poultry breeder, beekeeper, sheep farmer, etc. (ANC, 2023). In the period 2014-2023, for occupations in agriculture, the standard for the occupation "Crop and livestock farmer" has been updated, and the measures foreseen in the *"National Employment Strategy 2021-2027"* specific to both agriculture and the rural environment refer to "*developing and updating occupational standards in line with new technological changes and the digital agenda*", and to "*reducing employment in subsistence agriculture and facilitating the relocation of this human resource to non-agricultural activities*". (MMSS, 2023).

Training modalities: in accordance with Ordinance no. 129/2000 on vocational training of adults, art. 8, paragraph 2 and paragraph 3, supplemented by Law 167 of 2013, vocational training of adults (organized in forms other than those specific to the national education system), includes: *initial vocational training* (provides the necessary preparation for acquiring the minimum professional skills required for obtaining a job) and *continuing vocational training* (is subsequent to initial training and provides adults with either the development of professional skills already acquired or the acquisition of new skills).

Vocational training is carried out for: induction, qualification/requalification, further training/specialization, and the skills acquired are obtained *formally* (by completing an organized programme), *non-formally* (by doing a specific activity at work or by self-training) or *informally* (non-institutionalized training methods: family, company or professional environment, etc.). (Ordonata nr. 129/2000 privind formarea profesională a adulților, art. 8, alin. 2 si alin 3, completata de Legea 167 din 2013.

The functions of vocational training: vocational training promotes personality development, orients the adult towards a new way of solving problems, ensures the acquisition of skills and abilities for adaptability to challenges, educates, cultivates individual skills and interests to participate actively in society, etc. (Natalia Luta, 2018).

Occupational standard: the occupational standard (OS) is the document that specifies the competences and the quality level associated with the results of the specific activities of an occupation (ORDER No. 3712/1.721/2018 of 21 May 2018).

The occupational standard is structured according to the labour market requirements and the requirements for vocational education and training and includes the plan and the theoretical and practical education and training programme for quality assurance of the system. The development of the SO is carried out in accordance with the International Standard of Classification of Occupations (ISCO 08), the Classification of Occupations in Romania (COR), as well as the European Classification of Skills/Competences, Qualifications and Occupations (ESCO), documents in which the main tasks and responsibilities specific to an occupation are specified, (ORDER no. 6.250/2.156/2022).

CONCLUSIONS

Adult vocational training in rural areas is necessary due to the challenges faced by society, the economy and the environment. The adaptation of the agricultural worker to the "technological changes", to the "green transition and digitization" requires theoretical training and training with a predominantly practical content, to stimulate and train professional competences in order to carry out the activities required in the workplace, "at the quality level specified in the occupational standard".

Considering the socio-economic context, revealed by the evolution of the population employed in rural areas, the rural population employed in agriculture, the level of education, the degree of participation in training, etc., the income from agricultural factors, etc., we consider that for the agricultural worker training must have a character of improvement or specialization, in order to stimulate and train professional skills to deal with unforeseen situations that may arise during the production process.

Agriculture is a knowledge-based activity, it is the application of the results of agricultural research to improve production and income through appropriate training of agricultural workers. In this context, the aim is to increase productivity and reduce vulnerability rather than to create jobs. The professional training of adults for activities specific to agriculture is pursued through the extension services within MADR, which are appropriately connected to research (for example "Sectoral Strategy in the field of agriculture and food production", developed and implemented by MADR, etc.). (MADR, 2023).

For the period 2021-2027, the National Employment Strategy provides for measures, both for updating occupational standards in accordance with new technological changes and the digital agenda, as well as measures for reducing employment in subsistence agriculture and facilitating human resources for non- agricultural. (MMSS, 2023).

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FOOD PRODUCTION VERSUS POPULATION FROM FOOD SECURITY PERSPECTIVE

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Abstract: *The food-population ratio has two determinants: population and agricultural production. The population is constantly growing, putting pressure on existing resources, which are becoming insufficient. Globally, agricultural production has grown at the same rate as population growth, but at different rates in different geographical areas and regions. This raises the question of comparing the rate of growth of agricultural production with the rate of population growth and identifying regions where agricultural production is growing compared with regions where population growth is occurring.*

Keywords*: Food-population ratio, food security, population growth, agricultural production*.

JEL classification: Q18, Q56.

INTRODUCTION

Food security refers to people's access to sufficient, safe and nutritious food to lead healthy and active lives. Food security involves issues such as the availability, accessibility, adequacy and utilization of food. (DO IT)

Thus, ensuring food security involves, among others, the physical access of the population to sufficient food, thus two important variables intervene: population and food.

Regarding the population, there is sufficient evidence that it will increase considerably in the future, globally, and the pressure of the population on the resources will be greater and greater.

Thus, the second component intervenes, namely access to food, the latter being achieved following the processing of agricultural production.

This raises the issue of comparing the agricultural production growth index with the population growth index and identifying the regions where agricultural production growth is taking place versus the regions where demographic growth is taking place.

There are various factors that influence food production and food security. Agriculture is the main source of food production. Farmers grow agricultural crops such as cereals, vegetables, fruits and oilseeds and raise animals for meat, milk and other derived products (He, et al., 2019). The use of modern agricultural technologies such as agricultural machinery, irrigation and pesticides improves yields and productivity. (Takahashi, et al., 2020)

Climate change can affect food production by altering rainfall patterns, increasing temperatures, and causing extreme events such as droughts and floods. (Anderson et al., 2020)

Government policies, such as agricultural subsidies and regulations, can influence food production and distribution. (June, 2017)

Regarding the interdependencies between the population and food security, according to the specialized literature, various manifestations have been identified. A growing population requires greater food production to meet increasing food demands.

Increasing urbanization can affect access to agricultural land and lead to dependence on imported food in cities. (Szabo, 2016)

Poor people may have difficulty affording healthy and nutritious food, which can lead to food insecurity. (Laborde, et al., 2020)

Areas affected by conflict and social instability can have major difficulties in ensuring food security due to the destruction of infrastructure and the disruption of food production.

International trade relations influence the availability and affordability of food, as many countries depend on food imports. (Amit, et al., 2017)

In general, to ensure food security, it is important to have policies and programs that promote sustainable food production, improve access to food for the disadvantaged, and adapt to climate change and other threats to food production.

MATERIALS AND METHODS

In this paper, we want to analyze the relationship between the dynamics of agro-food production and the dynamics of the population with implications for ensuring food security. To achieve this aspect, the use of statistical data provided by the international FAOSTAT database was used, namely data on world population dynamics in the period 1961-2020 and forecasts for 2030 and 2050, as well as data on global agricultural production. With the help of these data, a quantitative analysis of them was resorted to, determining dynamic indices for the analyzed period, as well as determining the agricultural production per inhabitant at the continental level.

RESULTS AND DISSCUSION

The food/population ratio has two determinants: population and agricultural production. The growing population puts pressure on existing resources, which are no longer sufficient. Globally, agricultural production is growing at the same rate as population, but at different rates in different geographic regions. This raises the issue of comparing agricultural production growth rates with population growth rates and identifying areas of agricultural production growth versus areas of population growth.

The demographic factor. Population growth is a debated issue in many specialist papers because of the consequences it has on food security and resource use. In the year 2023, the world's population is 8 billion people, and 99% of the population growth, which is about 80 million people per year, is occurring in developing countries. It is estimated that the population of Central African countries will increase by 193% between 2003 and 2050 (Semionov, 2009, p.272). About 90% of the world's population lives on 10% of land. The highest population densities are found in the United States, Europe, India and East Asia. But densely populated areas are not necessarily overpopulated, as long as they have sufficient food, energy and water resources. The region with the largest population growth, Africa, faces the worst shortages of such essential resources.

To estimate the degree of satisfaction of the need for food products in the world, the ratio between population growth and food production growth is analyzed. The latter, even if it has an increasing trend, the food situation in the world has not changed. In Africa, the region where hunger is most acute, and in Asia, the region with the highest population density, food security is still low.

The global food situation and, consequently, ensuring food security is influenced by the demographic factor. In table 5.1. and Figure 5.1. the world population dynamics from the last decades of the last century, in 2015, and the world population forecasts for the years 2030 and 2050 are presented.

The distribution of the population on the globe is unbalanced: 75% is distributed in the northern part (about 60% in Asia, 10% in Europe, 5% in North America) and 25% in the southern

part (15.3% in Africa, 5 .7% in South America and 0.5% in Oceania). 60% of the world's population lives in Asia, 19.5% in China, and 17.8% in India.

Table 1. World population dynamics, 1961-2020, projections for 2030 and 2050 (thousands of people)

Geographical area	1961	1970	1980	1990	2000	2010	2020	2030*	2050*
Total world	3085785	3687496	4443492	5296249	6122769	6985603	7840952	8321382	9306131
Africa	293662	368149	482806	635288	811099	1055233	1360677	1562046	2191597
North America	207562	231284	254453	281162	313288	345272	373956	401658	446864
South America	151779	191462	240854	295577	347433	393078	431530	461497	488072
Asia	1704840	2089418	2581949	3132855	3719042	4221171	4664324	4867740	5142223
Europe	637317	692764	738988	776947	726780	736276	746225	741232	719258
Oceania	16104	19502	22970	26967	31130	37102	43933	47095	55235

* forecasts, Source: FAOSTAT, 2023

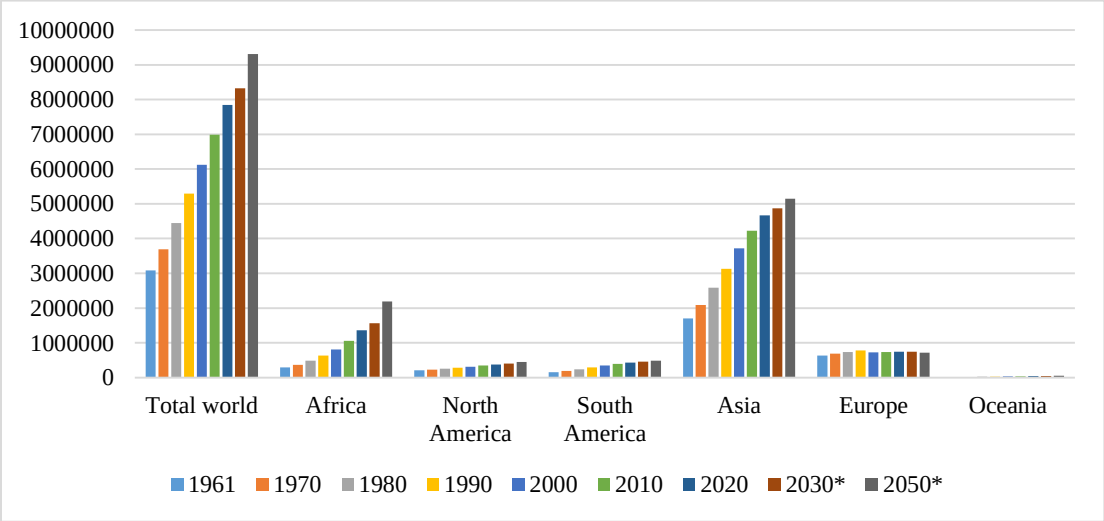

Figure 1. World population dynamics, 1961-2020, projections for 2030 and 2050 (thousands of people)

Source: own realization based on the data in Table 1.

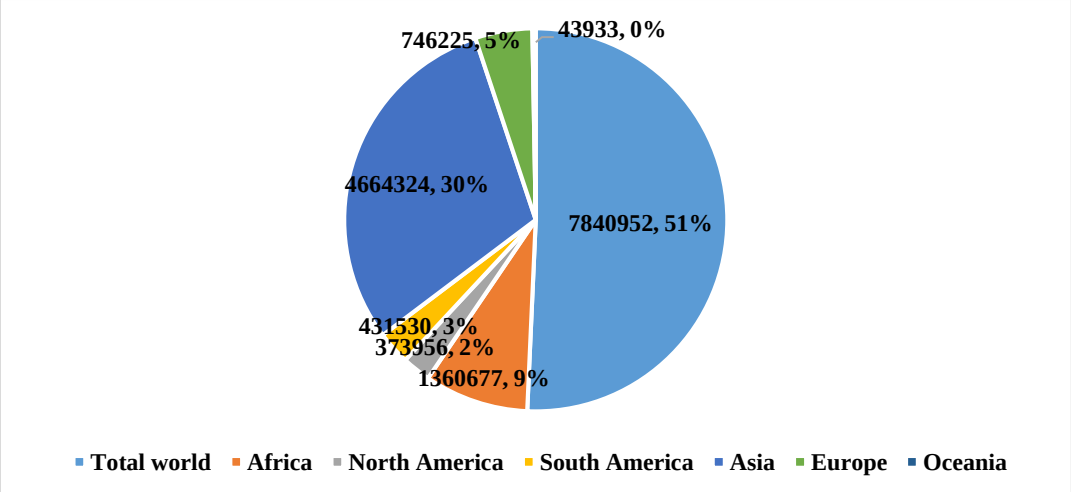

Figure 2. Distribution of world population by geographic region, 2020

Source: own realization based on the data in Table 1.

In terms of dynamics, the last decades had the fastest rates of population growth. Worldwide, the population has increased 2.5 times since 1961 to date. The most accelerated rate of population growth is registered on the continents of Africa (4.6 times), South America (2.8 times) and Asia (2.7 times), where the level of poverty is higher than the world average. Demographic gaps between developed and developing countries have deepened, all the more so as the world population has grown from 3 billion in 1961 to 8 billion people in 2023.

According to estimates, the world's population will continue to grow, so that in 2050 it will exceed 9 billion inhabitants. The results of research in the field of population dynamics show, however, that the population explosion will not take place, due to the manifestation of some phenomena that will limit it, such as natural calamities, diseases of the modern world, inadequate resource distribution systems, family planning, etc.

Globally there are two types of trends. On the one hand, special demographic phenomena are manifested in several countries where the birth rate is low (the United States of America, Japan, France, Italy, Germany and other Western European countries, where the population dynamics is approximately 100% On the other hand, there are countries where population explosion is difficult to control. In China, the population grew from 1,264,099,069 people in 2000 to 1,425,671,352 people in 2023 (112%), and in India, from 1,059,633,675 people to 1,428,627,663 people (134%).

To solve the food problem from the perspective of population growth, worldwide, there are numerous initiatives. Thus, at the Population Conference in Cairo (Wijkman, Rockstrom, 2013, p.142) an action plan was developed whose main goal was to radically improve the situation of women and reduce the birth rate. The conference showed that measures to limit population growth, reduce poverty, increase well-being and reduce environmental degradation are closely linked and mutually reinforcing. Reports compiled after the Cairo conference showed that significant progress had been made: the birth rate had fallen significantly from an average of about 5 children per woman in the 1950s to 2.6 in 2010.

Decline in the birth rate it is a determinant of increased well-being and prosperity globally. More than 70 countries have a birth rate of less than 2 children per woman. Among them are Canada, Australia, Japan and many European countries, but also countries such as Singapore, South Korea, Russia and Uruguay. At the opposite pole, however, in many African countries, but also in countries such as Afghanistan, Yemen, Saudi Arabia, Pakistan, Guatemala, Bolivia, the average number of births for a woman is between 4 and 8.

In this context, it is easy to predict an increase in the population in the perspective of 2050.

Food production per capita. The analysis of population dynamics is accompanied by that of food production per inhabitant.

In Table 2. food production indices are shown in 2021 compared to 2010, calculated based on the value of food production, based on the period 2014-2066. Although population growth creates pressure on food resources, still, worldwide, humanity has the necessary daily food, food production having an increasing trend, more dynamic than that of population growth (124%, compared to 112%).

Although food production increased in the year 2021, compared to 2010, to 124%, however, at the level of the continent, different trends are manifested. In Africa, food production grew the fastest (at 133%), followed by Asia at 127%.

In South America, food production increased by 124% and in Oceania by 121%. Slower rates of agricultural production growth were recorded in Europe and North America, where the indices have values of 116% and 114%, respectively.

Table 2. Indices of the value of world agricultural production, by region, compared to population indices

Region	Value of agricultural production (thousands of international dollars)			Population (thousands of people)		
	2021	2010	2021/2010 (%)	2021	2010	2021/2010 (%)
World	4125746540	3323571228	**124**	7840952	6985603	**112**
Africa	387135537	290349849	133	1360677	1055233	129
North America	426895240	374503460	114	373956	345272	108
South America	422268222	339448241	124	431530	393078	110
Asia	2147622130	1687523240	127	4664324	4221171	110
Europe	575369257	496870062	116	746225	736276	101
Oceania	66271653	54753119	121	43933	37102	118

Source: own processing based on FAOSTAT data, 2023

The production of agro-food products shows a certain specialization of the continents (Table 3).

Table 3. Production of the main agricultural and food products, in 2021, per inhabitant (kg/person)

Product	World	Africa	North America	South America	Asia	Europe	Oceania
Cereals	439,6	204,7	**1446,3**	595,3	349,5	746,6	**1404,6**
Fruits	130,2	119,6	68,8	**221,8**	126,3	111,2	**229,2**
Meat	51,2	20,9	**157,0**	118,6	36,0	88,5	**174,3**
Milk	131,4	50,9	**324,7**	170,9	95,2	316,6	**829,2**
Vegetables	165,3	81,1	87,5	57,9	**214,0**	**121,2**	91,6

Source: FAOSTAT, 2023

With the exception of Oceania, where the highest per capita productions are recorded for almost all agricultural products, except for vegetables, the highest amount of cereals per capita is recorded in North America, 1400 kg/person; the largest amount of fruit per inhabitant – in South America, 221 kg/person; the largest quantity of vegetables per inhabitant – in Asia, 214 kg/person; and the largest quantities of milk and meat – in North America, 324 kg/person, respectively 157 kg/person.This structure of agro-food production per inhabitant reflects a certain specialization of it on the continents, with a concentration on the Oceania area for products of animal origin.

The United States of America is the main producer of grains, which are primarily used for animal feed, followed by export. In Asia and South America there are favourable conditions for the development of vegetable and fruit production, even in several cycles.

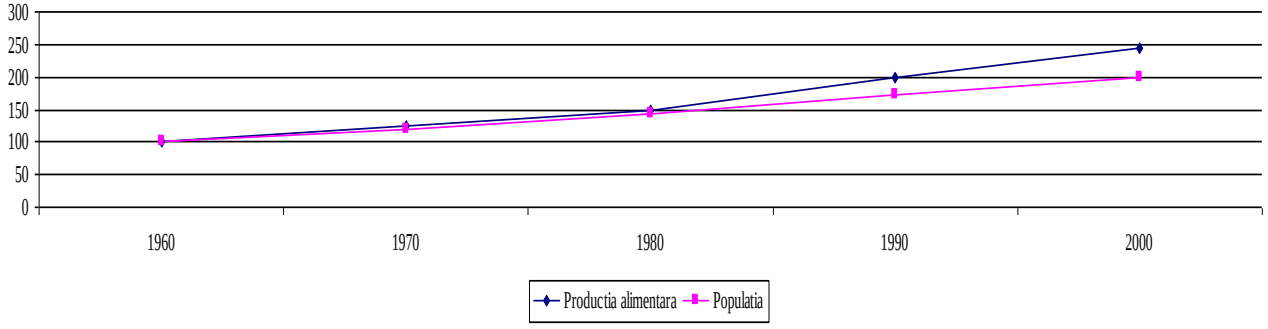

Figure 3. Indices of food production and population, 1961=100 (%)

Source: FAOSTAT

In Figure no. 3 shows the indices of food production and population in the period 1961-2000, with a fixed base in 1961. It can be seen that food production increased more than the population, in 2000 the index was 245%, compared to the population growth index of 198%.

The analysis of the population-food ratio shows that both population and agricultural production have increased in recent decades, but differently depending on the region. Food insecurity is caused not only by the growing demographic factor, but also by food production unevenly distributed across regions and categories of states, which means that solving the food problem can only be achieved through economic restructuring measures of agriculture in developing countries. development, especially through investment and technology transfer.

CONCLUSIONS

The study of the relationship between population and food reveals a complex and interconnected landscape in which food production, food access and food security are key factors. With a growing global population and challenges such as climate change, urbanization and social instability, providing food for every individual becomes a significant challenge.

Investments in sustainable agricultural technologies, innovative agricultural practices and effective government policies are essential to increase food production and ensure equitable access to food. Education and public awareness of healthy and sustainable food choices also play a crucial role in promoting food security.

It is also important to pay special attention to vulnerable populations, such as the poor and those affected by conflict, to ensure that they have access to sufficient and nutritious food. In addition, international cooperation and fair-trade initiatives can play a significant role in addressing inequities in global food distribution.

Achieving long-term food security requires an integrated and collaborative approach involving governments, non-governmental organizations, the private sector and civil society. Only through joint efforts and innovative strategies can we ensure that food is available, accessible and nutritious for all, thus contributing to a safer and healthier future for everyone.

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ORGANIC FARMING AND BIODIVERSITY

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Abstract: *Organic farming is a sector with real development potential in Romania, being an essential instrument on the way to environmental protection, through the conservation of soil, improvement of water quality and support to biodiversity. The present paper aims to analyses the evolution of organic farming, both at national and county level. Year by year, the areas under organic farming and the number of organic operators, mostly farmers, have increased. The counties Tulcea and Timiș have the largest areas under organic farming, and most operators in organic farming work in the counties Sălaj and Satu Mare. The organic farming provides a favorable framework for maintaining biodiversity, using friendly, economically and socially efficient practices for farms, generating modern attributes for rural communities, and offering a different lifestyle and a different quality of life for the entire society.*

Keywords: *organic farming, nature protection, biodiversity*

JEL Classification: Q15, R1

INTRODUCTION

Food security must be a priority in any scenario, but at the same time there is a need for healthy products, and biodiversity on cultivated areas is the best barometer for healthy products. Where an environmentally friendly agriculture is practiced, both the quality of obtained products and the biodiversity are at a high level.

The practice of increasingly intensive agriculture is one of the main causes of biodiversity loss and ecosystem degradation, which are among the biggest threats facing humanity, according to the World Economic Forum. In conventional farming, there is a decline of biodiversity as a result of specialization, intensification, absence of mixed farms, lack of uncultivated land and mainly of pesticide use. The organic farming practice on increasingly large areas helps to create a more varied landscape and ensures greater biodiversity.

Through the Common Agricultural Policy, financial support for organic farming has been provided in all the EU member states. The new CAP regulations were adopted by the European Parliament in Plenary only on 23 November 2021. The delegated and implemented acts of these new CAP regulations (2023–2027) were voted in the first quarter of the year 2022 and the regulations are active from 1 January 2023 to 31 December 2027. Organic farming can make a decisive contribution towards a sustainable food and farming sector while satisfying citizens' preferences. With the right incentives in both pillars, many more farmers could make an even larger contribution to the environment, climate and rural communities. The new eco-schemes account for 25 per cent of the First Pillar's budget. These eco-schemes are mandatory for the Member States but voluntary for farmers; this is less binding than the current greening measures. Eco-schemes can offer a good opportunity to compensate farmers whose farming practices benefit biodiversity and the environment. The rest of the CAP's new green architecture consists of nine good agricultural and environmental conditions (GAECs), and 35 per cent of the Second Pillar's budget is dedicated to agro-environmental and climate measures (AECMs). The organic movement defended ringfencing of at least 70 per cent of the entire CAP budget across both pillars to ensure a level playing field and to avoid a race to the bottom for the climate and environment. With the European Green Deal (European Commission 2019c) and the publication of the EU Farm to Fork (European Commission 2020a) and Biodiversity

Strategies (European Commission 2020b), the European Commission has put forward clear objectives for transitioning to sustainable food systems by 2030.

In Romania, organic farming has received support under NRDP since the first programming period 2007-2013, through Measure 214 – agro-environmental payments, the objective of which was to contribute to the sustainable development of rural areas by encouraging farmers to introduce or continue the production methods meant to protect the environment, biodiversity, water, soil and rural landscape. Payments were provided for high nature value grasslands, traditional farming practices, important grasslands for birds and green crops.

In the programming period 2014-2020, the support to organic farming continued through Measure 11 – Organic farming, with the two sub-measures, 11.1 – Support for conversion to organic farming methods and 11.2 – Support for maintaining organic farming practices. The financial allocation of the measure in the period that was extended until 2023 is 479.37 million euros (MADR, 2023). Funding was provided for some other measures that aimed to encourage and support the production of organic products priority being given to projects through which applicants aim registration in the organic farming system. Thus, through investment measures, such as "Investments in agricultural holdings"," Support to investments in processing/marketing of agricultural products", greater priority was given to projects through which applicants aimed registration in the organic farming system. At the same time, under the measure "Support to setting up of young farmers", the beneficiaries of projects by which they committed themselves to have the entire holding registered in the organic farming system benefitted from an additional payment of 20,000 euros.

In the next programming period, through the National Strategic Plan 2023-2027, a total financial allocation of 389.12 million euros for organic farming is foreseen, namely 162.6 million euros for the financing of conversion commitments and 226.52 million euros (MADR, 2023) for the financing of commitments in the period of maintaining organic farming practices.

STATE OF KNOWLEDGE

Organic farming contributes to "combating climate change, stopping loss of biodiversity and promoting sustainable consumption" (FiBL&IFOAM, 2022). According to the latest report of FIBL (Research Institute of Organic Agriculture), in the year 2020, "74.9 million hectares were under organic agricultural management worldwide", out of which Oceania had 35.9 million hectares, Europe 17.1 million hectares, Latin America 9.9 million hectares, Asia 6.1 million hectares, North America 3.7 million hectares and Africa 2.2 million hectares. In the global ranking of the above-mentioned report, in the year 2020, Romania ranked 20th by the number of hectares cultivated under organic farming system, the first three positions in the ranking being occupied by Australia (35.7 million hectares), Argentina (4.5 million hectares) and Uruguay (2.7 million hectares). In the European Union, the countries with the largest areas under organic farming were France (2.5 million hectares) and Spain (2.4 million hectares), which ranked 5th and 6th respectively in the worldwide ranking (FiBL&IFOAM, 2022). In the European Union, with a total area of 14.9 million hectares under organic farming, France, Spain, Italy (2.1 million hectares) and Germany (1.7 million hectares) were on top positions, more than half of the area under organic farming being found in these countries. According to the same report, Romania ranked 12th.

Organic farming "produces safe and nutritious food, while protecting the environment and using natural resources in a sustainable manner, ensuring a healthy food system for Romania and organically certified food supply with high value added" (MADR, 2023).

In the European Union, the "Farm to Fork" and "Biodiversity" strategies propose actions for combating biodiversity loss, protection of human and nature health and supporting all actors in the agri-food chain.

Ensuring healthier and more sustainable food for Europe is the main objective of the EU's "Farm to Fork Strategy", and the main objectives regarding food security and safety are the following:

- Ensuring a supply of sufficient, affordable and nutritious food products, within planetary boundaries
- Cutting by half the use of pesticides, fertilizers and sale of antimicrobials
- Increasing the land areas under organic farming
- Promoting more sustainable food consumption and healthy diets
- Reducing food loss and waste
- Combating food fraud along the food supply chain
- Improving animal welfare

The plan of action for the development of organic production, part of the "Farm to Fork" Strategy, presents a set of actions to increase the share of organic farming in the EU, and its main objective is to boost organic production to achieve the target of minimum 25% agricultural land under organic farming in the EU by the year 2030. The EU member states are encouraged to develop national plans for organic farming. The plan of action is divided into three inter-connected axes that reflect the supply chain structure and the ambitions of sustainability objectives of the European Green Deal: Axis 1 – Stimulating demand and ensuring consumer trust; Axis 2 – Stimulating conversion and strengthening the entire value chain; Axis 3 – Ecological models that lead by example: improvement of organic farming contribution to environment sustainability. The three axes will be supported by 23 actions, continuing some of the successful actions from the period 2014-2020, and proposing a set of new actions and mobilizing different financing sources. To achieve the plan, member states were invited to set national targets for organic farming and generally to have ambitious targets in terms of organic production in their strategic plans. For Romania, in the year 2030, the utilized area under organic farming system could reach 800,000 ha, i.e. 6% of the utilized agricultural area (MADR, 2023).

The EU Biodiversity Strategy for the year 2030, adopted with the "Farm to Fork" Strategy, support each other, bringing nature, farmers, businesses and consumers together. The Biodiversity Strategy includes a series of objectives and commitments to be achieved by 2030 at the latest and is the cornerstone of nature protection in the EU, being a key element of the European Green Deal. The following are among the main actions to be taken:

- Creating protected areas to cover "30% of the EU land and sea area", expanding the coverage of existing Natura 2000 protected areas;
- Restoring degraded ecosystems on the EU's territory through a series of commitments and specific measures, including "reducing the use of chemical fertilizers and pesticides by 50% and operating at least 25% of agricultural land under organic farming system and planting 3 billion trees";
- Facilitating the transformational change by which a "new EU governance framework for biodiversity will be established, with clear obligations and milestones";
- Creating an ambitious global biodiversity framework.

The organic farming impact on environment and biodiversity has received the most attention from researchers, and while some still dispute the ecological benefits of this type of agriculture (Colman R., 2000), there is a growing consensus that it does provide a number of environmental

benefits as compared to conventional agriculture (Petersen et al., 2006; Cobb et al., 1999).When comparing biodiversity between organic and conventional farming systems, a variety of studies have found a higher total abundance of arthropods, birds, plants and soil organisms on organically farmed land (Crowder D. W. et al, 2012). Other studies showed that "the species richness in organic farming is up to 34% higher than in conventional farming" (Smith O. M. et al, 2019). A significant increase in nematode abundance and thus positive effects on biological soil quality were observed in organic farming systems compared to conventional systems (Puissant, J. et al, 2021).

Organic crop production farms spend less on fertilizers and plant protection products than conventional farms. "Organic arable crop farms save 75-100% on plant protection product costs per hectare and 45-90% on fertilizer costs per hectare compared to conventional farms" (EU, 2023).

As a result, organic farming is gaining ground and is continuously growing, supported by the increasing demand of consumers, who are willing to buy bio products to stay healthy. All these add to the requirements of society for sustainable agriculture development, as well as the multitude of favorable effects of organic agriculture at the level of farm, environment and biodiversity.

MATERIAL AND METHOD

The present study intends to be an analysis of organic farming in Romania, in close relation to available statistical data from the Ministry of Agriculture and Rural Development (MADR). According with the existing data the analysis at national level was made for the period 2016-2021 and the analysis at county level, only for the year 2020.

The methodology used for the purpose of this study consisted of two types of instruments – data collection and quantitative analysis. Thus, the data were processed, analyzed and interpreted and they formed the necessary set of information for carrying out the present diagnosis analysis of the existing situation of organic agriculture in Romania.

RESULTS AND DISCUSSIONS

In the period 2016-2021, in Romania, the organically farmed area increased 2.5 times. In the year 2016, the area under organic farming system was 226.3 thousand ha, to reach 578.7 thousand ha in 2021, accounting for 4.5% of total utilized agricultural area in Romania.

In the year 2016, there were 10562 certified operators in organic farming, as a result of available funds allocated to this sector. A decreasing trend could be noticed, one possible explanation being that producers' expectations did not always correspond to reality, but in the year 2021 their number was expected to reach the maximum in the analyzed period, namely 12231.

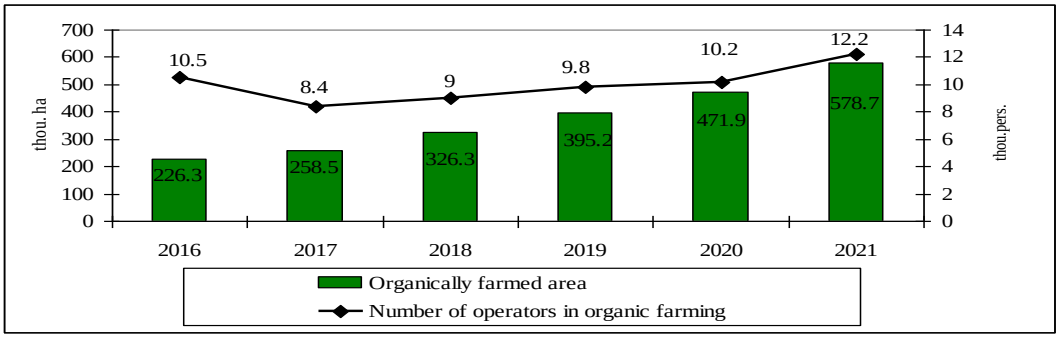

Figure 1. Evolution of cultivated area and operators in organic farming

Source: MADR, 2022

In the investigated period, more than 94% of organically certified operators were farmers, followed by traders and processors of organic products. The low share of processors of agricultural products reveal that the largest part of organic production is exported under the form of raw material to other countries. That is why the main objectives for the development of organic farming should be the increase of organically cultivated areas and of organic products with high value added, and in particular the processing of these products to obtain organic products with high market value.

Romania is well-known for organic products such as honey, walnuts, aromatic herbs and forest fruits, sea buckthorn in particular, yet official data indicate a different situation.

In the year 2016, cereal prevailed in the structure of organic crops, with 33.2%, followed by pastures and hayfields (25.5%) and industrial crops (23.6%). In the year 2021, there was a change in the hierarchy, with pastures and hayfields ranking first (37%), followed by cereals (24%) and industrial crops (19.8%). The area under pastures and hayfields increased 3.7 times in 2021, as against their area in 2016, while the area under cereals only slightly increased in the analyzed period. The increase of the area under organic pastures and hayfields is due to subsidies provided to farmers for these areas.

Table 1. Structure of crops in organic farming

- thousand ha -

	2016	2017	2018	2019	2020	2021	2021/2016 Difference
Area	226.3	258.4	326.3	395.2	471.9	578.7	352.4
Cereals	75.2	84.8	114.4	126.8	134.2	139.4	64.2
Grain pulses	2.2	5.0	8.8	7.4	5.7	5.9	3.7
Roots and tubers	0.7	0.7	0.5	0.5	0.4	0.3	-0.4
Industrial crops	53.4	72.4	80.2	78.4	91.6	114.4	61.0
Green plants	14.3	20.4	28.3	37.7	53.8	74.7	60.4
Other crops in arable land	0.2	0.08	0.1	0	0	0.2	0
Vegetables	1.2	1.5	1.0	0.8	0.8	1.2	0
Permanent crops	12.0	13.2	18.6	22.2	22.2	21.2	9.2
Pastures and hayfields	57.6	50.7	66.9	115.4	158.1	214.7	157.1
Land left uncultivated	9.5	9.7	7.6	6.1	5.2	6.8	-2.7

Source: MADR, 2022

In the livestock production sector, bovines were the most numerous organically certified animals, and their number followed an increasing trend. In the sheep and goat sector, the situation was different, as their number experienced a dramatic decline in the analyzed period, probably due to the decline of sheep and goat herds.

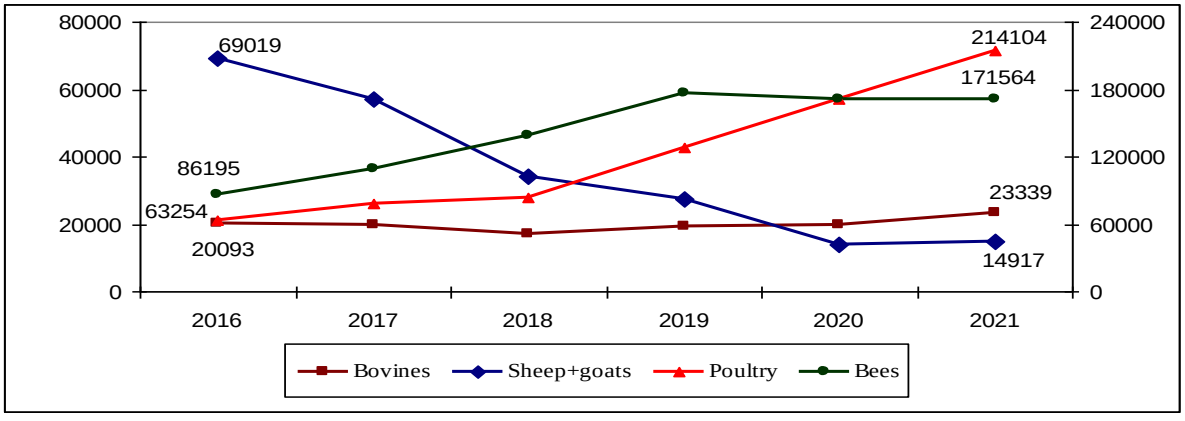

Figure 2. Evolution of number of organically certified animal herds

Source: author's processing based on MADR data, 2022

The organically certified animal production includes dairy products and eggs in particular.

The organic cow milk production is quite stable, and the main 4 companies producing bio certified dairy products in Romania are: Lactalis Group, which includes the companies Albalact, Covalact, Rarăul, Lactate Harghita and LaDorna, followed by Olympus (Dairy Factory Brașov), Hochland and Friesland Campina (Napolact).

The number of organically certified poultry significantly increased, being 3.4 times more numerous in 2021, as compared to 2016, due to the high demand for organic eggs, as well as the possibility for small businesses to launch organic production with low investment and a stable cash flow. In Romania, the largest egg producer is Toneli Holding, in the southern part of the country, which produces eggs with code 1 (free range), 2 (on the ground) and 3 (battery cages), as well as organic eggs (code 0), in parallel with conventional production. There are also companies that produce only organic eggs, such as *Ouă de Țară* in the county Arges, which has 50,000 poultry on 20 ha of pastures.

The number of organically certified bee families significantly increased in the analysed period, resulting in the increase of organically certified honey production. According to the data, organic bee honey production was 4480 tonnes in 2021, double compared to that in 2020.

In terms of territorial distribution, in the year 2020, the counties with the largest organic areas were Tulcea (60371.9 ha), Timiș (55896.3 ha), Constanța (32611.6 ha) and Arad (29882.5 ha), and the counties with the smallest organic areas were Ilfov (481 ha) and Dâmbovița (578 ha).

The situation is different if the organically certified area is taken into consideration: thus, the counties with the largest organically certified areas were Tulcea (47756 ha), Timiș (36616 ha), Iași (18858 ha) and Constanța (17651 ha), while the counties with the smallest organically certified areas were Vâlcea (71 ha) and Dâmbovița (211 ha).

In the year 2020, in total area registered in the organic system, 57.4% was represented by the organically certified area, and the remaining 42.6% was the area in conversion. In terms of the share of the already organic certified area in total organic area, Suceava county ranked first, with 90.6%, followed by two counties in the southern part of Romania, namely Călărași and Giurgiu. There were counties where the share of the area in conversion in total organic area was high, with Vâlcea county ranking first, followed by Gorj and Brăila (Annex 1).

In the year 2020, the counties with the largest number of economic operators in organic farming were Sălaj (831) and Satu Mare (829), and those with the smallest number of organic operators were Giurgiu (27) and Ialomița (38). It is worth noting that in the county Mehedinți, all the 51 economic operators registered in organic agriculture were organic farmers.

CONCLUSIONS

The organic farming has the potential to contribute to the protection of environmental factors, to biodiversity conservation and to fight against climate change, thus providing public goods and at the same time serving a market in full ascent.

Organic farming is a dynamic system in Romania, one of the arguments being that the organic farming area has increased year by year. In the year 2021, the area under organic farming was 2.5 times as high compared to that in 2016, and accounting for 4.5% of the country's total utilised agricultural area. Although it had an oscillating evolution, the number of operators in organic farming was higher in 2021 compared to 2016, but the share of processors in organic farming was very low. The crop structure was dominated by cereals in 2016, and in 2021, pastures and hayfields will take

first place. The increase of the area occupied by organic pastures and hay is due to the subsidies granted to farmers for these areas. Regarding the organically certified livestock, cattle and birds were more numerous, as were the number of bee families, while the number of sheep and goats decreased. As a result, the productions of organically certified cow's milk, eggs and honey were stable and even increased. From the point of view of territorial distribution, in the east and west of Romania are the counties with the largest ecologically certified areas (Tulcea, Timş, Constanţa and Arad).

The organic farming practice in Romania has real premises for future development. Farmers who practise organic farming are not necessarily motivated by economic goals, most often their goals are to optimise the interactions between land, animals and plants, preserving the natural flows of nutrients and energy, with the aim to maintain and improve biodiversity.

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ANNEX 1

Share of organically certified area and of area in conversion in total area registered in organic farming system, by counties, in the year 2020

County	Share of organically certified area %	Share of area in conversion %
Alba	58.3	41.7
Arad	52.2	47.8
Argeș	31.0	69.0
Bacău	37.0	63.0
Bihor	34.8	65.2
Bistrița-Năsăud	63.9	36.1
Botoșani	54.1	45.9
Brăila	21.7	78.3
Brașov	51.4	48.6
București	87.6	12.4
Buzău	66.8	33.2
Călărași	87.1	12.9
Caraș-Severin	43.9	56.1
Cluj	62.3	37,7
Constanța	54.1	45.9
Covasna	55.3	44.7
Dâmbovița	36.6	63.4
Dolj	26.4	73.6
Galați	60.6	39.4
Giurgiu	80.5	19.5
Gorj	12.5	87.5
Harghita	42.4	57.6
Hunedoara	65.0	35.0
Ialomița	68.6	31.4
Iași	80.3	19.7
Ilfov	88.5	11.5
Maramureș	53.8	46.2
Mehedinți	36.3	63.7
Mureș	37.3	62.7
Neamț	37.5	62.5
Olt	37.0	63.0
Prahova	36.3	63.7
Sălaj	45.5	54.5
Satu Mare	35.8	64.2
Sibiu	50.3	49.7
Suceava	90.6	9.4
Teleorman	53.0	47.0
Timiș	61.9	38.1
Tulcea	79.1	20.9
Vaslui	36.7	63.3
Vâlcea	2.8	97.2
Vrancea	58.4	41.6
Total	**57.4**	**42.6**

Source: author's processing based on MADR data

BIODIVERSITY IN THE SUSTAINABLE DEVELOPMENT GOALS

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Abstract: *Biodiversity is influenced by the process of economic development, between the two there is a causal relationship – when development does not respect the environment, biodiversity experiences negative transformations. The EU Biodiversity Strategy 2030, which derives from the 2030 Agenda for Sustainable Development, calls for member states to step up their conservation efforts to protect 30% of Europe's land and marine area by 2030 (of which 10% will have to be strictly protected).Although Europe already has more protected areas than any other continent (mainly through the Natura 2000 Network) and among the highest proportions of its area covered by protected areas, the current network of protected sites is not large enough to protect biodiversity. This paper proposes an analysis of the significant aspects of biodiversity in Romania, based on statistical data, in the context of the sustainable development goals. Evaluating public data sources, national concerns in the field of environmental protection, respectively biodiversity, are highlighted, through the analysis of specific indicators, through which the progress made in achieving the goals of the 2030 Agenda is evaluated: protected areas, conservation and protection of wetlands, mountain ecosystems, sustainable forest management, transition to circular economy, relation with agriculture – influences and consequences, all in a statistical approach, at national level (without neglecting, however, the European context).*

Keywords: *environmental protection, biodiversity, protected areas*

JEL Classification: P48, Q01, Q15, Q56, Q57

INTRODUCTION

Although nature provides us with everything essential for life – food, medicine and health, materials, recreation and welfare means, the unsustainable human activities are causing the loss of biodiversity at a faster rate than ever. This is "not only an environmental problem, but also a problem of economic development, of global security, an ethical and moral problem, a self-preservation issue" (Living Planet Report 2020).

Thus, biodiversity is fundamental to human life, its conservation and protection being a priority for strategic investments in order to preserve human health and safety. Over time, certain areas have been declared protected areas, with the aim of protecting biodiversity.

The new EU Biodiversity Strategy for 2030 envisages connecting with nature, bringing nature back into our lives, setting ambitious targets to further promote the protection of Europe's nature. Although Europe has the largest number of protected areas than any other continent – more than 130,000 sites for Europe's Protected Area Objective – the EU has as central element of the Strategy the target to increase the coverage of terrestrial and marine protected areas, as well as the dedicated designation of strictly protected areas – *creation of protected areas that cover at least 30% of the EU's terrestrial and marine area, expanding the coverage of existing Natura 2000 areas by the year 2030.*

Thus, it is necessary to expand the terrestrial network of protected areas by about 4% and of strictly protected areas by 7%. In addition, greater efforts are needed for marine protected areas, which need to increase by 19% by 2030. At the same time, all primary and old-growth forests should be strictly protected, as should other biodiversity-rich areas that develop through natural processes.

MATERIALS AND METHODS

Evaluating public data sources, this study highlights national concerns in the field of biodiversity, of protected areas respectively. One of the methods used to prepare the raw analysis

material was the customized query of available official databases – the results published by NIS in the Environmental Statistics Series and the Tempo Online public database query, followed by author's own processing of data. Data from EUROSTAT, UN, European Environment Agency, FAO and World Bank were also used.

For documentation purposes, the national and international specialized literature (treatises, monographs, research projects, papers/scientific communications in established journals), various studies and analyses were significant benchmarks. The national reports, strategies and plans of action for biodiversity conservation and development in Romania were also consulted. The information from analyses, reports and official and unofficial studies was also used.

Another method used in this study was filtering, gathering and analysis of complementary information (internet, publications).

RESULTS AND DISCUSSIONS

The Sustainable Development Agenda 2030 comprises 17 Sustainable Development Goals (SDG) that, in their turn, include targets that need to be quantified to assess goal achievement. The European Commission has monitored progress towards each SDG, at EU level.

Two of these goals – **Life Below Water** (SDG14) and **Life on Land** (SDG15) – highlight the importance of biodiversity and ecosystems, as well as the quantification of various aspects of the two domains, through *specific indicators***.** Throughout the five-year period under review, at EU level, significant progress has been made towards many socio-economic goals, while in the field of environmental protection, progress has been less favorable.

A ***Progress Report on SDG achievement***[1] in the last 15 years was produced by each individual member state. In the year 2023, Romania, through the National Institute of Statistics, carried out an objective assessment of the dynamics of changes in the last period, based upon statistical indicators. For each goal, the evaluation was carried out on the basis of national indicators on sustainable development, using the latest available data[2].

Monitoring progress indicators in SDG 14 – Life Below Water aims to prevent and reduce marine pollution, manage and sustainably protect marine ecosystems, conserve coastal areas and ensure sustainable fishing.

The ecological status of waters – presupposes the development of international collaboration with the countries of the Danube river basin in order to improve the ecological status of the Danube waters and reduce the negative impact of tributaries on marine ecosystems when they discharge into the Black Sea.

The Black Sea is the most isolated marine ecosystem in Europe. The analysis of existing data series for the period 2012-2020 reveals a linear evolution of the *volume of waste water discharged into the Black Sea*, the average volume being 63 million m^3/year, according to data from the above-mentioned report. This indicator provides a picture of marine water pollution in coastal areas.

The area of marine sites of Community importance designated on the basis of Natura 2000 network, another indicator for evaluating the conservation of the marine environment, increased 4.5

[1] *halfway through the deadline for Agenda 2030;*
[2] *given the time lag regarding the availability of statistical data, the latest available year differs from one goal to another, and that is why certain indicators refer to either 2020 or 2021.*

times in 2022 compared to 2008, and the number of coastal bathing water sites classified as excellent increased 10.5 times compared to 2012.

Encouraging sustainable fishing – involves protecting and conserving aquatic living resources. The development of domestic fish production activity, which supports the national demand and ensures the sustainable management of living aquatic resources through an ecosystem approach to production, export and import activities should represent a priority for Romania.

Fish biomass from fishing and aquaculture experienced a steady increasing trend in the period 2012-2021, the amount of fish stocks being by more than 50% higher, the highest increase being noticed in the level of fish biomass from catch (over two thirds).

Given that domestic production is not sufficient to cover the domestic fish and crustaceans demand, Romania annually imported between 60 and 85 thousand tons of fish and crustaceans, with an annual value of over 200 million EUR (in the years 2018 and 2019).

However, in the year 2020, the annual value of *fish and crustaceans imports* decreased for the first time in the last ten years. *Exports*, accounting for about 10% of imports, slightly increased, which determined a significant diminution of the yearly trade deficit, to around 175 million EUR (as against 180-190 million EUR in previous years).

Monitoring progress indicators in SGD 15 – Terrestrial life targets the conservation and sustainable use of terrestrial ecosystems, the fight against desertification, the restoration of degraded land and soils, development of wetlands and green infrastructure, sustainable forest management, support of research in the field, elimination of abusive deforestation and plane cutting, transition to a circular economy.

The conservation status of ecosystems is characterized by indicators that highlight positive aspects, yet insufficient to counterbalance land degradation and the pressure exerted on soil so as to have a complete picture of terrestrial ecosystems.

The area of terrestrial sites of community importance designated on the basis of Natura 2000 network increased by 22% in 2022 compared to 2008.

The ecological status of ecosystems indicates how natural environment resists to pressures exerted by human activities, how forests are affected by pressures generated by habitat degradation and loss. This implies not only the sustainable management and safeguarding of forests, but also sustained afforestation actions in certain areas. In Romania, the *forestland area* increased by 0.6 percentage points in the period 2008- 2021, but this growth cannot be interpreted as positive, due to the too short data series.

As regards the regeneration[3] of certain areas, it can be noticed that in the period 2008-2021, *the (total) land area on which regenerations were carried out* increased by 3.4 percentage points, mainly due to the increase in *natural regenerations* (by one third, in the above-mentioned period).

The land area on which artificial regenerations were carried out decreased by almost 30% compared to the reference year. The forested area had an uneven evolution, in the first part of the analyzed period, i.e. a decrease by 6 percentage points, followed by an increase by 20 pp, up to a maximum in the year 2014, followed by a continuous decrease in all subsequent years.

[3] ***Regeneration*** *represents the process through which a new generation of forest trees is established, which can take the form of natural regenerations and artificial regenerations (afforestation).* ***Natural regeneration*** *is the process by which woodlands are restocked by trees that develop from shoots or from germinating seeds that have naturally reached the ground.* ***Artificial regeneration (afforestation)*** *represents the set of works through which a land surface is planted or seeded, with the aim to create new stands, both on exploited forest land and on land without forest vegetation.*

The conservation status of protected areas is also an indicator that completes the picture of the status of ecosystems. Although the number of protected areas increased in the last years, many protected habitats and species did not reach a favorable conservation status. More than two-thirds of protected habitats have a good conservation status and more than one quarter of these have a poor conservation status. At the same time, almost half of the protected species have a good conservation status and slightly over one third have a poor conservation status. One fifth of the protected species have a poor or unknown conservation status (*according to the latest available data from the Biodiversity Information System for Europe)*.

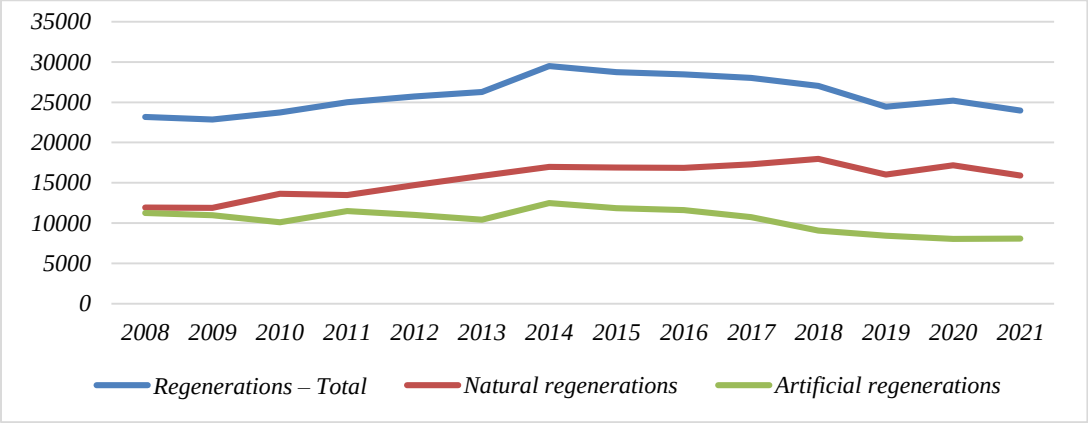


Figure 1. Land area on which regenerations were carried out, by regeneration categories, in the year 2021

Source: NIS, Tempo Online

Total water resources is another indicator by which the ***water status is*** evaluated. In 2020, the total water resources were at about the same level as 10 years ago; however, by analyzing them by the water resources development and utilization level, a doubling of the volume of underground water can be noticed. While in the year 2012, 86% of water resources came from surface waters, in the year 2020 this share was reduced to 70%, in favor of underground water.

As regards the *quality of surface waters*, it can be noticed that in the ten analyzed years, the structure of the length of watercourses has changed, by quality classes: while in the year 2012, about 60% of the length of monitored watercourses was of class I and II (very good and good status) and 40% of class III (moderate status), after ten years, the proportions have reversed.

The status of rivers deteriorated in the investigated period, and from data analysis it resulted a decrease by 13% of the length of rivers in classes I and II (good and very good status). While in the year 2012 there were no rivers in class IV (poor status), in the year 2020, their share in total monitored rivers reached 7.5%, and those in classes III and V (moderate and bad status) increased by 64%.

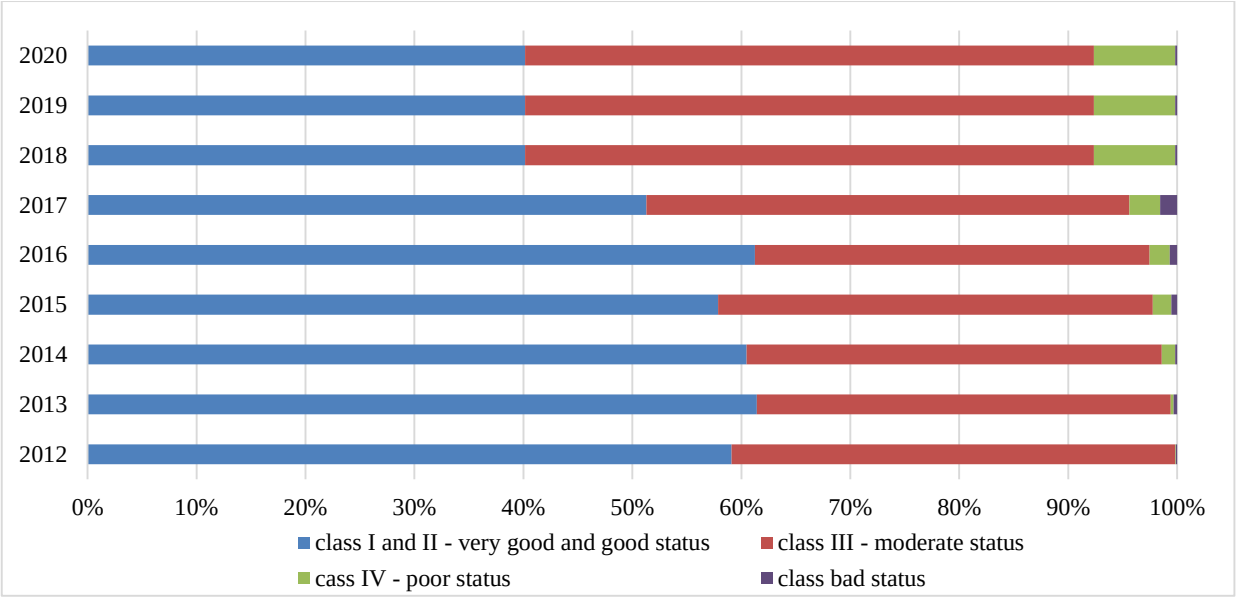


Figure 2. Quality of surface waters, by quality classes and length of monitored water courses, in the period 2012 - 2020

Source: NIS, Tempo Online, author's own calculations

BIODIVERSITY IN THE SUSTAINABLE DEVELOPMENT GOALS

By their natural value and low degree of human intervention on their territory, **protected areas** are the best models for natural and semi-natural ecological systems. Within natural ecosystems there are complex connections that make it difficult to estimate the importance of each species in the functioning of these ecosystems. Thus, maintaining biodiversity is essential to ensure the survival of all forms of life, and the designation of protected areas is a first step towards the conservation and protection of their value.

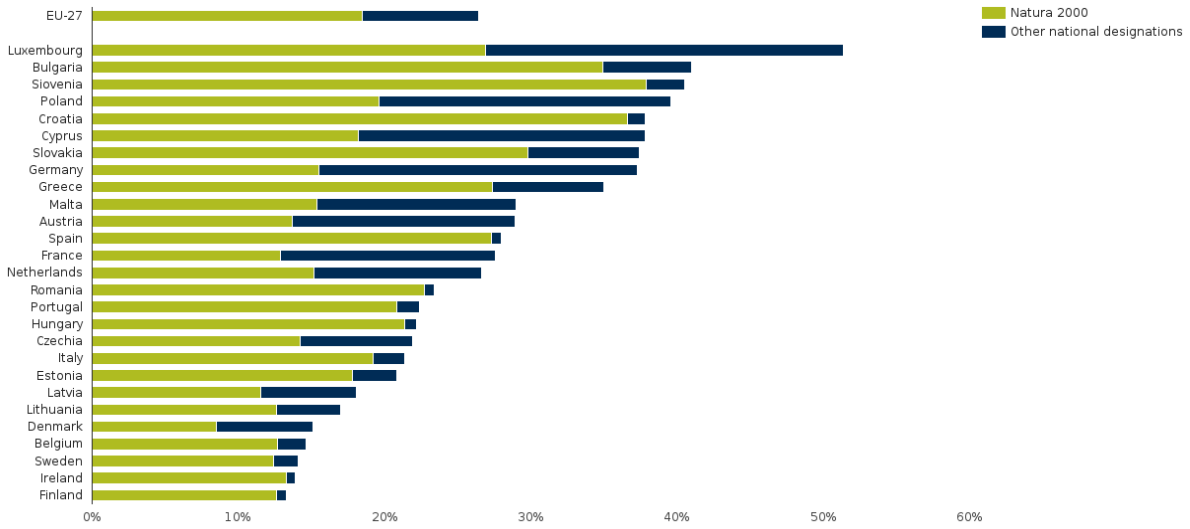
The designation of certain areas as protected areas represent the key to policies for biodiversity protection and conservation, a first step to protect their value, in terms of plant and animal species, (rare or valuable) habitats, landscapes or cultural values in the respective areas.

Biodiversity protection and conservation is achieved by imposing certain restrictions on the use of resources in such areas, intended to act as a barrier to human activities with high negative impact on the respective area, yet without preventing the normal life of inhabitants and the development of economic activities compatible with protecting these areas. At the end of 2021, according to Eurostat data, at EU level, about 1.1 million km² of the area of EU member states was designated for biodiversity conservation as Natura 2000[4] sites or nationally protected sites. These covered 26.4% of the EU's total area (*18.5% being designated as Natura 2000 sites and 7.9% having other national designations*, representing over 100 thousand sites, in total.

Data analysis highlights 9 EU member states with more than 30% of their area designated as protected sites: Luxembourg (52%), followed by Bulgaria and Slovenia (41%), Croatia, Cyprus, Germany, Greece, Luxembourg, Poland, Slovakia and Slovenia. At the opposite pole, the lowest share

[4] *The action framework at EU level for biodiversity preservation, one of the European Community policy objectives in the field of environmental protection is established through two directives: "Bird" Directive (1979), the first legislative framework of the EU that includes provisions related to the protection of bird species and of their natural habitats and "Habitat" Directive (1992), which establishes the framework for the protection of several plant and animal species (except for birds) and of their natural habitats. These EU Directives aim to protect the biodiversity of the European continent by creating a network of protected areas at EU level, in which to conserve habitats and species characteristic to the biogeographical regions of Europe, a network called* ***Natura 2000,*** *which became the* ***largest network of protected areas in the world****, the cornerstone of biodiversity protection in the EU.*

of protected areas is found in Finland (13.3%), Ireland (13.9%), Sweden (14.1%), Belgium (14.6%), Denmark (15.1%).



Share of protected terrestrial areas, designated as Natura 2000 sites and of nationally designated areas, in total country area (%), in the year 2021

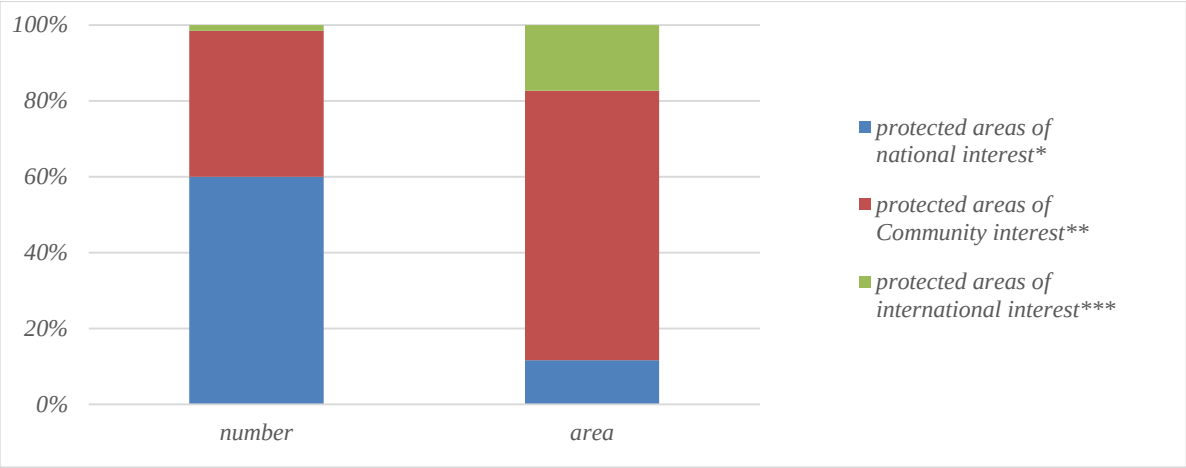
Source: European Environment Agency

In 20 of the 27 member states the protected areas represented minimum 20% of the total area of each state. 7 member states have protected areas below the European average (26.4%), much under the objective of the Biodiversity Strategy for 2030 – 30%.

Some member states protect a large part of their national territory as Natura 2000 sites. The countries that have designated at least 30% of their terrestrial area as Natura 2000 protected areas are: Slovenia, Croatia, Bulgaria and Slovakia, and those that have designated at most 13-15% of their terrestrial area as Natura 2000 sites are Finland, Ireland, Sweden, Belgium, Denmark. This ranking of the EU member states according to the land area protected as Natura 2000 sites highlights that biodiversity decreases from the south-east of Europe towards the northern countries.

Romania is one of the few countries in Europe that still has primeval forests, pristine landscapes and wild animals, natural values that have been lost for a long time in other European countries. Among the 11 biogeographical regions of Europe, five are from Romania. Currently, Romania has a network of protected natural areas (part of Natura 2000 network) covering over 23% of the country's total area. Regarding the *number of sites* in Romania, in the last ten years (2012-2021) other 43 new sites within the European ecological network Natura 2000 (designated as avifaunistic special protection areas) have been added to the number of protected areas (according to the National Agency for Protected Natural Areas), with an area of 1223 thousand ha, which reflects the interest of authorities (still minimal, however) for their identification, designation as sites and their conservation.

The specific indicators of protected areas make it possible to provide a picture of them. The analysis of the number of protected areas, by types, is not relevant, without being correlated with the corresponding surfaces, by types.

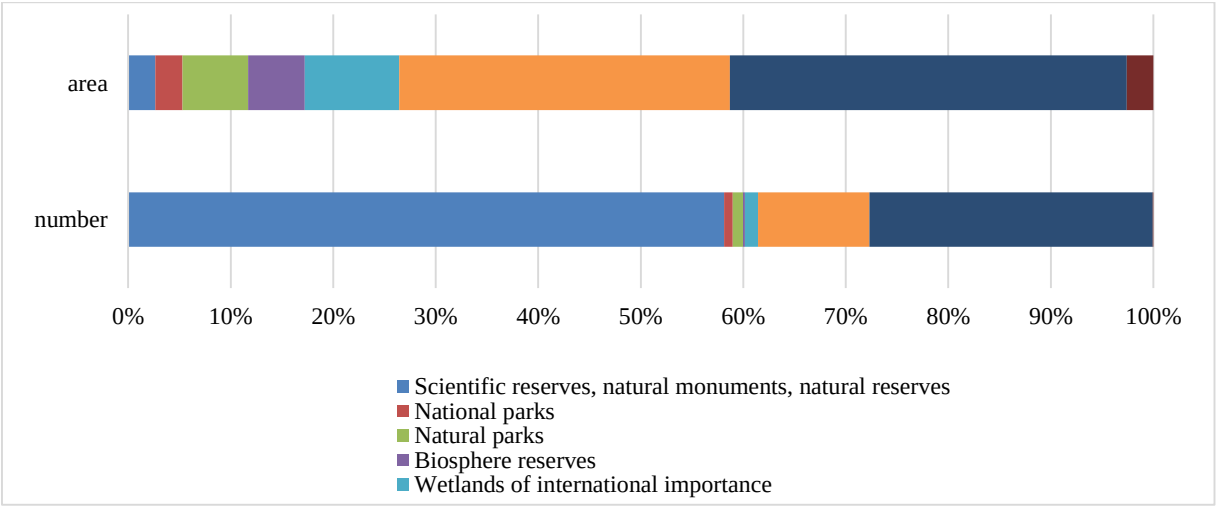


Number and surface of protected areas, by main categories, in the year 2021

* Scientific reserves, natural monuments, natural reserves, National parks and Natural parks;
**Sites of Community importance and avifaunistic special protection areas;
*** Biosphere Reserves, Wetlands of international importance, Natural sites of the Natural World Heritage
Source: NIS, Statistical Yearbooks and Tempo Online, author's own calculations

The correlation between the number, surface and types of protected areas reveals that a small number of protected areas (of a given type) cover a large surface or, reversely, a large number of protected areas cover a very small surface. Thus, the functional structure of protected natural areas highlights that, although 60% of the total number of protected areas are ***protected areas of national interest***, these cover only 11.7% of the total surface of protected areas. By contrast, the ***protected areas of Community interest***, although representing slightly over one third of the total number of protected areas, cover 71% of the total surface of protected areas. The same situation can be noticed in the ***protected areas of international interest***, which represent only 1.5% of the total number of protected areas, but cover 17.3% of the total surface of protected areas.

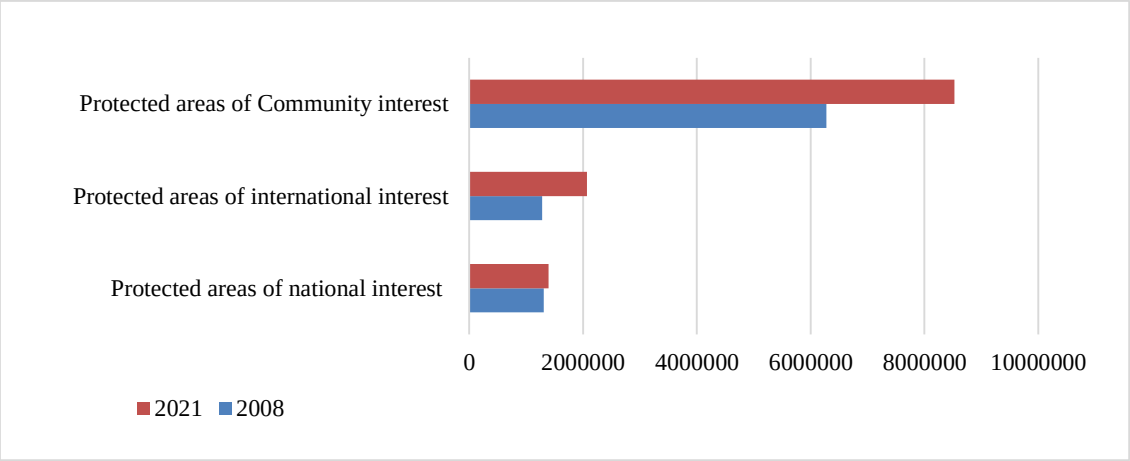
The distribution by types of protected areas. Out of the total number of protected areas, 58.1% were scientific reserves, natural monuments, natural reserves, 27.6% sites of Community importance and 10.9% avifaunistic special protection areas (the other types being in insignificant numbers – only 0.4% of total protected areas).



Structure of protected areas (number and surface), by types, in the year 2021

Source: NIS, Statistical Yearbook 2022

The evolution of protected areas over time highlights the expansion of protected natural areas by 35%, mainly due to protected areas of international interest.



Dynamics of protected areas (hectares), by main categories, in the period 2008 – 2021

Source: author's own calculations based on NIS, Statistical Yearbooks and Tempo Online data

As regards the ***conservation status of protected areas***, the latest available data from the Biodiversity Information System for Europe reveal a good conservation status of ***protected habitats***, of over two-thirds, and a poor conservation status (in more than one quarter of these). At the same time, almost half of the ***protected species*** have a good conservation status and slightly over one third have a poor conservation status. One fifth of protected species have a bad or unknown conservation status.

CONCLUSIONS

Biodiversity is all around us, in our agricultural landscapes, in the localities we are living, in parks and gardens. Our present and future depend on it.

The evolution of protected areas in Romania reveals that changes have been produced over time, in the sense of merging certain categories of protected areas or designation of new ones, which determined the (significant) expansion of protected areas nationwide. However, in reality, this expansion represents only a resettlement of protected areas by categories. However, the positive dynamics of protected areas cannot be denied, which proves the authorities' awareness, within minimal limits, of the need to stop biodiversity loss.

However, despite the expansion of protected areas, in recent decades, habitats and species have continued to face major deterioration (due to the irrational use of resources that nature provides and to the brutal impact of human activities on the natural environment), and restoring biodiversity shows minimal signs of improvement.

It is imperative to develop appropriate policies to protect and restore biodiversity, to implement them and to bring nature back into our lives.

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CHARACTERISTICS OF THE DEMOGRAPHIC SYSTEM IN THE ROMANIAN RURAL AREA – DEVELOPMENTS AT THE REGIONAL LEVEL IN THE POST-ACCESSION PERIOD AND PERSPECTIVES

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Abstract: *Over the time, demography has been the subject of multiple researches, given its importance in the development process of any community. The population and the changes in its structure, as well as aspects related to birth, mortality or specific demographic indicators (economic dependency rate and demographic ageing index), represent the starting point in the development of any sustainable development strategy. In this context, the present approach aims to carry out an analysis of the demographic system in the Romanian rural area in the post-accession period, using data and public information from the national statistics, as well as information from relevant reports, with presenting of the main structural changes and existing gaps in regional level.*

Keywords: *demography, structural changes, inter-regional gaps.*

JEL classification: J11, J12, J13, J14.

INTRODUCTION

Among the problems that Romania is currently facing is the demographic one. Considered as the backbone of the development of any society, demography plays an important role in ensuring the stock of human resources for the sustainable development of society.

The demographic problems, related in particular, to the decline of the population, including by residential areas, but also of specific indicators, as well as, most of the time, the unpredictability of some forecasts, make demography a constantly topical subject not only for the environment academic, but especially for the decision makers. The adoption of measures that contribute, for example, to the reduction of the demographic dependency rate or the aging index requires, among other things, significant financial efforts oriented in this direction.

However, the current demographic trends do not reflect an intervention of the decisive factors likely to improve the demographic indicators, but, on the contrary, continue the trend of their deterioration, which is not an argument in favor of ensuring a sustainable demographic structure.

MATERIAL AND METHODS

From a methodological point of view, the present approach is based on public information provided by the Tempo-Online database. The time period analyzed covers the period 2017-2022, respectively 2023, depending on the availability of data. The analysis is based on established statistical methods such as comparisons, structures and dynamics, both on residential environments and on development regions.

RESULTS AND DISSCUSION

The transition of Romanian society from the centralist to the competitive model is characterized by radical changes in the evolution of demographic phenomena, in demographic

structures. In the Romanian rural area, the phenomena reported at the level of the entire country are present, with oscillating intensities and dynamics, including at the regional (local) level.

From an administrative point of view, in 2023, the Romanian rural area includes a number of 2682 communes and 12958 villages. At the local level, the South-Muntenia region holds 18.1% of the total number of communes, while, in terms of the number of villages, the North-East region is in first place (18.7% of the total number, respectively with 2414 villages).

In the period 2017-2023, the resident population of Romania registered, in general, a tendency to decrease by 3%, a decrease mitigated by the changes that occurred at the level of the rural population. Thus, if in the urban environment, during the analyzed period, the population decreased by 5.7%, in the rural area we witness an increase of 0.1%. In fact, it is about a reversal of the migratory process from the village to the city, manifested over time, namely the return to the village.

Out of the eight development regions, the Bucharest-Ilfov region recorded the highest increase in the rural population with 20.9%, a situation that can be explained, among other things, by the proximity of the city of Bucharest, with a high level of development, to the rural localities of residence. However, three of the eight regions register a population decrease trend with percentages oscillating between 5.5% (South-West Oltenia) and 0.6% (South-East) (Table no. 1).

Table 1. Dynamics of the total population, urban/rural area in 2023/2017 (%)

	Total	Urban	Rural
TOTAL	-3.0	-5.7	0.1
North-West	-1.4	-5.2	2.8
Centre	-2.5	-5.3	1.1
North-East	0.2	-3.1	2.6
South-East	-4.1	-7.2	-0.6
South-Muntenia	-5.9	-7.5	-4.9
Bucharest-Ilfov	0.8	-1.8	20.9
South-West Oltenia	-6.2	-7.1	-5.5
West	-6.8	-12.5	2.2

Source: authors' own calculations based on Tempo-Online databases, 2023.

As a share in the total population, in three out of eight development regions the share of the population from the rural environment in total exceeds 50%, on the first place is South-Muntenia region (61.3%), followed by the North-East, South-West and South-West Oltenia. The three regions regroup 51.4% of Romania's rural population. It should be noted that during the analyzed period there is a visible tendency to increase the share of the rural population in total, with percentages between 0.4% (South-West Oltenia) and 3.4% (West) (Table no. 2).

Table 2. The evolution of the share of the rural population in the total population, on regions (%)

	2017	2018	2019	2020	2021	2022	2023	2023/2017 (%)
TOTAL	46.4	46.2	46.1	45.9	46.4	47.7	47.9	1.5
North-West	47.7	47.6	47.6	47.3	47.9	49.6	49.8	2.0
Centre	42.7	42.7	42.8	42.6	43.0	44.0	44.3	1.6
North-East	58.3	58.2	58.0	57.7	57.9	59.4	59.7	1.4
South-East	47.0	46.9	46.9	46.6	47.0	48.5	48.7	1.7
South-Muntenia	60.7	60.5	60.5	60.2	60.6	61.2	61.3	0.6
Bucharest-Ilfov	11.2	11.3	11.5	11.5	11.9	13.2	13.4	2.2
South-West Oltenia	54.3	53.8	53.7	53.5	54.6	54.6	54.7	0.4
West	39.1	39.1	39.3	39.3	40.3	42.3	42.9	3.7

Source: authors' own calculations based on Tempo-Online databases, 2023.

The structure of age of the rural population registered an oscillating evolution at the level of age groups. If on the whole rural area, the population between 0-14 years registered a slight increase of 0.7%, on development regions, there is a visible tendency to reduce the rural population included in this interval in only a little less than five out of the eight development regions, with percentages varying between 7.51% (West) and 1.89% (Center), which is not an argument in favor of ensuring a sustainable and sustainable labor force.

Moreover, in the period 2017-2022, the rural population between 15-64 years decreased in just six years by 11.9% on the total rural area, with percentages that oscillated between 18.44% (West) and 8.9% (Bucharest-Ilfov).

Against the background of the setback recorded in the two age categories, there is also the increase in the population in the over 65 segment, in all development regions (Table no. 3).

Table 3. Population dynamics by age structure in 2022 compared to 2017 (%)

	0-14 years	15-64 years	over 65 years
TOTAL	0.7	-11.9	17.2
North-West	0.4	-11.2	17.6
Centre	-1.9	-11.3	18.5
North-East	6.3	-10.9	20.6
South-East	-3.2	-13.0	18.5
South-Muntenia	-2.8	-12.2	16.4
Bucharest-Ilfov	8.1	-9.0	13.3
South-West Oltenia	-1.9	-11.9	21.0
West	-7.5	-18.4	14.6

Source: authors' own calculations based on Tempo-Online databases, 2023.

Thus, raising the issue of the sustainable and sustainable development of rural communities is, first of all, due to the existence of a damaged demographic structure, an aging population and a high pressure of the elderly population on the working age, but also a disproportionate base in relation to the other categories of the population.

Calculated as the ratio between the population over 65 years old and the population between 15-64 years old, the rate of economic dependence has increased both overall and by development region, above the national average, with 2 of the eight regions (Table no. 4), which reflects the deterioration of the capacity of the working-age population in the effort to support the elderly population, against the background of the more pronounced growth of the last category compared to the population in the 15-64 age range.

Table 4. The evolution of the rate of economic dependence in the rural area on regions (%)

	2017	2018	2019	2020	2021	2022	2022/2017 (%)
TOTAL	44.1	45.8	47.5	49.3	50.8	54.7	23.9
North-West	41.8	43.3	44.6	46.2	47.5	51.3	22.7
Centre	46.8	48.7	50.5	52.2	53.8	57.5	22.8
North-East	47.3	49.5	51.6	54.0	55.8	60.1	27.1
South-East	46.2	48.2	50.2	52.1	53.9	57.6	24.6
South-Muntenia	45.2	47.0	48.8	50.6	52.2	55.3	22.4
Bucharest-Ilfov	42.5	44.2	45.8	47.7	48.9	51.7	21.7
South-West Oltenia	40.2	41.5	42.7	44.1	45.7	49.9	24.0
West	42.5	43.9	45.4	47.0	48.6	54.4	28.0

Source: authors' own calculations based on Tempo-Online databases, 2023.

The population ageing index, calculated as a percentage ratio between the population over 60 years old compared to the population between 0-14 years old, follows the same upward trend but with a much higher intensity. Thus, in 2022 compared to 2017, the ageing index of the rural population registered an increasing trend with percentages between 4.8% (Bucharest-Ilfov) and 23.9% (West) (Table no. 5).

Table no. 5. Evolution of the demographic ageing index on regions (%)

	2017	2018	2019	2020	2021	2022	2022/2017 (%)
TOTAL	106,8	109,1	110,9	112,6	115,8	124,3	16,4
North-West	99,7	102,4	104,4	106,3	109,8	116,7	17,1
Centre	113,3	116,4	119,5	122,5	126,9	136,8	20,8
North-East	92,1	93,4	94,3	94,7	98,2	104,4	13,4
South-East	115,6	119,2	122,9	126,7	132,9	141,6	22,5
South-Muntenia	112,6	116,4	120,4	124,7	129,5	134,8	19,7
Bucharest-Ilfov	109,5	109,7	108,3	106,9	107,2	114,7	4,8
South-West Oltenia	95,4	99,9	103,3	107,1	109,3	117,7	23,3
West	116,2	118,1	119,8	121,4	124,9	144,0	23,9

Source: authors' own calculations based on Tempo-Online databases, 2023.

Calculated as the difference between the number of live births and the number of deceased persons, the natural increase in the rural environment registered a continuous and increasing deterioration in the period 2017-2022 (Table no. 6). If overall, this difference increased by almost 32%, the most significant increase is in the Center region, which recorded a tripling of the difference between the number of live births and the number of deceased persons. Moreover, even in the Bucharest-Ilfov region, in six years, the natural increase became negative after in 2017 it had positive values.

Table 1. The evolution of natural increase in rural areas in a regional profile (no. of people)

	2017	2018	2019	2020	2021	2022
TOTAL	-41824	-43049	-39380	-53843	-74957	-55180
North-West	-3410	-3465	-2921	-5612	-8180	-5584
Centre	-913	-1380	-1052	-2728	-4684	-2911
North-East	-5672	-6762	-4923	-7469	-11830	-8640
South-East	-7060	-7661	-7639	-8407	-11442	-9008
South-Muntenia	-12880	-12783	-12524	-16191	-20280	-15748
Bucharest-Ilfov	170	114	20	-260	-806	-316
South-West Oltenia	-8868	-8498	-8261	-9513	-12297	-9754
West	-3191	-2614	-2080	-3663	-5438	-3219

Source: authors' own calculations based on Tempo-Online databases, 2023.

Without being interpreted in a negative way, but with an important effect not only from the point of view of the pressure created on the working-age population, but also in relation to the social policy measures involved, the life expectancy tends to decrease by approx. 2 years, with percentages varying between -1.2 years (West region) and -2.8 years (Bucharest-Ilfov region) (Table no. 7).

Table no. 2. Life expectancy in rural area, on regions (years)

	2017	2018	2019	2020	2021	2022	2022/2017 (%)
TOTAL	74.13	74.19	74.23	74.36	73.61	72.75	-1.9
North-West	74.08	74.28	74.53	74.62	73.76	72.65	-1.9
Centre	74.62	74.64	74.67	74.88	74.1	73.14	-2.0
North-East	73.95	73.92	73.77	74	73.65	72.82	-1.5
South-East	73.43	73.39	73.29	73.28	73.17	72.24	-1.6
South-Muntenia	74.17	74.25	74.21	74.13	73.23	72.13	-2.8
Bucharest-Ilfov	75.34	75.13	75.2	75.79	74.78	73.76	-2.1
South-West Oltenia	74.27	74.44	74.75	74.96	74.39	73.18	-1.5
West	74.51	74.61	74.91	75.28	74.55	73.61	-1.2

Source: authors' own calculations based on Tempo-Online databases, 2023.

CONCLUSIONS

During the analyzed period, we are assisting to a decline in the population in Romania. If in the urban area the reduction of the population is much more pronounced, in the rural area there is a visible trend of a slight increase in the population in the period 2017-2023 by 0.1%, with percentages that vary from one region to another.

Population growth in rural areas in certain areas can be explained by the transfer of population in the near of economically developed areas, which allow the maintenance of jobs within them, areas located being situated at a reasonable distance from the localities of residence or domicile.

A worrying trend is the deterioration of the population structure by age groups, with negative effects on the sustainability of the labor force. In addition, the growth of the elderly population, even in the conditions of a slight setback in the average life expectancy, represents a negative aspect from the perspective of the need for state intervention through measures to support this trend.

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MAIN FACTORS OF AGRICULTURAL LAND USE CHANGE IN ROMANIA – A TERRITORIAL ANALYSIS

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Abstract: *In Europe, in the last decades, there have been significant changes in the categories of agricultural land use, in the two main directions of change: intensification and extensification. The main objective of this paper aims to analyze the main factors that influenced these changes in Romania at county level. The research methods used to achieve the main objective were: i) bibliographic documentation; ii) statistical analysis (data on the land fund structure at county level); and iii) cluster analysis. Starting from the theoretical model proposed by van Vliet, who identified multiple factors that affect changes in land use categories (demographic, economic, technological, institutional, socio-cultural and location factors) in his papers, it can be concluded that understanding the processes of changing the use of agricultural land and the factors that influence this process is important to anticipate Romania's future development paths.*

Keywords: *agricultural land use, factors of agricultural land use change, Romania*

JEL Classification: Q15, R14

INTRODUCTION

Land is an important input for the production of a wide range of goods, including but not limited to the production of agricultural commodities. Private decisions on the use of agricultural land often give rise to both external costs, such as restrictions on land access and damage to wildlife habitat, and external benefits, such as visual landscape, opportunities for recreational and rural activities, etc. Changes in agricultural, agro-environment, land use and regional policies and many non-political factors, such as climate change, demographic change and globalization, are increasingly affecting land use and management (OECD, 2009).

In recent decades, in Europe, the use of agricultural land has been subject to significant changes. Exploring these changes is important because of the major consequences they have, mainly in the field of environmental protection and human well-being (Plieninger et al., 2015). These changes were mostly captured in case studies implemented at local level. As socio-economic and biophysical conditions vary from one location to another, the conclusions of the case studies cannot be generalized. In this context, in order to get an overview, a series of meta-studies have been carried out that synthesize the conclusions from local studies and identify global/regional patterns of change in land use categories (Magliocca et al., 2015).

At European level, such a study was carried out by vanVliet and his colleagues. They present the fact that Europe has heterogeneous patterns of agricultural land use change and analyze the two directions of its change: intensification and extensification (vanVliet et al., 2015a). The understanding of changes in agricultural land use, especially those aimed at intensity, is limited because the studies conducted are few and heterogeneous. In his approach, to analyze patterns of land use change, vanVliet aims to recognize and analyze the factors leading to these changes.

MATERIAL AND METHOD

The objective of this paper aims to identify and consider the main factors that influenced the changes in the categories of agricultural land use at county level. The main objective was approached through the five classes of agricultural land use: arable, vineyards, orchards, pastures and hayfields.

The methods used to achieve the proposed objective included: i) bibliographic documentation; ii) statistical analysis, which involved the analysis of periodic primary data and the analysis of secondary data collected by the National Institute of Statistics (NIS) at county level; and iii) multivariate analysis.

For the selection of specific indicators, the theoretical model developed by vanVliet was used (Figure 1). This model aims to better understand both the connection between land use change and urban development processes, as well as their consequences at different territorial levels. To facilitate the aggregation of the conclusions from the case studies, the authors conducted a meta-study that summarizes the results of the studies based on a systematic review of the specialized literature. A model of the manifestations and underlying factors of agricultural land use change in Europe was thus obtained. As it can be seen in Figure 1, demographic, economic, technological, institutional, socio-cultural and location factors were identified. Information on farm and farmer has also been added to these.

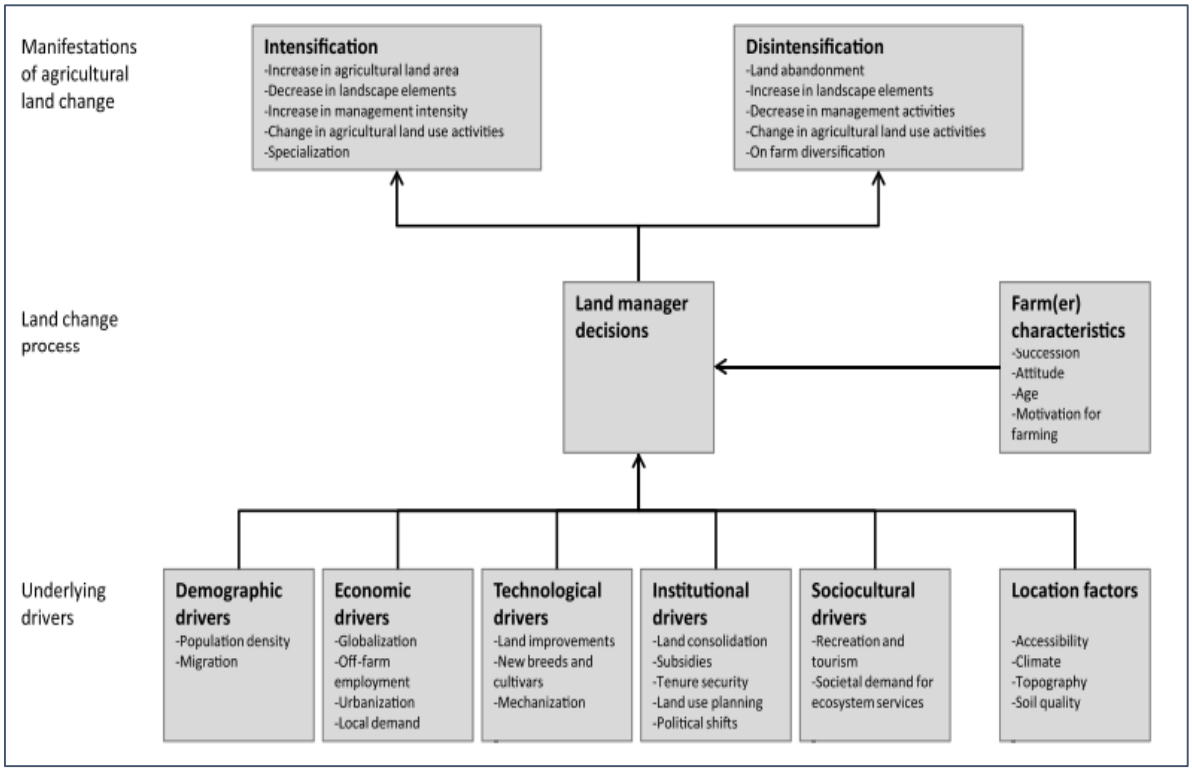

Figure 1. Conceptual framework of the manifestations and factors underlying agricultural land use change
(Source: van Vliet et. al., 2015a, p.27)

Based on the theoretical model previously presented in this paper, we used a set of indicators at the level of the 41 counties of Romania, which were grouped into seven categories. In the process of building the database, there was a certain limitation generated by the availability of indicators: many indicators proposed in the literature could not be used because they are not available at county level or their accuracy is not satisfactory. Thus, a number of 29 indicators were selected to be analyzed.

In order to have an integrative approach to the intensive and extensive agricultural use categories, an integrated/multidimensional data processing method was applied: the selected variables were processed through factor analysis and cluster analysis (Jaba & Grama, 2004). As a

result, six clusters/classes of change in agricultural land use categories were found for the 41 counties of Romania (Table 1).

Table 1. Intensity of change of agricultural land use categories, by types of clusters *

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
Counties	Botoșani, Neamț, Bacău, Vaslui, Constanța, Bistrița-Năsăud, Mureș, Brașov, Prahova, Dâmbovița, Argeș, Vâlcea, Gorj, Mehedinți, Caraș-Severin, Timiș, Bihor, Sălaj	Cluj, Hunedoara, Harghita	Satu-Mare, Maramureș, Suceava, Iași, Arad, Sibiu, Vrancea, Galați, Buzău, Dolj	Alba, Covasna, Olt, Ilfov	Tulcea, Brăila, Ialomița, Giurgiu	Teleorman, Călărași
Arable	- /+	- - -	- /+	- /- -	+	- -
Vineyards	- -/- - -	- - -	- /+	- /+	- -	- /+
Orchards	- -/- - -	- - /- - -	- -	- - -	- - -	- - -
Pastures	- /+	- /+	- /+	+	- /++	+ + +
Hayfields	+/++	- /- -	- - /+	- /+	- - -	+ ++/++

* In order to present the changes that took place in the period 1990-2020 in the agricultural land use categories, specific to each cluster, three intensities were used, which were noted as follows: high growth +++, medium growth ++, low growth +; large decrease - - -; average decrease - -; small decrease -. This classification corresponds to three ranges established according to the average value.

Following the analysis carried out, it can be concluded that each analyzed cluster registered changes both in the categories considered intensive and in the extensive categories, with different intensities.

RESULTS AND DISSCUSIONS

Debates on the drivers of change in agricultural land use categories are generally dominated by simplifications involving concepts, values and policy decisions (Lambin et al., 2001).

Demographic factors represent an important topic of analysis in the framework of territorial planning policies, being considered important for future developments: they play an essential role in the changes in the structure of ecosystems and land use (Nelson et al., 2007). In this paper, three demographic factors were studied: population evolution, evolution of population density and degree of urbanization. The demographic context in which agricultural activity is carried out is generated by the characteristics of the population. The viability of agriculture and the rural area is dependent on the quantitative and qualitative dimensions of the demographic volume, on the processes that define it, on the characteristics that describe its specificity. One of the main effects of the demographic decline process is the contraction of the pool of labour resources, with implicit effects on the use of agricultural land and on the development opportunities of the territory implicitly.

The results of the analysis show that the demographic variables are different from one cluster to another. Population decline can be seen in all 6 clusters. The population density has also decreased. Cluster 2 and cluster 6 registered a slight decrease in the degree of urbanization in the context where this indicator registered slight increases in the case of the other clusters.

Economic factors. The models of participation in economic activities and employment, existing at the level of the agricultural sector, determine both the viability and the economic and social

sustainability of rural communities, considering zonal agricultural specificity, production traditions, productive structure etc.

The indicators selected for the description of the economic dimension indicated a series of particularities for each cluster. Thus, Cluster 1 is characterized by a small to medium increase in GDP/capita and a medium to large increase in the value of agricultural production. Even though the population engaged in agriculture has registered an important decrease, the number of waged workers in agriculture and agricultural income have increased.

Table 2. Determinants of the change in the pattern of agricultural land use*

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
Demographic factors						
Population evolution	- -/- - -	- /- - -	- /- -	- -/- - -	-/- -	- -/- - -
Evolution of population density	- - -/--	- - -/--	- - -/-	- -/+	- -/-	- - -/--
Degree of urbanization	-/+	- /- -	-/+	+/+++	-/+	- /- -
Economic factors						
Evolution of population engaged in agriculture	- -/- - -	- -	- - /- - -	- - /- - -	- -	- - /- - -
Evolution of wage earners working in agriculture	+ +/+ + +	-/ +	+ + /+ + +	+/+ +	-/+	+
Evolution of agricultural output value	+ +/ + + +	+ +	+ +/+ + +	+ +/+ + +	+ /++	+/+ +
GDP/inhabitant	+/+ + +	+ +/+ + +	+/+ + +	+/ + +	+	+
Nominal agricultural income	+/+ +	+/+ +	+/+ +	+/ + +	+/ + +	+/ + +
Technological factors						
Large Livestock Units/100ha	-/+	- - -	- -/- - -	- -/- - -	- - -	- - -
Number of tractors/ha	- /+	+ +/+ + +	-/+ +	-/+ +	-/+ +	-/+ +
Consumption of chemical fertilizers/ha	- -/- - -	+/+ +	- -/++	--/+	-/+	+/++
% irrigated area	-/+	0	-/- -	+	+ +/+ + +	+
% unused agricultural area	+ +/+ + +	+/+ +	+/+ +	+/ + +	+/+ +	+/+ +
Location factors						
Evolution of modernized roads	+/+++	+/+++	+/+++	+/+++	+/+++	++/+++
ANC-areas facing significant natural constraints	-	0	0	0	+	0
ANC-mountain areas	-/+	++/+++	-/++	++/+++	0	0
ANC-areas affected by specific constraints	-/+	-	-/+	-/++	++/+++	++/+++
Socio-cultural factors						
Poverty rate	-/+	-/++	++/+++	++	++/+++	+++
Evolution of the number of agro-pensions	-/+ + +	+ +	+/+ + +	-/+ + +	+/+ +	+
Producer groups	-/+++	-	-/+	-/+	-	-/+
Production cooperatives	-/+++	-/++	-/+++	-/++	-	-/++
Institutional factors						
% farms under 5 ha subsidies	++/+++	++	-/++	-	-	-
% farms over 500 ha subsidies	-/++	-	-/++	-/++	++/+++	+++
Farms and farmers						
% crop farms in total farms	-/++	+++	-/+++	-/+++	-	-
average area of a farm	-/+++	++	+/++	+/+++	+/+++	++
agricultural training of farmers	---/+++	---/+++	---/+++	---/+	+/+++	++/+++
% young farmers	++/+++	-/+++	-/+++	-/++	-/++	-/++

*To present the changes in agricultural land uses, specific to each cluster, three intensities (positive or negative) were used, which were noted as follows: high growth +++, medium growth ++, low growth +; large decrease - - -; average decrease - -; small decrease -. This classification corresponds to three ranges established according to the mean value.

Cluster 2 is characterized by an average decrease of the population engaged in agriculture, accompanied by a slight decrease of the number of waged workers in this sector. The value of

agricultural wages, the value of agricultural production and GDP/capita show average increases. In the case of Cluster 3, with the exception of the agricultural population engaged in agriculture (that experienced a sharp decrease), all other indicators have positive, increasing values. The situation is almost similar in the case of Cluster 4, which is characterized by a small to average increase in the number of waged workers. Specific to Clusters 5 and 6 is the low growth of GDP/capita and also a small to average increase in the value of agricultural production. The difference between the two clusters is given by the evolution of the population engaged in agriculture, which registers a slight decrease in the case of Cluster 5 and a slight increase in the case of Cluster 6. The evolution of waged workers in agriculture have slightly positive values in the case of Cluster 6.

The technological factors have a specificity for each cluster: i) Cluster 1 records a range of values, from slight decrease to slight increase in the case of LLU per hectare, number of tractors per hectare and irrigated area. Fertilizer consumption recorded a moderate to large decrease. On the other hand, the share of uncultivated agricultural land experienced a significant increase; ii) Cluster 2 is characterized by a significant decrease in the livestock sector. The endowment with tractors experienced a medium to large increase and the consumption of fertilizers per hectare also recorded a medium-level increase. The share of unused agricultural areas also increased, registering an average level; iii) in the case of Cluster 3, there is an important decrease in the LLU per hectare and also a slight to average decrease in the irrigated areas. The endowment with tractors shows a medium to high growth. The uncultivated agricultural area registers a range of values up to an average level; iv) Cluster 4 has a small to medium increase in unused agricultural areas and also a slight increase in irrigated areas. The consumption of chemical fertilizers and the endowment with tractors range from a moderate decrease to a slight increase, and animal husbandry shows a significant decrease; v) Clusters 5 and 6 follow the same trends with small differences: strong decrease in the animal husbandry sector, slight decrease to average increase in the number of tractors per hectare and small to average increase in the unused agricultural area. The differences appear in the case of fertilizer consumption, which registers a slight to medium increase in the case of Cluster 6 and a slight decrease to a slight increase in the case of Cluster 5. The irrigated area experienced a medium to large increase in the case of Cluster 5.

In the case of *location factors*, in addition to the evolution of the share of modernized roads in total roads, we also analyzed the areas facing natural constraints. The density of transportation infrastructure is a major factor that can influence agricultural land use, as accessibility helps transport agricultural products to local markets and inputs to the farm. The influencing mechanism of accessibility on the land use pattern is complex and also depends on economic, demographic and cultural factors, land availability, land demand and territorial policies (Yongwei et al., 2020). Areas facing natural constraints are areas difficult to operate due to problems caused by naturally restrictive conditions (classified in three categories: i) mountain areas; ii) areas facing significant natural constraints; and iii) other areas facing specific constraints. The analysis of the evolution of the share of modernized roads shows an increase in the case of all six clusters. In the case of areas facing natural and specific constraints, the following particularities can be noted: Cluster 2 and 4 have the most important areas belonging to the ANC-ZM category; the ANC-SPEC category is found in Cluster 5; ANC-SMN is specific to Clusters 5 and 6.

Analyzing the *socio-cultural factors*, the following features of the six clusters can be highlighted: the poverty rate has the highest values in the case of Cluster 6; Clusters 3, 4 and 5 generally fall within the range of average values of poverty rate; Clusters 1 and 2 have a better situation, with poverty rates with low to medium values. The evolution of the number of agro-

pensions registered increases in all clusters: the most important were found in Cluster 3. Producer groups and cooperatives register low values in all six clusters; the best situation is found in Cluster 1.

Institutional factors – in terms of subsidies, it can be noted that the highest amounts for farms under 5 hectares are specific to Cluster 1, followed by Clusters 2 and 3. On the other hand, the share of subsidies for farms larger than 500 ha are characteristic of Clusters 6 and 5.

Farms and farmers – the share of crop farms in total farms has the highest values in the case of Cluster 2, followed by Clusters 3 and 4; Clusters 5 and 6 have low values. The evolution of farm size increased slightly in Clusters 4 and 5 and had an average value in the case of the others. The training of farmers registered a medium to high increase in the case of Cluster 6. For this indicator, the value had a wide range of values: from a strong decrease to a strong increase in the case of Clusters 1, 2 and 3. On the other hand, Cluster 1 had a medium to large increase in young farmers; in Clusters 2 and 3 the evolution of the number of young farmers is heterogeneous and in the case of Clusters 4, 5 and 6 it registers low values.

CONCLUSIONS

Starting from vanVliet's scheme, who identified the main factors that affect the change in agricultural land use categories (demographic, economic, technological, institutional, socio-cultural and location-related factors) in his works, it can be concluded that in the case of Romania, the economic, institutional and location factors can be considered the main factors influencing both intensification and extensification. Demographic factors are primarily mentioned in the context of extensification. Differences in institutional factors are significant at territorial level and differ across regions, depending on the different subsidy systems that are implemented. Technological factors influence the intensification of agricultural land and are manifested, first of all, by an increase in the intensity of land management. Farm and farmer characteristics are important for both intensification and extensification. The methodology used has both strengths and weaknesses. The advantages of this approach are the transparency of data in the framework matrix of indicators and the possibility of their evaluation at county level. On the other hand, presenting results at county level may lead to false accuracy (each county has significant micro-level heterogeneity).

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THE ROLE OF ACTIVE AND INCLUSIVE PARTNERSHIPS IN TOURISM DEVELOPMENT IN TULCEA COUNTY, ROMANIA

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Abstract: *Tourism represents an important factor in the socio-economic development of rural areas in Romania. Natural landscapes and local traditions are valued by entrepreneurs from the countryside and are transformed into attractions for tourists from the urban environment or from abroad. At the same time, the development of tourism and leisure businesses also has a social role by creating jobs for the local population and improving the standard of living in the countryside. Local Action Groups are active partnerships at the level of a relatively small territory and that include in a balanced way representatives of the public, private and civil society sectors. The "bottom-up" LEADER approach, applied by the Local Action Groups, is based on the identification of solutions that meet the real needs at the local level and the provision of financial resources for them. The research paper aims to carry out an analysis of the development of businesses in the tourism sector in Tulcea county supported by measure 19 Local Development LEADER from the National Rural Development Program. To carry out the study, information was collected, processed and interpreted from the database of the Agency for the Financing of Rural Investments, from the local level and from the Ministry of Agriculture and Rural Development. The research conclusions highlight the role of LAG partnerships in supporting tourism initiatives in rural areas and the importance of applying the LEADER approach in solving local problems and socio-economic development in rural areas.*

Keywords: *LEADER, tourism, Local action group, rural development*

JEL Classification: Q01, Q26

INTRODUCTION

The main activity of rural population is agriculture, but this sector does not cover the needs of the population from the perspective of ensuring a constant and sufficient income for a decent living. In this context, non-agricultural activities become a necessity to supplement incomes and increase the quality of life in rural area. (Sima E. 2022) Tourism is a field that can be exploited as an alternative or in complementarity with agricultural activities.

The existing natural and human resources in the countryside can generate earning opportunities for local entrepreneurs and, to the same extent, meet the demands of tourists, increasingly attracted by natural settings and traditions. Even if the tourism sector was hard tried during the pandemic, tourist reception structures specific to the rural environment (pensions and agro-pensions) were preferred by tourists. (Roșu E., Voicilaș D-M, 2022)

Grants from the European Fund for Agriculture and Rural Development, through specific national programs, support local entrepreneurs to start non-agricultural businesses in the countryside, including in the tourism and leisure sector.

Within the National Rural Development Program 2014-2020, measures 6.2 and 6.4 are provided to support the initiation and development of the non-agricultural field. (Părnuș Rusu A., Gheorghe E., Mitulescu R., Marin Ilie N., Ifrim D. 2023), (MADR, 2023). At the same time, through measure 19 Local development LEADER, partnerships formed at local level under the name of Local Action Groups (LAGs), develop and implement local development strategies using the LEADER tool.

The "bottom-up" LEADER approach applied by the Local Action Groups is based on the identification of solutions that meet the real needs at the local level and the provision of financial resources for them. (European Commission, 2023).

MATERIAL AND METHODS

The purpose of the research paper is to carry out an analysis of the development of tourism sector businesses in Tulcea county supported by measure 19 LEADER Local Development, from the National Rural Development Program and to present the impact of starting tourism and leisure businesses for increasing the quality of life in the targeted area.

The following research methods and techniques were used to carry out the research: the identification and collection of specific data, their analysis, synthesis, interpretation. Information is presented in graphical and tabular form.

The information analyzed and used in the paper was taken from representative materials from the websites of the authorities with a role in the elaboration, management, implementation and control of rural development programs in Romania, namely: the Management Authority for the National Rural Development Program, within Ministry of Agriculture and Rural Development; Agency for Financing Rural Investments, Local Action Groups from Tulcea county. Also, the specialized literature and the legislation with incidence in the field of the work were studied.

RESULTS AND DISCUSSION

Local Action Groups have the opportunity to elaborate development strategies for territories made up of communes and cities with a population of up to 20,000 inhabitants - this being the eligible territory where the LEADER financing instrument can be applied.

These partnerships aim at the socio-economic development of the territory in which they operate, increasing the attractiveness of tourist destinations in the territory through innovation and authentic rural experiences, as well as increasing the standard of living of the inhabitants. In many areas of Romania, the tourism sector represents an opportunity for development, therefore in most local development strategies we find measures to support it.

This paper proposes an analysis of the situation of LAGs in Tulcea county from the perspective of start-ups financed in the tourism sector. Five LAGs are active in Tulcea county, covering the entire LEADER eligible territory: Macinului Mountains-Old Danube LAG, Razim LAG, Danube Delta LAG, North Dobrogea LAG, People of the Delta LAG.

They have 17,530,063.46 euros at their disposal to implement the strategies, with the 2014-2020 PNDR as a source, including the additional funds related to the 2021-2022 transition period. (Părnuș Rusu A., Gheorghe E., Mitulescu R., Marin Ilie N., 2022)

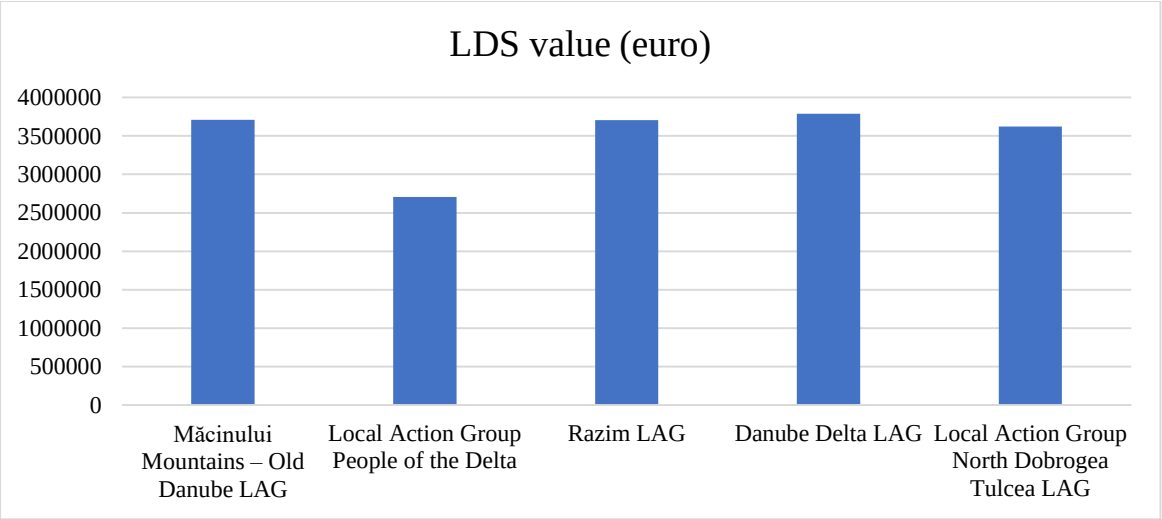

Figure 1. – LDS value (euro)

The allocation of each LDS was made according to the area covered by the LAG and the number of inhabitants in the respective territory, as well as based on quality criteria of the strategy. Thus, SDL Măcinului Mountains – Old Danube LAG has a value of 3,711,129.53 euro, LDS of "Local Action Group People of the Delta" has a value of 2,704,712.04 euro, LDS of Razim LAG has a value of 3,704,152.54 euro, LDS of Danube Delta LAG has a value of 3,787,203.44 euro, LDS of "Local Action Group North Dobrogea Tulcea" has a value of 3,622,865.91 euro. (MADR, 2022)

This funding is for projects in the public field, the agricultural field and the non-agricultural field. Considering that a significant part of the territory covered by the 5 LAGs is found in the Danube Delta Biosphere Reserve, with a special natural setting, it creates opportunities for the development of tourism and leisure activities. Thus, in each of the strategies of the LAGs there is a measure that can be used to finance the start-up of non-agricultural activities, including in the tourism sector. Within the SDLs, 43 projects were financed to support start-ups that carry out tourism and leisure activities, with a total value of 1,655,000.00 euros

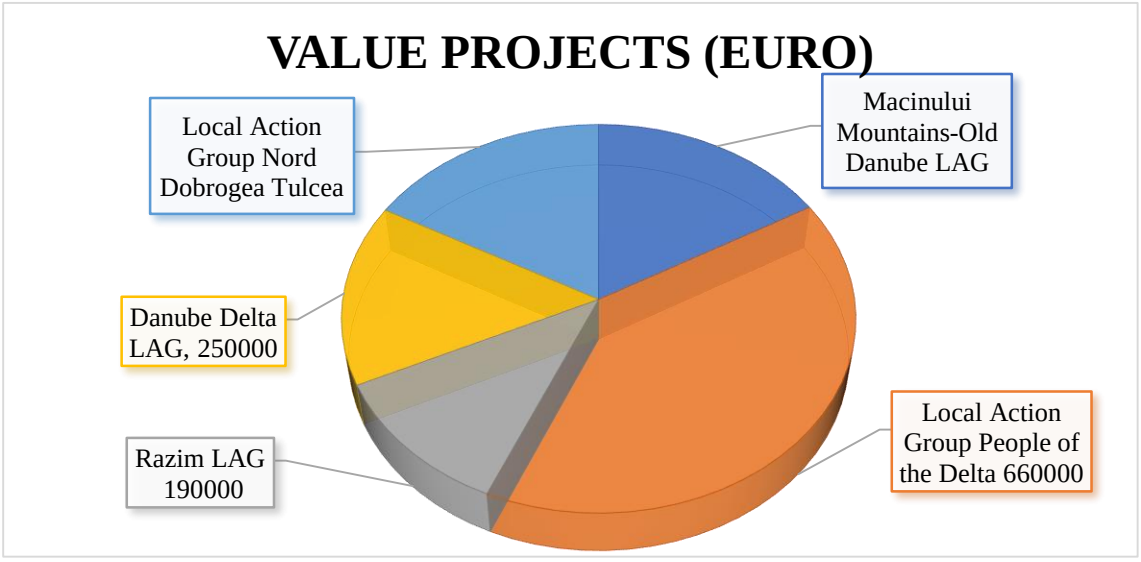

Figure 2. Value of projects in the tourism field for start-up

At the Măcinului Mountains - Old Danube LAG level, 9 projects were financed, with a total value of 275,000 euro, at the "Local Action Group People of the Delta ", 22 projects were financed,

with a total value of 660,000 euro, at the Razim LAG 3 projects were financed, with a total value of 190,000 euro, 5 projects were financed at the Danube Delta LAG, with a total value of 250,000 euro, 4 projects were financed at the "Local Action Group North Dobrogea Tulcea", with a total value of 280,000 euros. (AFIR, 2023)

Table 1. Number and value (euro) projects in the tourism field for start up

LAGs	Projects number	Value (euro) projects
1. Măcinului Mountains - Old Danube LAG	**9**	275,000.00
2. Local Action Group People of the Delta	**22**	660,000.00
3. Razim LAG	**3**	190,000.00
4. Danube Delta LAG	**5**	250,000.00
5. Local Action Group North Dobrogea Tulcea	**4**	280,000.00
Total	**43**	**1,655,000.00**

The typology of the projects is varied and we can note the development at a high level of business in the tourism field. For the most part, the projects are aimed at tourist reception structures, new constructions or modernizations and extensions of existing ones being supported. The financed accommodation structures are structures of the agro-pension, camping or guest rooms type, which combine the function of accommodation with agricultural, fishing or handicraft activities specific to the Danube Delta area. Tourists thus have the opportunity to get involved in the activities of the locals and discover the traditions and customs of the area.

Figure 3. Projects typology in the tourist field

Locals from Tulcea County exploit the attractions of the Danube Delta, offering tourists specific recreational opportunities, such as boat trips on the Delta's canals, observing specific flora and fauna, unique in Europe. An important attraction is the specific cuisine, based on fish and aquaculture products. The local gastronomic points financed are represented by private kitchens, where food is prepared according to culinary recipes specific to the area, which are served directly to

the final consumer. The products served are prepared according to traditional methods, those used in the household, tourists can discover special dishes.

Tabel 2. Number of projects according to typology

LAGs	Projects number	Projects typology
Măcinului Mountains - Old Danube LAG	9	Accommodation structure Recreational and leisure center Local gastronomic point
Local Action Group People of the Delta	22	Accommodation structure Leisure tourist services Local gastronomic point The house upgrade and appropriate equipment for introduction in the tourist circuit Traditional boat tourism
Razim LAG	3	The purchase of equipment for the organization of recreational and entertaining events Leisure and recreational activities
Danube Delta LAG	5	The purchase of boats Accommodation services in camping cabins Leisure and excursions Accommodation structure
Local Action Group North Dobrogea Tulcea	4	Construction/establishment of the agro pension

As can be seen in table 2, all LAGs in Tulcea county supported local entrepreneurship in the tourism and leisure sector and encouraged local residents to carry out economic activities in a legal, legally constituted form. This aspect increases the confidence of tourists, who can spend a safe stay. The number of projects is directly proportional to the size of the territories covered by the LAGs, thus the Delta People LAG has the most funded projects, covering all tourism domains.

CONCLUSIONS

The five LAGs in Tulcea county promote sustainable tourism, help preserve natural and cultural resources in rural communities and lead to the improvement of the quality of life of the inhabitants of the People of the Delta area.

From the typology of projects, we can see the involvement of the business environment in promoting tourism in Tulcea county and the variety of activities that tourists from Romania and abroad will enjoy.

In essence, these are small projects with huge potential for the development of the rural area and with a major impact on the development of the business environment. Also, the funding granted also has a social impact for the local community, by creating jobs in established businesses and developing related services that rely on tourism activity, for example transport activities, handicraft production activities and crafts, cultural activities that promote traditions and folk wear.

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STRATEGIC NATIONAL PLAN 2023-2027 - OPPORTUNITIES OR CONSTRAINTS FOR SUSTAINABLE AGRICULTURE IN ROMANIA?

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Abstract: *The present work aims to make a synthesis of the specialized literature and European and national policies and strategies regarding the promotion of sustainable agriculture. In this way, an overview is achieved, in which synergies and common objectives can be noticed between various European policies and strategies that are based on the European Green Deal, these being the "Farm to Fork" Strategy, the Biodiversity Strategy, the EU Soil Strategy for 2030, the Long-Term Vision for the EU's Rural Areas. The four strategies are correlated with the three pillars of sustainability: Environment, Economy, Society. In the face of the new European policies and strategies that promote sustainable agricultural practices with beneficial environmental and health effects on the long term, which can contribute to reducing the effects of climate change, Romania, through the National Strategic Plan 2023-2027, has ambitious targets to achieve, which will represent a great challenge in the next period.*

Keywords: *sustainable development, sustainable agriculture, agricultural policies*

JEL Classification: Q01, Q18

INTRODUCTION

The sustainable development concept has expanded and acquired new values at theoretical and practical level in recent decades, and the agricultural sector has continued to have a very important place in sustainable development, both from the point of view of specialized literature and from the point of view of European and national political decision-makers.

At this moment, sustainable development is at the core of several European strategies and policies within the European Green Deal, such as the "Farm to Fork" Strategy (F2F, European Commission, 2020a), the Biodiversity Strategy (BS, European Commission, 2020b), the EU Soil Strategy for 2030 (SS, European Commission, 2021b), the Long-Term Vision for the EU's Rural Areas (LTVRA, European Commission, 2021a). The four strategies are correlated with the three pillars of sustainability: Environment, Economy, Society.

According to the European Green Deal, agriculture is one of the key areas – along with environmental protection, climate change, energy, industry, transport, digitalization and finance – in order to reach the goal of climate neutrality that the EU has proposed for the year 2050. Promoting sustainable agriculture is considered an important factor in balancing the economic, social and environmental needs. (Ștefănescu M., 2022).

MATERIALS AND METHODS

In the present work, the main working hypothesis is the fact that sustainable agriculture is the central subject of several European strategies and policies, generating additional requirements on Romanian agriculture. The transposition of European strategies and policies on agriculture itself is carried out through the National Strategic Plan for the period 2023-2027.

In carrying out this work, a methodology was used based on the collection of information from specialized literature (scientific articles published online - Researchgate, Academica.edu, etc., various scientific magazines, specialized books), as well as from European and national reports on the topic of agriculture sustainable in Romania from the perspective of the new PNS 2023-2027. This

review of the specialized literature aims to create an overview and understand the processes that take place regarding the topic addressed.

RESULTS AND DISCUSSIONS

Prospects of sustainable agriculture in Europe.

As agriculture is the second sector responsible for greenhouse gas emissions (11%) in the European Union (EU), ahead of the industrial sector (9%) (European Environment Agency, 2021), a strong focus is laid on the transition to a more sustainable agricultural and food system to help mitigate climate change and protect biodiversity.

To better understand the farming systems and identify the most sustainable forms of production, it is important to acknowledge that the agro-ecosystems produce much more than crops (Dale and Polasky, 2007) and that rural lands can provide much more than agricultural produce (Gawith and Hodge, 2019). When agro-ecosystems are well maintained, they serve society and human well-being by generating a range of ecosystem services, many of which are based on soil functions (Luj´an Soto et al., 2020), biodiversity, landscape features and traditional knowledge (de Groot et al., 2022).

The European Green Deal, through the "Farm to Fork" Strategy, the Biodiversity Strategy and the Soil Strategy provide clear political objectives and targets for the deintensification of production systems, making them less dependent on external inputs (Buckwell et al., 2022) and promoting ecosystem services that rural areas and farming systems provide to society. With 40% of land dedicated to agriculture, the rural area is an active factor in the transition to a green Europe (European Commission, 2021a). Thus, farmers play a key role in biodiversity conservation through sustainable agriculture practices; at the same time, biodiversity improves agricultural productivity by providing safe, sustainable conditions, nutritious and affordable foodstuffs (European Commission, 2020b).

The "Farm to Fork" Strategy (European Commission, 2020a) aims to promote the transition to sustainable agriculture based on the premise that there is an urgent need to reduce dependence on pesticides, antimicrobials and fertilisers, and at the same time to increase ecological agriculture, improve animal welfare and increase biodiversity. It is aimed to achieve the target of minimum 25% agricultural land under organic farming in Europe, reduce the use of pesticides by 50% and of fertilisers by 20% by the year 2030. This strategy encourages the transition to sustainable food systems, although the sustainability concept remains ambiguous and certain authors point out that no clear conceptual limits are established in this regard (Schebesta and Candel, 2020).

A key question concerning food security and the implementation of "Farm to Fork" Strategy is whether an increase by 25% of the EU's organic farming will produce enough crops to feed an already large and growing population. It has been scientifically proved that lower yields are obtained from the organic farming system, which means an increased need for farmland areas to produce the same quantity of crops (Muller et al., 2017). Expanding the agricultural land areas is not a good option as this would mean the conversion of forestland, meadows or wetland into arable land, which would result in the loss of products (timber, fibres, energy, etc.) and of eco-system services (carbon sequestrated in soil and vegetation, water regulation, biodiversity, etc.).

To meet the proposed European targets, an integrated approach to the Common Agricultural Policy and the Green Deal was used, aiming to "*transform the way food is produced and consumed in Europe, in order to reduce the environmental footprint of food systems and strengthen their*

resilience in the context of crises, while ensuring healthy food at affordable prices for the present and next generations." (EU Council, 2021). To this end, the CAP provides support under the form of subsidies and direct financing to European agricultural producers in order to integrate rural economy and environmental protection.

The New CAP 2023-2027 is a key instrument to connect the objectives of the "Farm to Fork" Strategy and farmers and will be implemented at national level with national strategic plans and ambitious environmental targets. 40% of the CAP budget will be dedicated to climate and environment (European Commission, 2020c). In addition to the environmental objectives, the CAP Reform also aims at a better and more equitable distribution of the financial support provided by establishing a maximum amount of 100,000 € subsidies per beneficiary per year. This measure is meant to prevent the situation from the previous programming period when at least 80% of CAP payments reached less than 20% of beneficiaries and thus supports social justice and socio-economic development, as foreseen in the Long-Term Vision for the EU's Rural Areas (European Commission, 2021a).

At present, the "ecological programs" are an integral part of the National Strategic Plans and thus funding will be provided to stimulate sustainable practices (for instance: precision agriculture, agro-ecology, organic farming included, carbon sequestration in agricultural soils and agro-forestry).

The conditionalities imposed on agriculture by the European Green Deal will put European farmers in front of a great difficulty in keeping up with global competition. For European farmers, this means less means to protect their crops, difficulty of the new breeding technologies in the face of restrictive legislation, etc. There will be rigours and pressures that will make European farmers uncompetitive in the short and medium term.

Prospects of sustainable agriculture in terms of the National Strategic Plan 2023-2027

The challenge for Romania comes from transposing the ambitious targets from the European strategies into the national strategic plan and reaching them in a relatively short period of time (Report on the national CAP Strategic Plan, 2021), out of which: to reduce the use and risk of chemical pesticides by up to 50% by the year 2030, to reduce the use of more hazardous pesticides by up to 50% by the year 2030; to reduce nutrient losses resulting from the use of fertilizers by at least 50%, without damaging soil fertility, and to reduce by at least 20% the amount of fertilizers used in agriculture by the year 2030; to ensure 10% of the agricultural area with highly diverse landscape features; to reduce by 50% the sales of antimicrobial substances for farm animals and aquaculture by the year 2030; to reduce by at least 55% the greenhouse gas emissions by the year 2030, compared to their level in the year 1990; to reach climate neutrality by the year 2050 and to ensure that 25% of the EU's agricultural land will be under organic farming by the year 2030.

For Romania, the National Strategic Plan 2023-2027 was approved by the European Commission on December 7, 2022. Its budget is 15.8 billion euros, out of which Pillar 1: 9.78 billion euros under the form of Direct Payments and 151 million euros Sectoral Interventions – support instrument under the European Agricultural Guarantee Fund (EAGF) and Pillar 2: 5.87 billion euros – instrument for the rural development policy funded from the European Agriculture and Rural Development Fund (EAFRD) and the State Budget (Figure 2).

Against the background of decreasing funds allocated to EU's agriculture in the next period, Romania receives a slightly higher funding for Pillar 1 and a significantly lower funding for Pillar 2. These funds will be distributed, as in previous programming periods, by the Agency of Payments and

Intervention in Agriculture (APIA) for Pillar 1 and the Agency for Financing Rural Investments (AFIR) for Pillar 2.

The National Strategic Plan has the following established objectives for the period 2023-2027 (Report on the CAP strategic plan 2021): I. Promoting a smart, resilient and diversified agricultural sector to ensure food security, increase farm viability by stabilizing farmers' incomes and eliminating disparities between farms; II. Strengthening market orientation and increasing the competitiveness of the agri-food sector by intensifying cooperation, encouraging collective investments, farm restructuring and modernization, through investments to improve productivity alongside with the development and modernization of food industry; III. Socio-economic development of rural areas by attracting and supporting young people, facilitating business development, promoting and increasing employment, social inclusion and local development in rural areas.

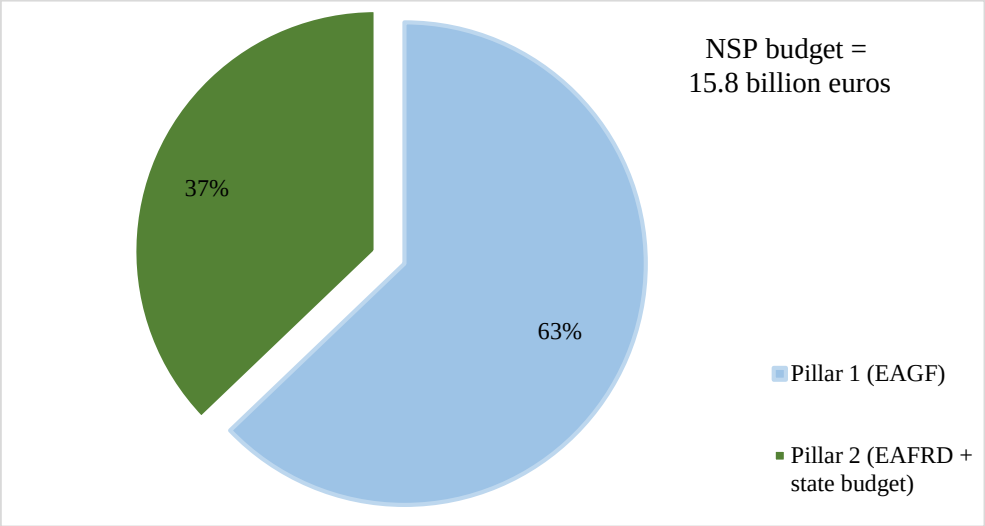

Figure 1. NSP 2023-2027 budget

Source: https://www.madr.ro/docs/dezvoltare-rurala/2022/PNS_2023-2027-versiunea_1.2-21.11.2022.pdf

In the case of NPS 2023-2027, the environmental objectives become paramount, and these will take into account the contribution to the mitigation and adaptation to climate change, the promoting of sustainable development and the efficient management of natural resources, as well as the contribution to the protection of biodiversity, the improvement of eco-system services and the conservation of habitats and landscapes. Thus, the new NSP comes with more environmental obligations for Romanian farmers both through Pillar 1 and Pillar 2.

To benefit from European payments, farmers must comply with more ambitious conditionalities. Through the eco-scheme payment system (25% EAGF), through environmental and climate commitments, for economic agriculture and irrigations (41.32%), an additional payment will be established for farmers to compensate for exceeding the minimum mandatory requirements.

The new NPS has been subject to a number of changes, out of which the most important would be that the focus is now laid on economic and ecological performance. Among the changes related to Pillar 1, the most notable would be the following:

- Change of terminology used in the new programming period, namely: Basic Income Support for Sustainability (BISS) replaces Single Area Payment Scheme (SAPS). BISS has a ceiling of 4.82 million euros and will be applied on an area of 9,697,000 ha, and its planned value ranges from 96.47 euros/ha in the year 2023 to 103.06 euros/ha in 2027.

Important for this programming period is the fact that in order to benefit from the BISS basic payment, a series of minimal (basic) environmental conditionalities will have to be respected, a level applicable to all beneficiaries of direct payments and compensatory payments on the entire holding and throughout the calendar year. Compliance with this conditionality system will raise certain difficulties for Romanian farmers.

- The Complementary Redistributive Income Support for Sustainability (CRISS) is a new scheme designed to farms from 1 to 50 hectares that represent the majority of holdings in our country; it has a ceiling of 978.69 million euros, that is 10% of total direct payments and covers an area of 3,748,473 ha. CRISS addresses farmers eligible for BISS payment, being a complementary support scheme.
- The coupled support for crop production involves interventions for the following crops: soybeans, alfalfa, legumes for processing (green peas, beans and green beans), hemp. Rice, potato seeds, hops, sugar beet, field vegetables for consumption, fresh or for processing (tomatoes, cucumbers, peppers, eggplants) and vegetables grown in greenhouses and plastic tunnels (tomatoes, cucumbers, peppers, eggplants, cabbages), as well as fruits (plums, apples, cherries, sour cherries, apricots and peaches) and seeds for forage crops. The allocated amount is 408.10 million euros, out of which: 78.78 million euros – 2023; 80.44 million euros – 2024; 81.28 million euros – 2025; 82.95 million euros – 2026; 84.65 million euros – 2027.
- In the livestock production sector, the coupled support will cover dairy cows, beef cattle, buffalo dairy cows, sheep/goats and silkworms, with the following amounts allocated for the four years: 522.02 million euros dairy cows; 114.9 million euros coupled support for beef cattle; 10.45 million euros coupled support buffalo dairy cows; 411.84 coupled support sheep/goats; 0.15 million euros coupled support silkworms.

One holding (1-50 ha) can simultaneously benefit from BISS, CRISS, ECO-SCHEME and Coupled support for the crop and livestock sectors, if it meets the requirements of those support schemes.

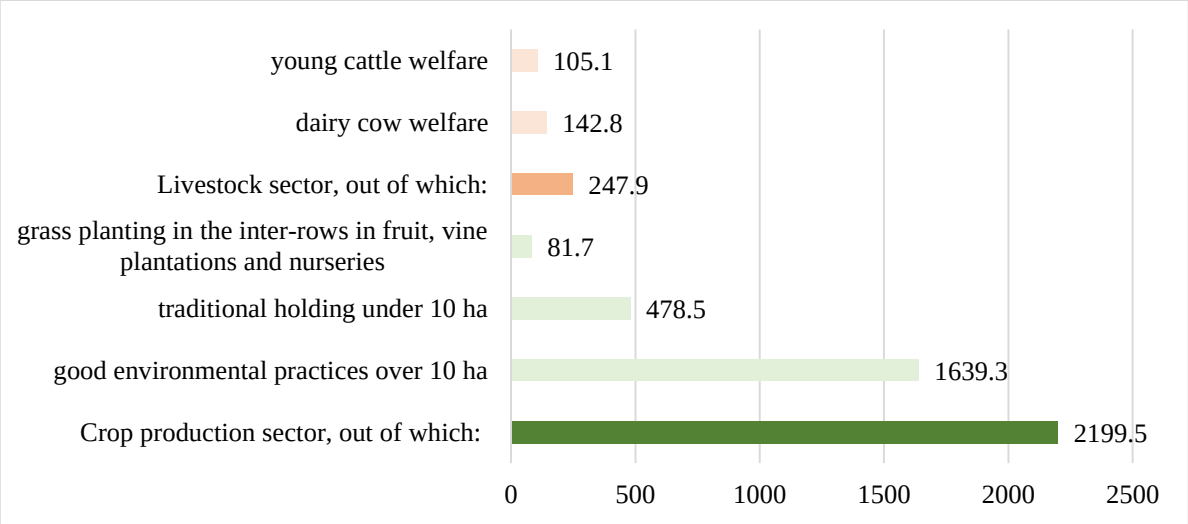

Figure 2. Allocated budget for Eco-scheme under Pillar 1

Source: https://www.madr.ro/docs/dezvoltare-rurala/2022/PNS_2023-2027-versiunea_1.2-21.11.2022.pdf

- The Eco-scheme is a means of stimulating the provision of public goods through the application of agricultural practices beneficial for the climate and the environment, hence it contributes to a higher environmental level. Farmers are stimulated by annual lump-sum payments, as is the case of eco-schemes regarding: good environmental practices, applicable in arable land over

10 ha (56 euros/ha); environmental-friendly farming practices on small farms (traditional holdings under 10 ha) (76.0 euros/ha); grass planting in the inter-rows in fruit, vine plantations and nurseries (77 euros/ha).

The annual payment for the eco-scheme will be granted for the partial coverage of income losses resulting from the additional costs following the application of general mandatory conditions and specific conditions. To be eligible for the eco-scheme, farmers must fully comply with the standards of good agricultural and environmental conditions provided for in BISS, in the conditionality requirements respectively.

As a first *mandatory requirement*, farmers must allocate, starting from 2024, 5% of arable land to non-productive and landscape elements (including fallow), so as to ensure the protection of soil as main natural resource for the agricultural activity. Another mandatory requirement concerns the cultivation of protein crops on 10% (2023) and 5% (in the following years) of the arable area. This practice is a stimulating tool for reaching the targets from the Green Deal Strategy ("The Farm to Fork" component), the protein crops being a natural alternative to enrich soil with nutrients and reduce the application of chemical fertilizers. As a mandatory general requirement, soil cover is meant to protect soils in the most sensitive periods of the agricultural year (June 15 – October 15), in order to mitigate climate change.

As regards the *specific conditions*, farmers can opt for one of the following requirements that boost the environmental ambitions: I. *Diversification of crops in arable land*, which contributes to the increase of biodiversity, sustainable management of environmental resources, preservation of natural capital and obtaining of safe and high-quality agricultural products. At the same time, this can contribute to climate change mitigation and adaptation, mainly by improving the capacity of carbon sequestration in soil. II. *Minimum tillage* (avoiding a great number of practices involved by ploughing, disking and other works such as seedbed preparation or crop maintenance) that contributes to the increased capacity of soil adaptation to the climate change effects, by preventing soil erosion and moisture loss. At the same time, through these methods, soil texture and structure and soil biota will be improved, and organic matter in soil will increase (+ of humus). III. *Planting two trees /ha/year* will contribute to the protection of crops, halting and reversing biodiversity loss, to the improvement of eco-system services and conservation of habitats and landscape that can be a refuge for wild birds and animals. At the same time, on medium term, this can contribute to soil erosion diminution, decrease of soil temperature in the proximity area of holding, slightly influencing the capacity to maintain water in soil and carbon sequestration capacity.

As compared to the previous programming period, the budget allocated to Pillar 2 Rural Development in the period 2023-2027 is significantly lower, which can be also noticed in the allocations for the environment and climate, and thus a more accurate selection of areas that will benefit from support is necessary or a better adaptation of conditions applicable to the specific environmental protection needs.

The interventions from Pillar 2 Rural Development with regard to Environment and Climate amount to 1,719.91 million euros, which represent 41.8% (a percentage higher than the mandatory percentage of 35%), while the main destinations are quite the same as in the previous programming period: Agro-environment and climate 492.33 million euros; Organic farming 389.12 million euros; Areas with natural constraints 663.99 million euros; Forestry 174.47 million euros.

As regards the environmental commitments in the NSP 2023-2027, there are no significant changes, these aim to continue the efforts from the previous programming periods with a series of optimizations that highlight higher ecological ambitions. The actions promoted for environmental

protection and climate change by the new NSP will contribute to reaching the objectives and targets of the EU/national policies referring to the conservation of biodiversity and ecosystems, soil and water protection, reduction of GHG and ammonia emissions and adaptation to the effects of climate change.

The agro-environmental and climate interventions in the NSP bring increased consistency from the perspective of more accurate correlation, on the basis of the most recent available data, of farmland sustainable management models with the most representative areas for the biodiversity elements whose protection is sought.

In this programming period, there is a decrease in the amounts dedicated to areas affected by natural and specific constraints, while the amounts dedicated to mountain areas are increasing. Unfortunately, the map of areas with natural and specific constraints has not been updated for 10 years (for example, there are large areas in the eastern part of Romania that have been facing severe drought in recent years). Another change that does not benefit these areas with natural and specific constraints is that they do not receive additional points for projects funded under Pillar 2.

Romania supports organic farms both in the conversion and maintenance period, as against other countries that have cut financial support to farms in the maintenance period. The European Green Deal sets the target that 25% of the EU's agricultural area should be under organic farming by the year 2030.

CONCLUSIONS

For Romania, reaching the environmental and climate targets proposed through the NSP 2023-2027, which overlap the European targets, appears difficult to achieve due to complex requirements, and the financial support is not correlated with the level of losses suffered by farmers, even though the environmental effects are positive. On the other hand, our country has a good level of environmental indicators, and reducing the current level of use of chemical inputs would lead to a decline in the productivity of agricultural land, and, implicitly, to jeopardising food security.

The transformation of the present Romanian agriculture into a more sustainable, organic agriculture represents a great challenge and needs a holistic approach that takes into consideration the social, economic, cultural and environmental aspects, while also taking into account the unforeseen changes that may occur, as was the case with the COVID-19 pandemic or the border war. The two crises have had many negative effects that we still feel today, but at the same time they have also created many opportunities that must be exploited in the future (e.g. digitalization accelerated by the pandemic or energy independence imposed by the war).

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WINE FARMS IN ROMANIA AND WINE PRODUCTION IN THE EUROPEAN CONTEXT

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Abstract*: This study presents a comparative analysis of the Romanian – EU vine and wine sector. Specialized reports and EUROSTAT structural statistics were extremely useful in providing comparable information. Other relevant data were taken from the European Commission. Unlike the EU average, with more than 82 % of the area dedicated to grape production for quality wines, Romania has a relatively low percentage, of 28%. According to turnover, 75% of the Romanian wine market is in the hands of ten large producers. The foreign trade in wine takes place predominantly on the EU market. The balance of trade is negative, with a growing trade deficit each year. Until 2021, Romania exported wines at prices higher than the prices of imported wines, but in the year 2021 wine import prices became higher.*

Keywords: *production, market, wine.*

JEL Classification: Q 10, Q 13.

INTRODUCTION

In the European Union, the vine and wine sector is regulated by a set of laws consisting of a basic regulation, delegated regulations, implementing regulations, supplemented by guidelines and legal interpretations.

Romania has benefited from EU financing for the vine and wine sector. From 2009 to 2013, the EU invested 42.5 million euros per year in Romania's viticulture. In the period 2014-2020, this funding increased to 47.5 million euros per year. The programme includes funding for structural reform and business development.

MATERIAL AND METHOD

Specific literature searches were conducted, in electronic databases in particular. Specialized reports developed by specialized bodies were analyzed. The following data were used in the paper from the EUROSTAT structural statistics: vineyard area, number of wine farms, size of wine farms, main varieties by category of grapevine age, year and colour, 2015 and 2020. The monitoring of the wine market in the EU is based on the structural statistics of vineyards. Data are collected every 5 years, and the holdings that produce only table grapes are excluded. In these statistics, only 16 Member States are included that have a minimum planted area of 500 hectares; their area represents 99.97% of the total area of the EU. According to (EC) Regulation no. 1337/2011, the main grapevine varieties are only those varieties that have an area larger than 500 hectares at national level. These were useful in providing comparable information at EU level. FAO statistics were also used. Other relevant data on wine production by types of wine were taken over from the European Commission. The utilized indicators allowed a comparative analysis of the Romanian – EU vine and wine sector.

RESULTS AND DISCUSSIONS

The historical and archaeological evidence points to an ancient wine culture. Similarly to modern physicians' vision, in the medical thought of ancient Greeks wine was considered a possible cause of troubles and even of health problems, mainly in the case of excessive drinking; thus, the

ancient physicians established the necessary precautions for its use. However, what is most unexpected, is that wine was considered a therapeutic agent not only for the mind but also for the body; thus, physicians largely used wine in their prescriptions, both for internal and external use (Jacques Jouanna, 2012). Avicenna (980-1037) mentioned that Persia had such a passion for wine that even after the Muslim conquest, the rigorous religion of Arabs could not eradicate this passion for centuries (Jean-Robert Pitre, 2009).

The world vineyard area was slightly over 7.3 million ha in 2020. The EU vineyard area accounts for about 45% of the world area under vineyards.

The world wine production in 2020 is estimated at 260 million hectoliters. The lowest production in recent years, under 250 million hectoliters, was obtained in 2017.

According to OIV estimates, the world wine consumption was 234 million hectoliters, down from previous years; the current situation was similar to that during the financial crisis of 2008-2009. The difference between the two situations is that at present the decline began before the crisis.

The EU vine and wine policy aims to ensure a viable wine production and also takes into consideration the other two general objectives of the CAP, namely a sustainable use of natural resources and a balanced territorial development. The types of grapes produced in the EU are classified into six different categories: for PDO, PGI wines, for table wines, grapes with dual destination (consumption/wine), for raisins and other vineyards where vines for the production of vegetative propagation material and other vines not classified elsewhere are included.

Quality wines are wines with protected designation of origin (PDO) and those with protected geographical indication (PGI). The protected designation of origin (PDO) identifies a product originating from a specific geographical area using the recognized and registered know-how. All PDO products must be produced exclusively from grapes from the respective area. The protected geographical indication (PGI) designates a product with a quality, reputation or other specific characteristics that can be attributed to a certain geographical area. All PGI products must be produced with at least 85 % grapes from the area in question. It is useful to specify that the viticultural year is the period that starts from August 1 and ends on July 31.

In the year 2020, the area under vineyards in the EU totaled 3.19 million hectares, accounting for 2% of UAA, out of which 3.14 million hectares were wine areas. Three quarters of the EU's area under vineyards is owned by three member states: Spain – 0.91 million hectares, France – 0.79 million hectares and Italy 0.69 million hectares.

The EU's area under vineyards remained relatively stable from 2015 to 2020.

More than half of the EU's area under vineyards (52.7%) is covered by red grape varieties, 44.6% by white grape varieties and 2.7 % by varieties of other colors.

Production was driven by the demand for quality wines, so that more than 82% of the vineyard area of the EU was used for the production of grapes for quality wines in the year 2020: 65.3% PDO, 17.1PGI, 13.2% Table wine, Dual purpose 2.7%, Raisins 1.2%, 0.5% Other vines.

A limiting factor was the age of vineyards in the EU, where 36.7 % of grapevines were aged more than thirty years in 2020, with other 41.3 % aged from 10 to 29 years; only 4.5% are young vine plantations less than three years old.

The number of wine farms totaled 2.2 million. The top three large producers own one fifth of the number of wine farms (Spain – 483 thousand, France – 75 thousand, Italy – 302 thousand).

Compared to the size of farms growing field crops, wine farms in the EU are relatively small-sized, with an average size of plantation of 1.43 hectares in 2020. France had the largest average size, i.e. 10.5 hectares. In the EU, most farms are smaller, and only 3.2% of them have 10 hectares (Figure

1). As a trend in the EU, the number of farms decreased, mainly in the category of farms smaller than 1 hectare.

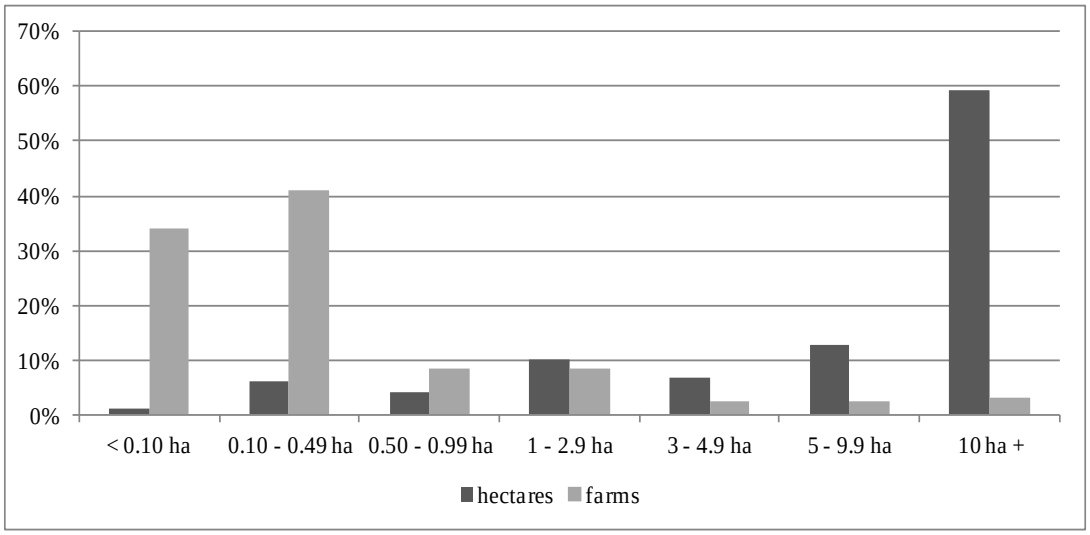

Figure 1. Distribution of areas and wine farms, by size classes in the EU, %

Source: Eurostat (vit_t2)

Quality wines represent almost 68% of the EU's vinified production. PDO wines account for 45% of total production, while PGI wines account for 22.7% of total, varietal wines 24.8%; the production of other wines, out of which table wines, represent one fourth of total production (Figure 2).

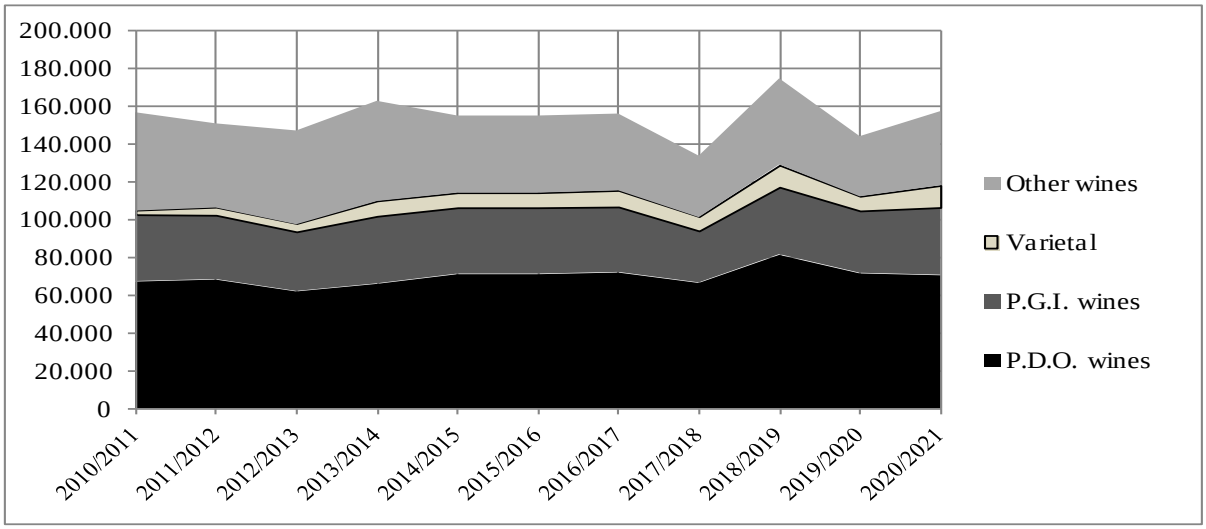

Figure 2. EU's wine production by types of wine, in the period 2010/2011-2020/2021 – thousand hl.

Source: Eurostat, Wine production (production from grapes harvested in the year n-1)

Romania's vineyard area totaled 180683 hectares in the year 2020, representing 5.7 % of the EU's vineyard area. Almost 28% of this area is dedicated to quality wines, mainly for PDO wines (Figure 3). The vineyards that are not in bearing yet are also included in these areas. (Table 1).

Compared to 2015, the area in production destined to wine grapes decreased by more than 10 thousand hectares, but the area that was not in bearing yet increased, as an effect of the vine and wine programme.

Table 1. Area under vineyards in Romania – hectares

VINETYPE (Labels)	2015	2020	2020/2015	
Total area under vines (in/not yet in production)	183,717	180,683	-3,034	-2%
Vines in production – total	179,361	169,189	-10,172	-6%
Vines in production - wine grapes – total	179,361	169,189	-10,172	-6%
Vines in production - grapes for PDO wines	29,572	25,052	-4,520	-15%
Vines in production - grapes for PGI wines	17,315	13,970	-3,345	-19%
Vines in production - grapes for wines with neither PDO nor PGI	132,402	130,167	-2,235	-2%
Vines in production - dual purpose grapes	72	0	-72	-100%
Vines in production – raisins	0	0	0	
Vines not yet in production – total	4,171	11,494	7,323	176%

Source: Eurostat vit_t1

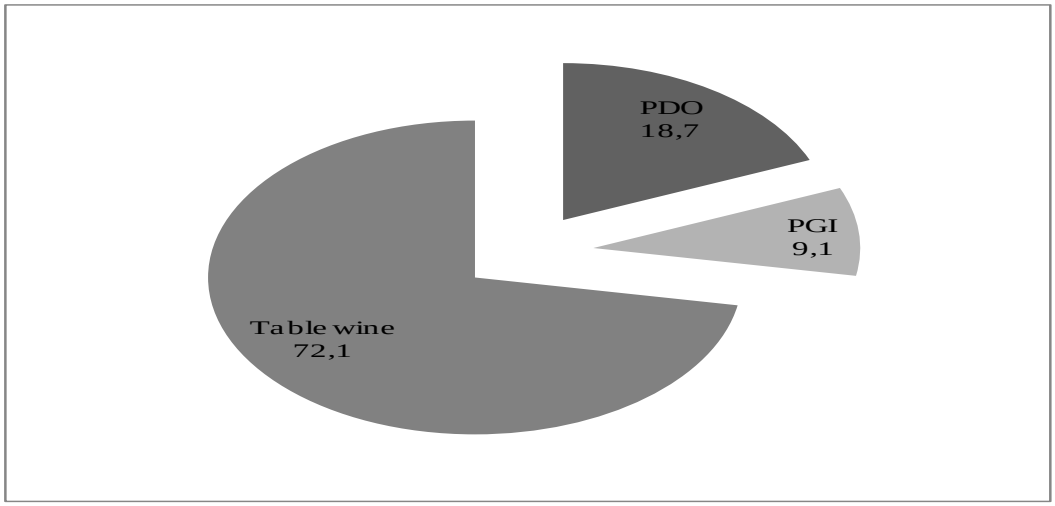

Figure 3. Share of vineyard areas in the EU, by production destination, 2020, %

Source: Eurostat, vit_t1)

Romania has the largest number of farms in the EU, i.e. 844015 farms, accounting for 38% of the European wine farms. More than 51% of farms have less than 0.10 hectares, and 45% have 0.10-0.49 hectares; the remaining 4% of farms larger than 0.5 hectares operate 50% of the area. It is worth noting that 0.1% of the farms larger than 10 hectares operate 31% of total area (Figure 4).

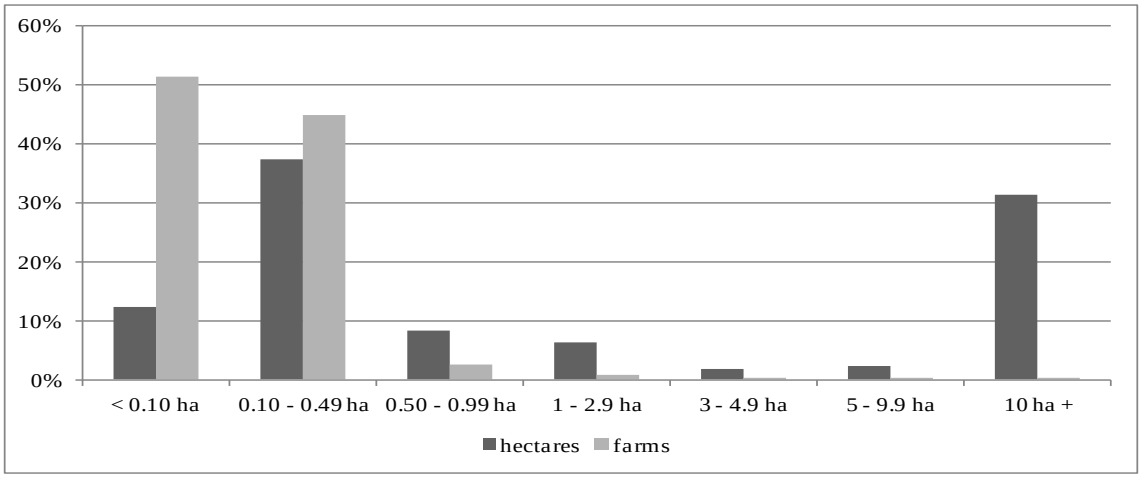

Figure 4. Distribution of vineyard areas and farms in Romania, by size classes %

Source: Eurostat (vit_t2)

The average area of the grapevine plantation is 0.21 hectares, the lowest in the EU. As compared to 2015, the number of farms decreased by 1.3%. While in the EU the red grape varieties prevail, in Romania white grape varieties are mostly grown (62.7%) and only 37.3% are red grape varieties. The age of plantations is essential for production efficiency. In our country, a restrictive factor, in addition to the small average size of plantation, is the high share of old plantations, aged more than 30 years. However, a positive effect of the vine and wine programme is that the share of plantations younger than three years has increased, currently representing 12.2 % compared to the EU average of 4.5%.

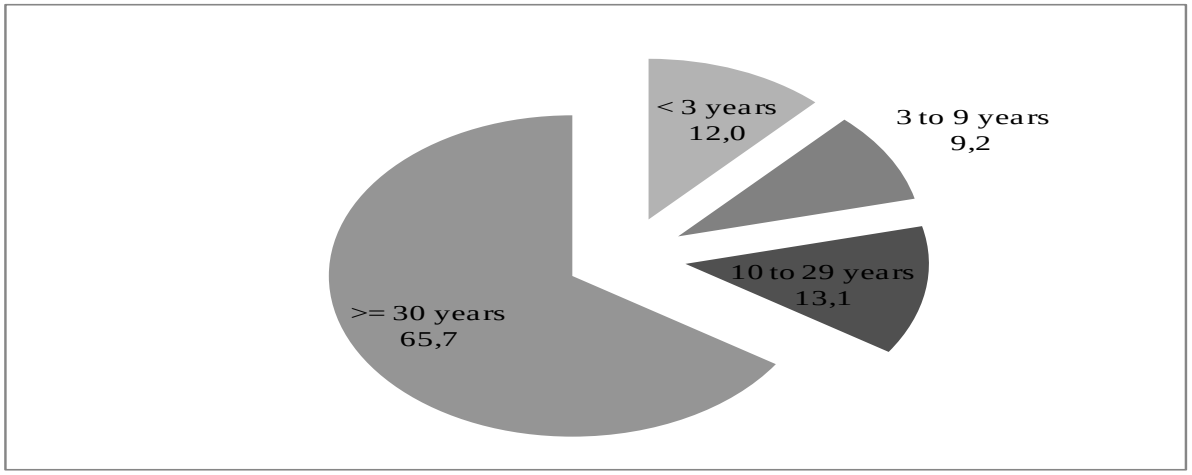

Figure 5. Distribution of grapevine plantations in Romania by age categories in 2020, Source: Eurostat vit_t4

From 2007 until now, the programme of reconversion of vine plantations has been running, with specific measures, of which the largest share responded to the structural needs, namely the restructuring and reconversion of grapevine plantations.

According to the www.TopFirme.com site, there are 252 economic operators in the wine industry (NACE code 1102), with a turnover of 255.3 million euros. The number of employees is 2529, and the net profit is 38.7 million euros, the figures being established on the basis of the latest balance sheets submitted. Recaş SA Winery ranks first, both in terms of turnover and profit.

	Turnover	Rank		Profit	Rank
Recas SA Winery	57.2	1	Recas SA Winery	16.7	1
Zarea SA	33.2	2	Ceptura SRL Winery	5.4	2
Ceptura SRL Winery	33.1	3	Zarea SA	3.9	3
Beciul Domnesc SA	27.7	4	Casa de Vinuri Cotnari SA	1.5	4
Vinexport Trade Mark SA	10.3	5	Beciul Domnesc SA	1.1	5
Domeniile Viticole Tohani SRL	8.4	6	Domeniile Sahateni SRL	1	6
Domeniile Alexandru Rhein 1892 SA	6.4	7	European Project Sud Est SRL	0.934	7
Carl Reh Vinery SRL	6.1	8	Tenuta Odobesti SRL	0.513	8
Vitipomicola Samburesti	5.7	9	Domeniile Viticole Tohani SRL	0.513	9
Casa de Vinuri Cotnari SA	5.2	10	Carl Reh Vinery SRL	0.463	10

Box 1. Ranking of economic operators in the wine industry by turnover and profit, million euros

Source: www.TopFirme.com

Romania's wine production represents less than 3% of the production in the EU. In the market year 2020/2021, Romania vinified 3984 thousand hectoliters of wine, out of which PDO 16%, PGI 5%, varietal wines 4%, and the remaining 75% other wines. The years with the best productions, of over 5000 thousand hectoliters were 2013/2014 and 2018/2019; the smallest vinified quantity was obtained in 2016/2017, i.e. 3301 thousand hectoliters. While in the market year 2010/2011, with a production of 3287 thousand hectoliters, quality wines represented 28% of production, in the year 2020/2021 quality wines represented only 21% of total production. However, in quantitative terms, the PDO production doubled, while the production of PGI wines decreased three times (Figure 6).

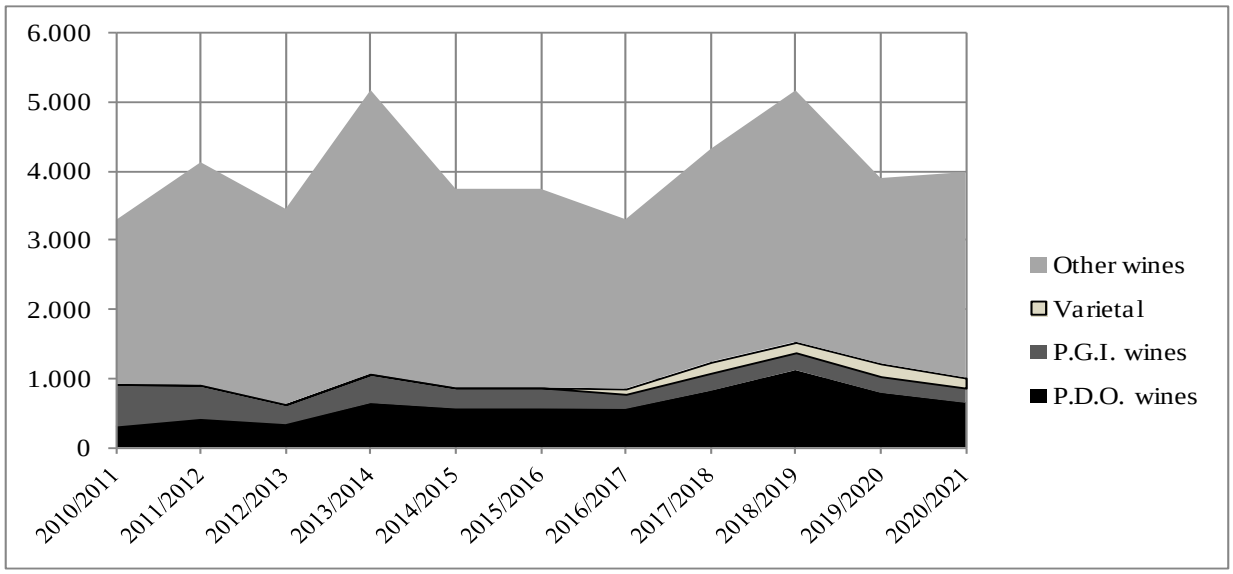

Figure 6. Romania's wine production

Source: Eurostat, Wine production (production from grapes harvested in the year n-1)

Average yields per hectare fluctuated, yet they are lower than the EU average (Table 2)

Table 2. Wine yields (hectoliters/hectare)

	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	***2021/2020***	***2021/last 5year av.***
EU	**56.5**	**57.2**	**57.6**	**49.0**	**61.7**	**50.5**	**54.8**	**53.6**	**-2.1**	**-1.3**
Spain	42.2	41.1	43.3	35.1	48.9	36.9	44.9	38.8	-13.6	-6.9
France	66.3	67.5	64.9	51.5	62.5	52.2	56.4	45.7	-18.9	-19.8
Italy	81.9	79.3	83.7	72.2	90.5	76.6	76.7	94.0	22.5	19.0
Romania	75.9	33.0	30.3	38.6	46.3	34.6	35.7	43.2	21.2	19.0

Source: DG Agriculture and Rural Development based on MS notifications

Consumption in the EU has had a historical decreasing trend, being about 23 liters/capita at present. In the year 2020, Portugal had the highest wine consumption per capita, with 51.9 liters, Italy with 46.6 liters, France with 46 liters, followed by Switzerland, with 35.7 liters. In Romania, wine consumption followed the production trend. The highest consumption was 22.7 liters in 2014 and the lowest 12.3 liters in 2018 (Figure 7).

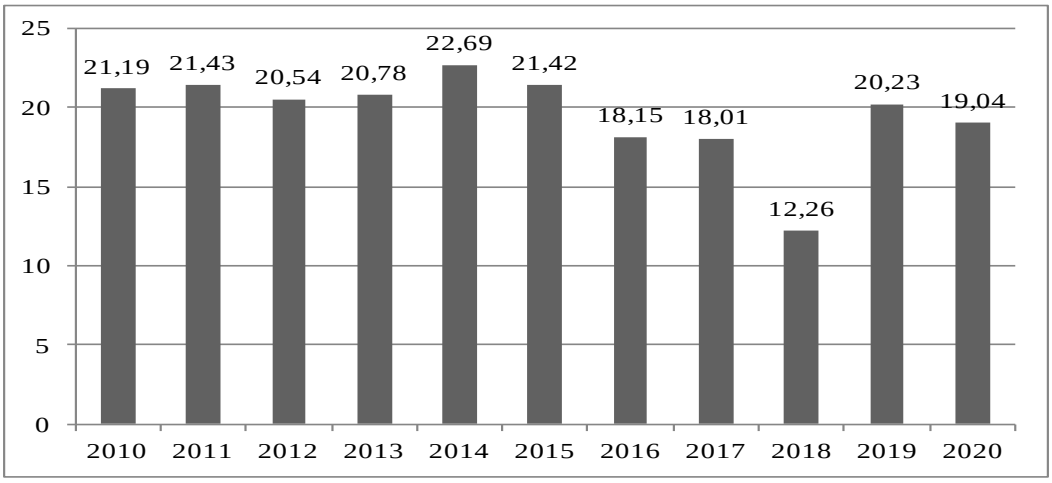

Figure 7. Evolution of wine consumption in Romania
Source: FAOSTAT

Compared to the year 2013, exports doubled in quantitative terms, and increased by 87% in value terms. In the year 2020, Romania exported 20.7 thousand tonnes of wine; in value terms, exports increased by 87%, from 16.5 million euros to 30.9 million euros. Quantitative imports increased from 36.7 to 44.7 million euros (+22%); in value terms, imports increased by 86%, from 38 to 70.5 million euros. The balance is negative both in quantitative and value terms. The trade deficit deepened (Figures 8 and 9). Wine trade mainly takes place on the EU market, and only 9% of the quantitative export is intended for third markets; 62% of import wines originate in the EU.

The value-to-quantity ratio reveals that cheaper wines are exported than in 2013.

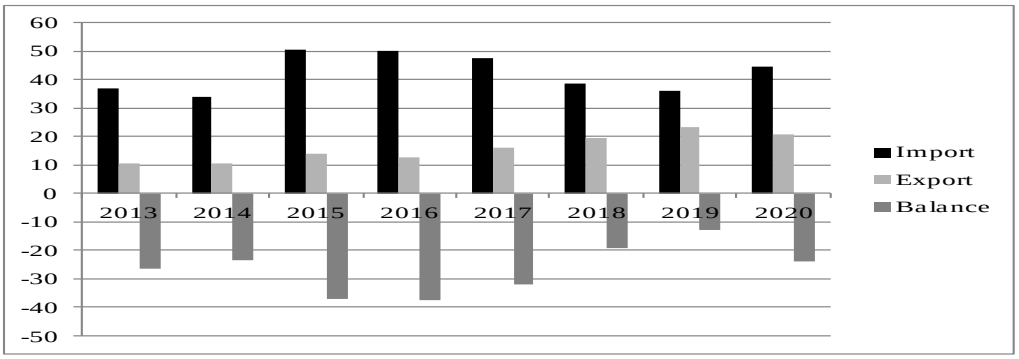

Figure 8. Wine trade in quantitative terms – thousand tonnes
Source: MARD

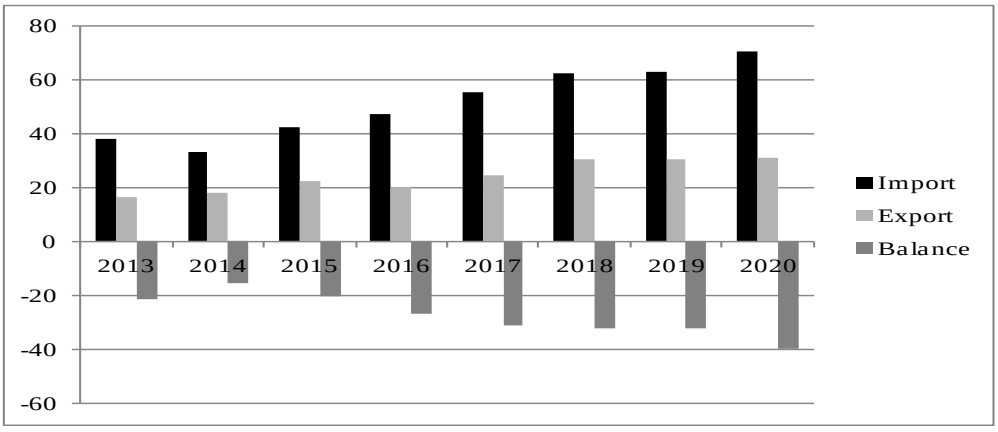

Figure 9. Wine trade in value terms – million euros
Source: MARD

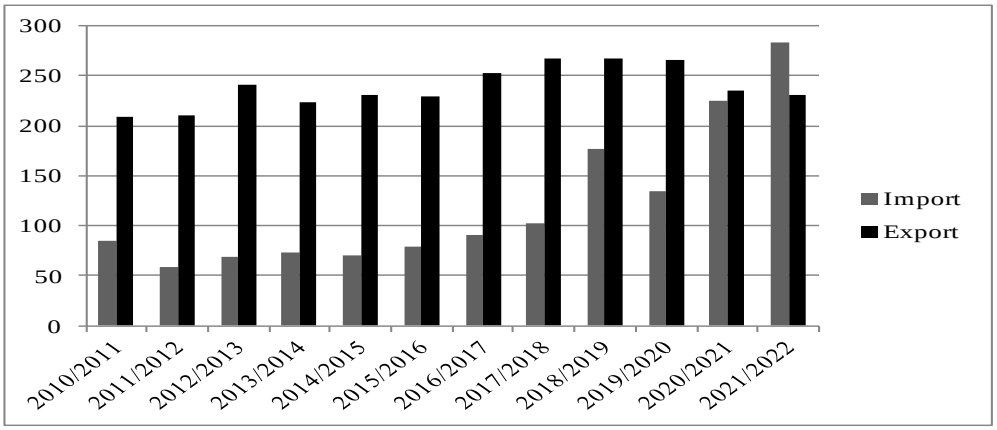

Figure 10. Average value of wine in foreign trade, euros/hl
Source: https://agridata.ec.europa.eu/extensions/DashboardWine/WineTrade.html

Overall, export prices were higher than import prices until 2021, when the value of import prices became higher. The difference in 2010 in favor of export was 123 euros/hl; in 2022, the price difference was 79 euros/hl in favor of imports (Figure 10).

CONCLUSIONS

Even though the area under vineyards slightly decreased, an improvement was noticed in terms of the new investments made through the support programme. A limitation in the sector is represented by the small size of plantations by farm.

Yields oscillate from year to year and are smaller than the EU average. Wine production fluctuates, being dependent on weather conditions. A restrictive factor is the unfavourable structure of wines, with a 75% share of other wines. In this sense, the support programme only succeeded in renewing the areas dedicated to quality wines and not the areas dedicated to other wines.

The top ten economic operators in the wine industry cumulate 75% of the sector's turnover and 83% of the profit obtained in this industry.

Wine consumption is close to the EU average, being partially covered by imports, which vary depending on domestic production. In value terms, imports have an upward trend.

The balance of trade is negative, and the deficit has increased each year. Overall, export prices were higher than import prices until 2021, when import prices became higher. The foreign trade in wine takes place mainly on the EU market, the measure of promotion on third markets having a minimal impact.

An opportunity of the sector, besides the continuation of the specific support programme, is the development of the wine tourism. In Romania, wine routes were established and launched around the year 2000.

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7. ***MARD

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PROFESSIONAL TRAINING OF FARM MANAGERS: ANALYSIS OF TRENDS AND CURRENT STATUS

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Abstract: *In recent years, worldwide, increasing the professional training of farm managers has become vital in the context of the implementation of new technologies/production methods: professional training is a key component needed to face current and future challenges. New technologies, which pave the way for greater efficiency in the agricultural sector, require farm managers to acquire new skills such as data analysis, robotics, GPS systems, drone operation, etc. Acquiring the right mixture of knowledge will increase understanding of precision farming techniques and strengthen farm sustainability. Romanian agriculture must rally along this path in order to become more sustainable - while meeting the increasingly high expectations of consumers. The main objective followed in this paper is the analysis of the structure of Romanian farm managers according to the degree of professional training. The methods used to achieve this objective were the documentary analysis of the works published in the country and abroad on this subject and the statistical analysis that used data collected during the Agricultural Censuses. The main conclusion that emerges shows that in the last ten years the level of professional training of farm heads was quite low, representing one of the main factors that led to maintaining a low competitiveness of the agricultural sector.*

Keywords: *professional agricultural training, farm manager, Romania*

JEL Classification: Q19

INTRODUCTION

In recent years, increasing the professional training of farm managers has become important in the context of the implementation of new technologies/production methods: their professional training is a key component to face economic, social and environmental challenges. Professional training in agriculture determines how farmers manage their agricultural farms and therefore the amount of output they get. Professional training in agriculture goes beyond the use of traditional agricultural tools to cultivate land or raise animals (Tambi, 2019). The new technologies that pave the way to better efficiency suppose that farm managers acquire new skills such as data analysis, drone operation, use of GPS systems, analysis of satellite images etc. (EP, 2016). Gaining more knowledge can increase understanding of precision farming techniques and strengthen the financial and environmental sustainability of farms. Agriculture must rally along this path to become more sustainable but also to meet the increasingly high expectations of consumers (EP, 2017).

Professional training has a significant impact on agricultural productivity. The higher the level of farmers' professional training, the greater the possibility of adopting and applying agricultural innovations properly (Närman, 1994). Over time, it has been noticed that the demand for agricultural products is changing and new opportunities are emerging for farmers: for example, increasing demand for high-value products, adopting advanced agricultural technologies, introducing new varieties of seeds, etc. To increase income and improve livelihoods, farmers also need to have a good grasp of the market situation and production systems (Ashby et al., 2008; Noor & Dola, 2011)

MATERIAL AND METHOD

The main objective followed in this paper aims to analyze the structure of farm managers according to the degree of professional training (in connection with different dimensions) as well as its evolution in the period 2010-2020. The methods used to achieve this objective were the

documentary analysis of works published in the country and abroad on this subject and the statistical analysis that used data collected by the National Institute of Statistics during the General Agricultural Censuses of 2010 and 2020.

In the statistics of the European Union (Eurostat), the training of the agricultural farm head is grouped into three classes: the data of the General Agricultural Census and the Agricultural Structural Surveys are collected in accordance with them. Thus, vocational training is classified into three types: elementary or basic training – refers to farmers who have completed any cycle of training in a school of basic agricultural education and/or in a training center that is oriented towards agricultural disciplines; practical experience - refers to the experience acquired by farmers through practical work on a farm; full agricultural professional training – refers to the completion of specific courses for agriculture, with a duration of at least two years after the completion of compulsory education completed in an agricultural school, college or university.

RESULTS AND DISCUSSION

European farmers play an important role in providing safe and affordable food for nearly 500 million European citizens, while maintaining their countries' landscapes. Against the background of the aging of the agricultural population, generational renewal has become a difficult problem to solve. The agricultural sector needs to attract a new generation of farmers with the necessary skills to live and work in a constantly changing environment: they will need to produce much more efficiently while protecting the environment; they will have to contribute to the fight against climate change; they will have to meet society's demands for a healthy and balanced diet; and it will be necessary to keep pace with scientific and technological progress. It is therefore essential that farmers receive adequate agricultural training to adapt to a changing environment (EP, 2017).

The professional training of Romanian farm managers in the European context: The professional training of farm managers is of significant importance because the success of a business depends primarily on the quality of the managerial act. Among the member countries of the European Union (EU), in 2020, Romania had the largest number of farms – 2,887,070 (31.84% of the total number of farm heads in the EU). They had the lowest level of professional training: 94.50% had only practical experience, 4.76% basic agricultural training and 0.74% full agricultural training (Figure 1).

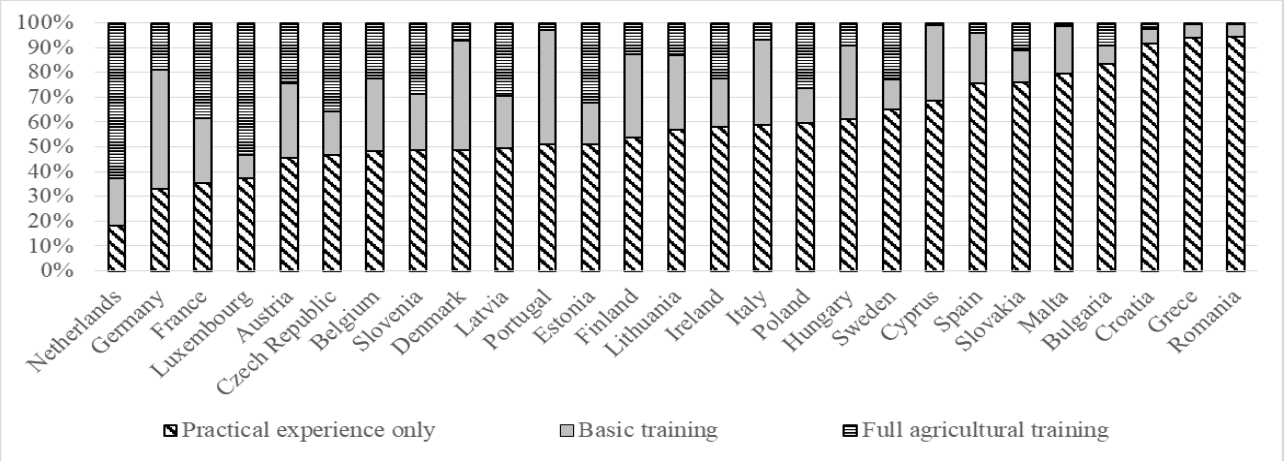

Figure 1. Distribution of farm managers according to professional training in EU Member States, in 2020

Source: author's processing according to Eurostat, accessed 2023

Evolution of the professional training of farm heads in the period 2010-2020: Compared to 2010, the training of farm heads marked a slight recovery: thus, the share of fully trained farm heads, although it indicates a sub-unit percentage, registered an increase of 85 % (from 0.40% to 0.74%); the increase is even more significant (125.59%) in the case of the category of farmers who have basic agricultural training (from 2.11% to 4.76%). However, an overwhelming share of farm heads (over 90%) carry out their managerial activity based on the gained practical experience. Roughly, out of ten farm heads, less than one followed some kind of agricultural training, a trend that is maintained throughout the analyzed period.

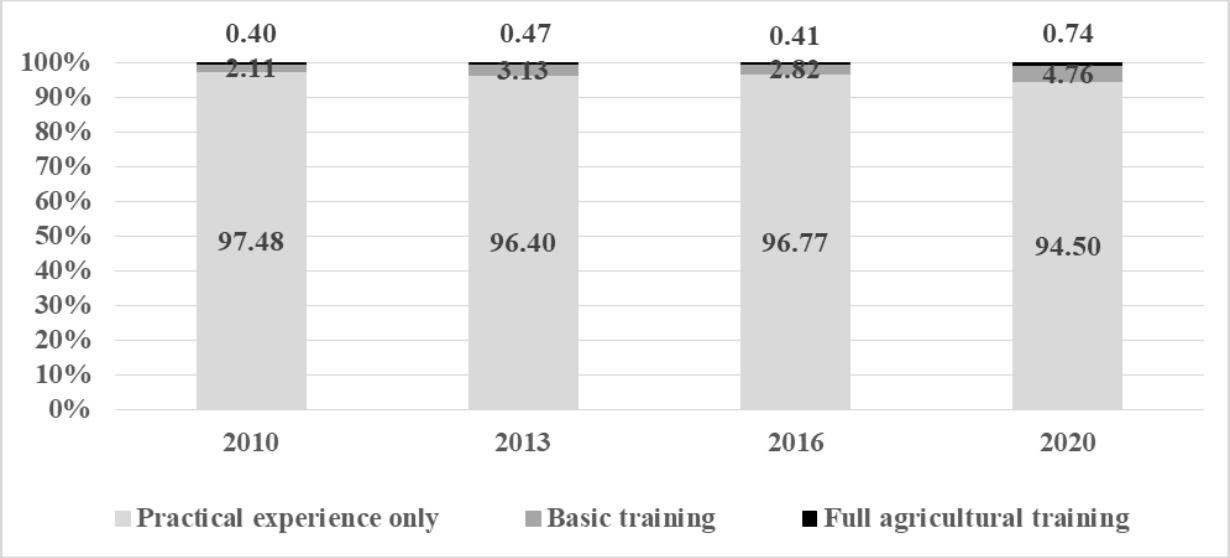

Figure 2. Distribution of farm heads by professional training, in the period 2010-2020
Source: author's processing according to Eurostat, accessed 2023

Causes of the low agricultural training of farm heads could be the following: i) from a cultural point of view, a large part of the rural inhabitants believe that one does not need to have a special training to practice agricultural activities; ii) lack of knowledge and ignorance made many agricultural workers not concerned with agricultural training; iii) the training of farmers was not a priority of agricultural policies for a long time: work in agriculture was considered as unskilled labor; iv) many farmers are still reluctant to adopt new technologies or practices in their activity (Tita at al., 2022).

Professional training of farm heads in 2020: If we analyze farm heads by professional training and age group, a relatively homogeneous structure can be noticed in which farm heads with only practical experience are distributed, in significant proportions, in all five age groups. In the group of young farmers, who belong to the "under 35" age group, the highest percentage (2.10%) of people with complete agricultural training was recorded. The most important percentage of farmers with basic agricultural training work in the "34-44 years" and "45-54 years" groups (Table 1).

Table 1. Share of farm managers by professional training and age group in Romania, in 2020

	under 35 years	**35-44 years**	**45-54 years**	**55-64 years**	**over 65 years**	**Total farms**
Practical experience only	94.82	89.27	88.95	96.85	98.04	2728240
Basic training	3.08	9.79	10.45	2.37	1.41	137390
Full agricultural training	2.10	0.93	0.60	0.77	0.55	21440

Source: author's processing according to Eurostat, accessed 2023

The analysis of farm heads by professional training and utilized agricultural area (UAA) by size classes shows that in all size classes, the largest area is operated by farm heads who have only practical experience: the trend is decreasing from the "under 5 ha" to the "over 100 ha" group. Farm managers with complete agricultural training work large areas from the "over 100 ha" group: in this case, the trend is increasing, from the "under 5 ha" group to the "over 100 ha" group. The same situation is found in the case of farmers with basic agricultural training.

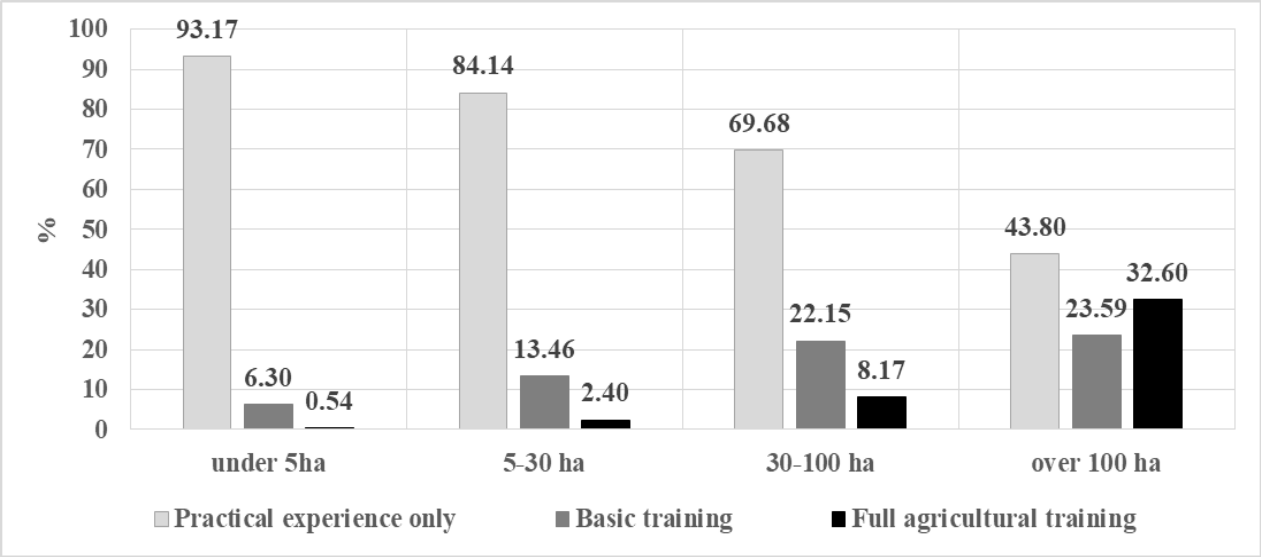

Figure 3. Professional training of farm managers and UAA by size classes, in 2020

Source: author's processing according to Eurostat, accessed 2023

The analysis of farm managers by professional training and economic farm size indicates that farmers who have only practical experience hold particularly high shares (over 90%) in the case of subsistence and semi-subsistence farms (Table 2).

Table 2. Professional training of farm managers by economic size of farms, in 2020

	Total farms	Practical experience only	Basic training	Full agricultural training
under 2000 euro	2092470	96.81	2.81	0.38
2000-7999 euro	611710	91.63	7.62	0.76
8000-14999 euro	90140	83.81	14.29	1.91
15000 - 249999 euro	88310	73.15	20.62	6.23
over 250000 euro	4420	44.12	19.00	36.88

Source: author's processing according to Eurostat, accessed 2023

Their share decreases as the size of farms increases: it is only 44.12% in the case of farms that are part of the group of large farms (over 250,000 euros). In the case of farmers with basic and full agricultural training there is an upward trend – from small farms to large farms.

CONCLUSIONS

The presence of professionally trained farm managers in the agricultural sector is one of the strengths that will support the recovery of the Romanian agricultural sector in the years to come. The nature of work in agriculture is changing at a faster pace than ever before. In this context, the analysis of strengths and weaknesses, opportunities and restrictions of this field (SWOT analysis) highlights the following aspects:

Strengths	Weaknesses
- improving the level of professional training of farm managers in the last ten years; **- young farm heads (group under 35 years old), have the highest share in the full professional training group (2.10%);** **-farm managers aged between 35 and 54 years have the highest share in the basic professional training group;** **- as the physical and economic size of farm increases, the degree of professional training of farm heads is higher;**	- farm managers who have practical experience only prevail in Romania's agriculture – only one out of ten farmers attended some kind of professional training; - farm heads with basic and full training have among the lowest shares compared to the EU member states;
Opportunities	**Threats**
- the presence of European funds intended to support professional training programs for farm managers; **- the existence of partnerships in the field of digitalization of the agricultural sector/digital innovation hubs, at the regional level;** **- the existence of broadband connections that ensure the access of farm heads to technology, information, e-learning, etc.;**	- the need for diversified skills in the agricultural sector and the reduced adaptation of the current education system; - increasing discrepancies between large and small farms regarding the implementation of new technologies, with negative effects in the field of market competition and environmental protection; - reduced adaptability of the agricultural extension service and professional training in the process of transferring information to farmers;

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TRADE IN AGRI-FOOD PRODUCTS – PERSPECTIVES FROM BIBLIOMETRIC ANALYSIS

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Abstract: *Growing global population and growing demand for food have put a lot of pressure on the global food supply chain. The global population is expected to reach 8.5 billion by 2030 and 9.7 billion by 2050. In this context, providing agri-food products in the quantity needed by an ever-growing population puts even greater pressure on the supply chain with agro-food products globally. The present study aims to identify research trends in the field, so that it can identify the characteristics of trade in agri-food products. These are illustrated through a bibliometric study where the research contributions of authors, countries and scientific journals are presented. By using this research method, we want to identify the links between the number of documents published in the field, the research topic, the frequency of citation of the articles and the interest given to the research subject depending on the country.*

Keywords: *trade, agro-food products, trade balance, supply chain, bibliometric analysis.*

JEL classification: Q10, Q13, Q17.

INTRODUCTION

In the specialized literature, the studies are focused on the analysis of the competitiveness of the trade in agri-food products, however, the measurement of the competitiveness of the agri-food trade still represents a challenge. From a methodological point of view, in order to measure the agri-food competitiveness of a region/country, a trade analysis (export-import) is necessary.

Most scientific articles have focused on the analysis of foreign trade at the regional or country level. Also, most of the articles included in this study analyzed the competitiveness of the agri-food sector either at the EU level or at the level of one of the member states, presenting significant events related to the agri-food trade, after the 2000s, namely: EU accession (2007), the crisis global financial crisis (2007-2008), the COVID-19 pandemic (2020), the Russian oil embargo (2022-2023), and the war in Ukraine (2022).

At the level of the EU member states, the results show that the old member states (Germany, Luxembourg, Belgium, the Netherlands, France and Italy) have a more developed commercial structure than the new ones, registering a higher share of processed goods, this share representing one of the most important elements of the competitiveness of the agri-food trade.

MATERIAL AND METHOD

Bibliometrics is a research method that quantitatively measures scientific publications on a given topic. This method appeared in the field of research as early as 1969, Alan Pritchard being the one who used it, for the first time, in a documentary note (Donthu et al., 2021).

Bibliometric analysis is based on statistical and mathematical methods for data evaluation. By applying this research method, it is desired to identify the links/correlations between the number of documents published in a studied field, in this case, trade in agri-food products, the research theme, the frequency of citation of articles and the interest given to the research subject in depending on the country.

The literature review for this paper was conducted by identifying scientific articles published in the Web of Science (WoS) database, with the aim of recognizing concerns about agri-food trade. Searching for articles was done by configuring the "Subject" field in WoS, which filters the search by title, keywords, author, abstract. The keyword used in the search was "trade agri-food products". The search results displayed a sample of 600 documents, and through the VOSviewer Software, the data were presented graphically, through maps and then interpreted.

RESULTS AND DISCUSSION

The annual publications registered in the Web of Science database based on the query after the keyword "trade agri-food products" totaled 600 publications, of which 83 (13.787% of the total publications from the period 1995-2023) were registered in the year 2022 An increase in the number of WoS indexed publications has been observed since 2009 (16 publications), reaching a maximum of 83 publications in 2022. It should be noted that 2023 is an incomplete year, this being ongoing, the analysis being carried out in the ninth month (September) of the year. (Fig.1)

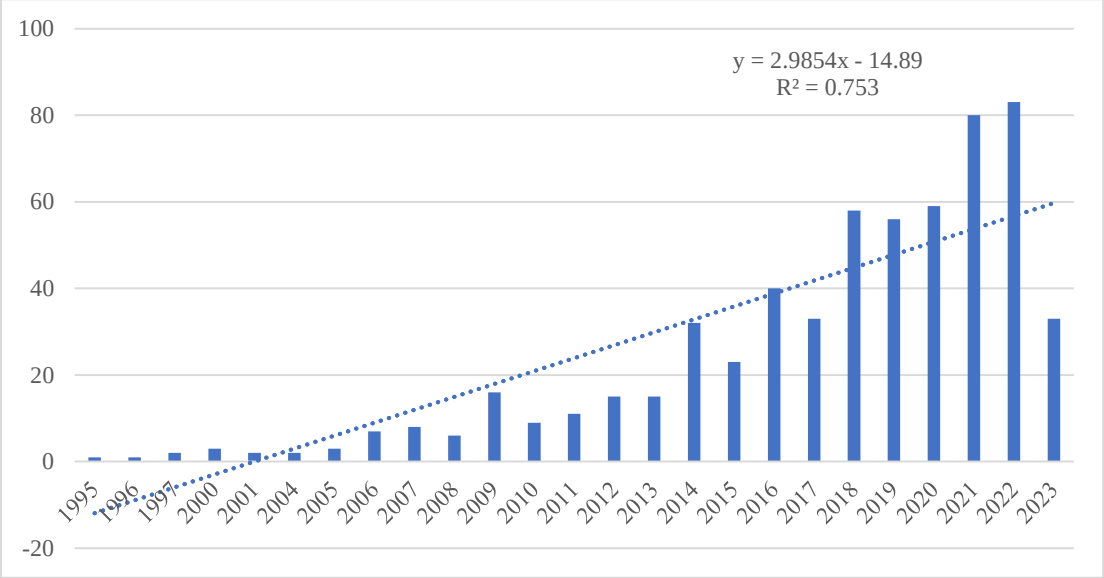

Figure 1. Annual publication trend from 1995 to 2023

Source: Own representation based on data provided by Web of Science, accessed on 31.08.2023.

The relevance of publications cannot be appreciated if the papers are not cited by other authors in their studies. So, the total annual citations are represented in the figure below, where an upward trend is observed in terms of citations at the level of the period 1995-2023, reaching a total number of 1,968 citations in the year 2022. (Fig. 2)

The main interrelated keywords are: trade, agri-food trade, export, import, agri-food products, market, competitiveness, competitive advantages and food security. Analyzing the connectivity of the keywords used, 6 clusters were identified.

The first cluster (red) consists of 40 agricultural keywords, including: agriculture, agricultural production, food security, sustainability and consumption.

The second cluster (green) comprises 36 keywords such as: trade, standard, quality, food, safety, food safety, certification, industry, innovation, challenges and governance.

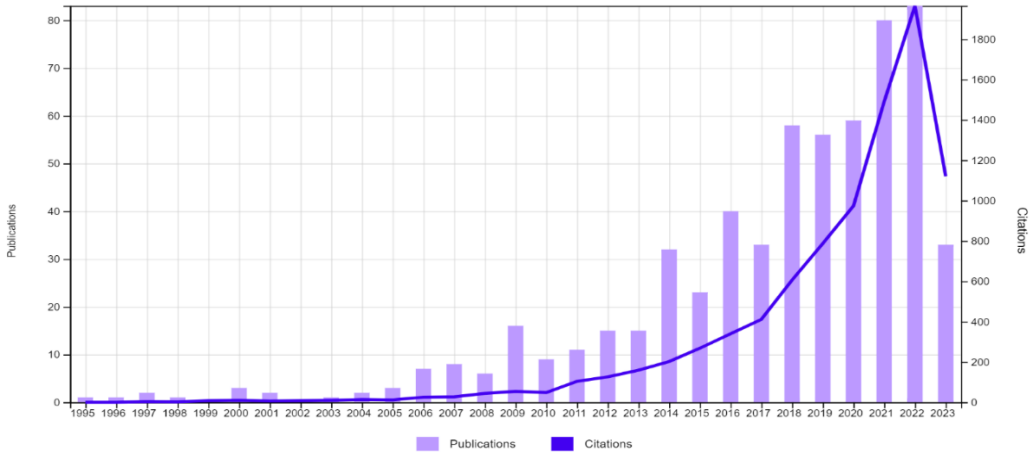

Figure 2. Trend of citations and publications over time

Source: Web of Science database, accessed on 31.08.2023.

The third cluster (blue) is represented by 34 keywords, including: agribusiness, international trade, market, countries, competitiveness, competitive advantage, trade liberalization and specialization. (Fig. 3)

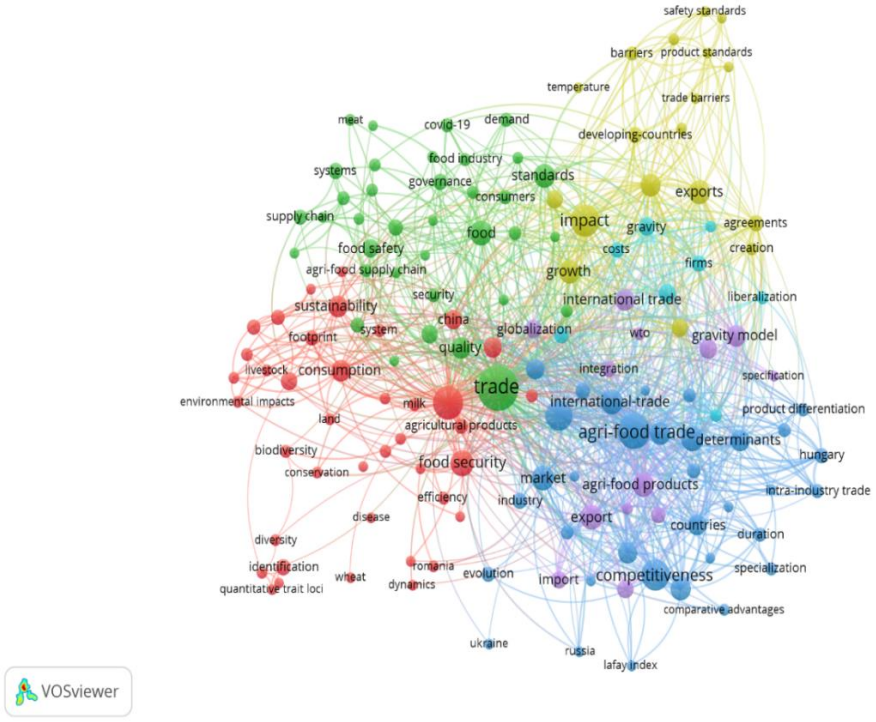

Figure 3. The connectivity of the keywords used ("trade agri-food products")

Source: Own representation based on data provided by WoS using VOSviewer., on 31.08.2023

The fourth cluster (yellow) consists of 18 keywords such as: agricultural trade, impact, growth, policy, agri-food sector, barriers, trade barriers, temperature, developing countries, agreement, regulations and product standards.

The fifth cluster (purple) is made up of 13 keywords from the field of international agri-food trade, including: agri-food products, export, import, international trade, foreign trade, integration, specification, globalization and the European Union.

The last cluster (turquoise) includes 8 keywords such as: export of agri-food products, competition, costs, companies, liberalization, prices, and product quality. (Fig. 3)

During the analysis, 600 scientific articles addressing the subject of "trade agri-food products" from 99 countries were identified. The table below presents the ranking of the first 5 countries that registered the highest number of published scientific articles, representing 66.33% of the total publications found in the Web of Science database. Canada ranks first with 142 scientific articles, followed by the USA (109 articles) and Italy (59 articles). (Table 1)

Table 1. Top 5 countries with the highest number of publications registered in Web of Science

No	Country	Number of registered papers	% of 600
1.	Canada	142	23,667
2.	USA	109	18,167
3.	Italy	59	9,833
4.	Poland	47	7,833
5.	Spain	41	6,833

Source: Web of Science database, accessed on 31.08.2023.

According to the map below, 6 research directions are distinguished. Close ties are also observed between Canada and countries such as the USA, England, Japan, Holland. At the same time, it was noted that Romania, Croatia, the Czech Republic, Hungary, Poland, Russia, Slovakia, Slovenia and Sweden have a similar direction. Romania is in close collaboration with Slovakia, Slovenia, Spain, China and France. Close association between authors from EU and non-EU countries is encouraged by various research programs that favor partnerships between these countries. (Fig. 4)

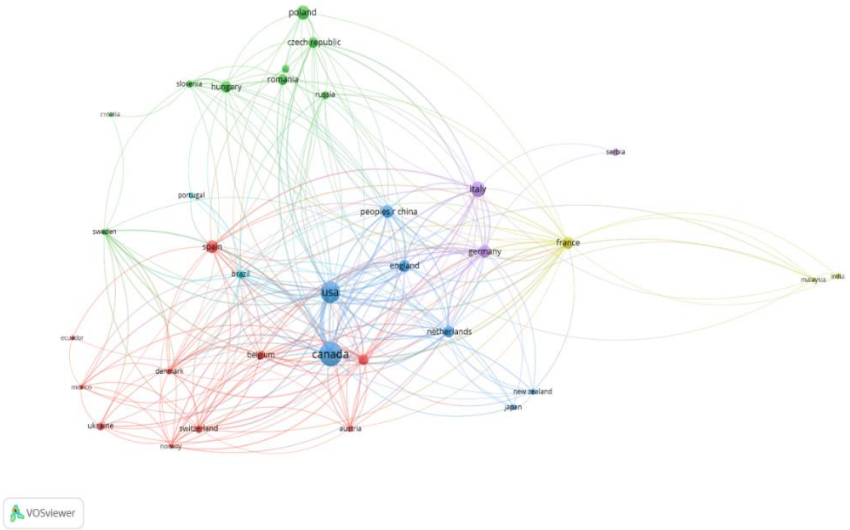

Figure 4. Graphic representation of co-author countries ("trade agri-food products")

Source: Own representation based on data provided by WoS using VOSviewer., on 31.08.2023

According to (Reardon et al., 2009), the agri-food sector has gone through several stages of restructuring over time that targeted specific areas, namely: wholesale trade (1960s – early 1990s); processing, (1970s – 1990s) and retail (1990s – 2000s).

The specialized literature shows that the sectoral reforms had repercussions on the agricultural sector, the visible result being the fact that subsistence agriculture facilitated the outflow of added value abroad. Also, the changes that occurred in the agri-food sector through the

development of the technical process did not only concern the production process, but also the way of marketing and consumption of agri-food products. The activity of the agri-food sector has acquired new values with the transition from the satisfaction of basic foods to following trends in the consumption of agri-food products, as well as the interest in preserving the environment. Moreover, the increase in the population's income has determined a considerable development of the agri-food sector and a diversification of the demand for agri-food products, which is able to identify new consumer profiles that are oriented towards the consumption of organic products, dietetic products, green products, exotic fruits and vegetables or authentic foods (Ciutacu & Chivu, 2014; Panait el al., 2020).

Another factor with both positive and negative influences on the agri-food sector is globalization. One of the negative effects of globalization is represented by the existence of global chains that affect the traceability of agri-food products, the agri-food sector becoming dependent on the distribution sector.

Mizik (2021), presented in his paper the trends of global agri-food trade, which since 2010, began to fluctuate between 14.2 and 18 billion USD, in 2020 its share reached approx. 10% of global trade. Latin America stood out as the largest net exporter of agri-food products (+US$123 billion) while, at the opposite pole, East Asia-Pacific is the largest net importer with a trade deficit of US$115 billion.

Studies have shown that the agri-food sector has proven to be one of the most difficult areas during trade talks. Although the issue of competitiveness in the agri-food sector of EU countries has been investigated in numerous scientific researches, they have mainly focused on assessing the competitive advantages of the EU and US agri-food sectors globally (Pawlak, 2021).

A paper analyzing the dynamics of agri-food comparative advantage between Nigeria and the European Union (EU28), using the 'product mapping' approach based on trade balance index, Balassa index, Lafay index and other descriptive approaches, shows that Nigeria has recorded substantially a negative trade balance index in international trade. (Verter et al., 2020)

An analysis of the efficiency of agri-food trade in the EU for the period 2013-2022 showed an increase in the value of agricultural production by 33.77%, an increase that increased exports. The results showed an increase in agri-food trade by +61.3%, amounting to 424.6 billion euros in 2022. The value of exports reached 229.1 billion euros in 2022, being 58% higher, while the value imports increased by 65.53%, reaching 195.5 billion euros. In terms of prices, it was noted that the average export price was higher than the average import price every year. (Popescu et al., 2023)

In Romania, 27 scientific articles were identified in the Web of Science database, at the time of the preparation of this study. One of the works emphasizes the fact that with the transition from the planned/centralized economy to the market economy, foreign trade with agri-food products in Romania presented significant changes felt on the trade balance, which registered a deficit at the level of the period 1990-2020. Currently, production processes in the agri-food sector are increasingly integrated at an international level. International trade shows a significant growth trend and includes goods represented by intermediate products, which are exported by one country to be processed/processed/packaged in other countries, which then, in turn, export them to other regions. (Andrei et al., 2022).

Romania's accession to the EU in 2007 had a strong impact on trade in agri-food products. The impact of joining the EU is linked, on the one hand, to the adoption of the production and marketing rules stipulated in the Community acquis and, on the other hand, to the liberalization of trade. The effects of accession were manifested by the increase in exports of agri-food products,

which also attracted an increase in imports and implicitly an increase in the trade deficit with agri-food products. Export growth is based on the increase in the value of exports of agricultural raw materials, especially vegetable products (cereals, oilseeds, industrial crops or medicinal plants). For the category of agri-food products, excluding the listed vegetable products, Romania has a negative foreign trade balance. Approximately 70% of agri-food exports represent unprocessed products. At the same time, for unprocessed products of animal origin, Romania relies on imports to cover domestic consumption needs (Tudor, 2014; Andrei et al., 2022).

At the present moment, agriculture faces the challenges imposed by the implementation of new production systems, climate change, price volatility, the development of international trade in agricultural products, changing diets, urbanisation/depopulation of rural areas. The results of the empirical research of Constantin et al., 2023 showed that there are competitiveness deficiencies in the dynamics of agri-food processing capacities and international trade patterns. Also, agro-food products with a low added value can contribute to the trade balance deficit and to the decrease of competitiveness levels. Regarding agricultural raw materials, they can provide strategic competitiveness if they are involved in processing/processing activities, and subsequently due to favorable trade flows, they can generate a large number of competitive advantages. Although agriculture and the food industry are interconnected, they may follow diverging trends in terms of competitive performance.

The results of the study carried out by Andrei et al., 2022, show that in the case of Romania, the high concentration of exports on a small number of categories of agri-food products that mainly include agricultural raw materials does not ensure the sustainable growth of the export of agri-food products. Romania should focus on the processing of raw materials and the creation of added value of agro-food products, and then on the export of finished products.

CONCLUSION

The most relevant existing scientific works based on WoS have been identified in the present research, representing promising directions for future scientific approaches.

During the analysis, 600 scientific articles were identified, and based on them, the links between the researched subject (trade in agri-food products) and the interest given to it according to the country and the number of citations were established.

The results of the analysis identified numerous publications, from which several significant insights can be derived. First of all, the number of scientific articles related to the trade of agri-food products increased during the analyzed period, the vast majority of them being published in journals such as: Sustainability (20 articles), Agricultural Economics Zemedelska Ekonomika (17 articles), Agrarian Perspectives Series (13 articles) , British Food Journal (13 articles), Acta Horticulturae (11 articles), Food Policy (11 articles), Scientific Papers Series Management Economic Engineering in Agriculture and Rural Development (11 articles), etc.. The fields of research were vast, the field agricultural registering 263 articles, followed by Business Economics (212 articles) and Food Science Technology (82 articles). Secondly, analyzing the global impact, it was found that in the top 10 countries with the largest number of publications in this field, Canada occupies the leading position in the ranking with a weight of approx. 24% (142 articles) of the total scientific articles identified.

Therefore, the subject of agri-food trade requires special attention mainly in terms of developing market strategies.

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ANALYSIS OF AREAS, PRODUCTION AND EXPORT POTENTIAL FOR SOFT FRUIT AND RASPBERRIES IN ROMANIA AND LITHUANIA

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Abstract: *This research paper analyses the evolution of cultivated areas, production and export potential of soft fruits in Romania and Lithuania compared to the European Union, using Eurostat and Intracen data. The comparative analysis method revealed a significant increase in Romania, with cultivated areas and production increasing by more than 250% and 800% respectively. In contrast, Lithuania showed smaller fluctuations, with a steady increase of more than 9% in cultivated areas and about 41% in production. In the case of raspberry cultivation, Romania has seen a significant increase, while Lithuania has had a larger but recently decreasing cultivated area. Romania and Lithuania export to Germany, France, Serbia and Poland, Germany, the Netherlands respectively, with Germany identified as the main market for these fruits.*

Keywords: *raspberries, export, Romania, Lithuania, berries.*

JEL classification: Q10, Q12, Q14, Q19.

INTRODUCTION

The cultivation of berries is a well-developed business in Europe, supplying significant quantities of the crop to European markets for direct consumption and for various products in the food industry. This sector is a key pillar of agriculture and an area with strong environmental potential. Although Poland, Russia, Ukraine and the UK are among the largest producers, each country has a distinct competitive advantage in berry cultivation (Multescu & Susman, 2022). The evolution of this industry is based on crucial aspects such as technological processes, the potential of organic farming, the creation of high value-added products, the orientation towards organic business and the promotion of sustainable agriculture (Asănică et al., 2016; Dumitru et al., 2021).

The main challenges faced by berry producers identified at EU level are price fluctuations, international regulations and standards, labour, climate change, but also global competition (Greblikaite et al., 2019).

In Romania, a variety of berries, such as blueberries, raspberries, strawberries, blackberries, are true jewels of nature, with a long history of human relationship with the environment (Leahu et al., 2020; Stavrescu-Bedivan et al., 2022). In addition to their unmistakable taste, berries contribute to a diverse ecosystem, which attracts the attention of researchers in terms of biodiversity, climate change, but also the food industry in order to achieve their maximum medical and economic potential (Micu et al., 2022). Bioactive phenolic compounds, such as phenolic acids and tannins, found in berries, have been recognized for their strong potential in protecting against a wide spectrum of diseases (Kačergius et al., 2004). These compounds, either individually or in synergistic combination, have demonstrated the ability to reduce the risk and impact of cardiovascular disease, cancer, inflammation, obesity, diabetes and other chronic diseases (Ložienė et al., 2016). Raspberries are an aromatic fruit that is known for its content of vitamins and substances that contribute to maintaining health and can help reduce the risk of various diseases (Stan et al., 2019).

In Lithuania, the berry industry is important regarding sustainable development, but also for the country's agri-food export. Thus, these fruits are of considerable importance for the Lithuanian economy and their potential should be exploited.

Various experiments and studies are carried out to help improve crop productivity, as recent studies show that on the global market raspberry growing is not sustainable (Ispiryan et al., 2023).

MATERIALS AND METHODS

The research is based on data provided by Eurostat on areas and production in Romania, Lithuania and the European Union, as well as data provided by Intracen to identify the export potential of berries to other EU countries. Comparative analysis was also used to identify differences in practices, production, export potential and to assess the factors influencing this potential between Romania and Lithuania.

RESULTS AND DISSCUSION

In 2014, Romania had an area of 470 hectares dedicated to berry cultivation, and by 2022, this area has increased to about 1.7 thousand hectares, showing an increase of more than 250%.

On the other hand, Lithuania, in 2014, was growing berries on an area of 7.69 thousand hectares, rising to 8.42 thousand hectares in 2022, an increase of more than 9%. There is a significant difference between the two countries' areas under berry cultivation in the period under review. In 2022, Lithuania cultivated 5 times more area than Romania.

Within the European Union, in 2016, the area devoted to berry cultivation was 140.83 thousand hectares, increasing by 2022 to 161.77 thousand hectares (Table 1).

Table 1. Determining the Economic Size of the Family Farm in 2022

Nr. crt.	Family members	Minimum/average economy wage	Average monthly expenditure on food and drink consumed	Months	Suggested profit achieved at farm level (lei) (1*(2+3)*4	Recommended profit in euro (rate 4.9204 euro) (col. 5 * exchange rate)	Production expenditure (euro) (according to Eurostat*)	SO VALUE (firm income) (euro)	Simulation - Physical size of the farm (wheat crop)
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	2	1,524	211	12	41,640	8,463	15,716	24,179	39
2	2	3,879	211	12	98,160	19,950	37,049	56,999	93
3	3	1,524	211	12	62,460	12,694	23,575	36,269	59
4	3	3,879	211	12	147,240	29,924	55,574	85,498	139
5	4	1,524	211	12	83,280	16,925	31,433	48,358	79
6	4	3,879	211	12	196,320	39,899	74,099	113,998	186
7	5	1,524	211	12	104,100	21,157	39,291	60,448	98
8	5	3,879	211	12	245,400	49,874	92,623	142,497	232
9	6	1,524	211	12	124,920	25,388	47,149	72,538	118
10	6	3,879	211	12	294,480	59,849	111,148	170,997	278
11	7	1,524	211	12	145,740	29,620	55,008	84,627	138
12	7	3,879	211	12	343,560	69,824	129,672	199,496	325
13	8	1,524	211	12	166,560	33,851	62,866	96,717	157
14	8	3,879	211	12	392,640	79,798	148,197	227,995	371
15	9	1,524	211	12	187,380	38,082	70,724	108,806	177
16	9	3,879	211	12	441,720	89,773	166,722	256,495	418
17	10	1,524	211	12	208,200	42,314	78,582	120,896	197
18	10	3,879	211	12	490,800	99,748	185,246	284,994	464

*based on the minimum/average wage in the economy, the lower and upper limits were determined according to family members, Source: own processing;

Due to the increase in the minimum/average income in the economy, as well as the increase in the exchange rate, the value of the S.O. has increased significantly, so that in the case of a family

farm, consisting of 2 persons, in the normal scenario, the economic size would be 24,179 S.O., In the "optimistic" scenario, the economic size of the same type of holding would be 56,999 S.O., compared to the previous year of analysis when it was 48,015 S.O. (equivalent to 93 hectares of wheat) (Table 2.).

Table 3. Scenario A1 (Objective function) - 2 members - 24,146 N/A

Subsistence and semi-subsistence farm	Cereal plants	Oil plants	Protein plants	Vegetable and flowering plants	Total
V1 Restrictions	0.25	0.25	0.25	0.25	1
Area (ha)	1.66	1.66	1.66	1.66	6.62
Estimated economic size (S.O.)	24,146				
V2 Restrictions	0.2	0.2	0.2	0.4	1
Area (ha)	0.88	0.88	0.88	1.75	4.39
Estimated economic size (S.O.)	24,162				
V3 Restrictions	0	0	0	1	1
Area (ha)	0.00	0.00	0.00	1.86	1.86
Estimated economic size (S.O.)	24,179				

Source: own processing;

In order to reach a minimum (normal) economic size of 24.146 S.O., the 2-person farm needs to cultivate 6.62 hectares taking into account the restrictions of option 1, 4.39 hectares taking into account the restrictions of option 2 and 1.86 hectares taking into account the restrictions of option 3 (where only vegetables and flowers are cultivated) (Table 3.).

Table 3. Scenario A2 (objective function) - 2 members - 56,999 N/A

Subsistence and semi-subsistence farm	Cereal plants	Oil plants	Protein plants	Vegetable and flowering plants	Total
V1 Restrictions	0.25	0.25	0.25	0.25	1
Area (ha)	3.90	3.90	3.90	3.90	15.61
Estimated economic size (S.O.)	56,845				
V2 Restrictions	0.2	0.2	0.2	0.4	1
Area (ha)	2.07	2.07	2.07	4.14	10.34
Estimated economic size (S.O.)	56,958				
V3 Restrictions	0	0	0	1	1
Area (ha)	0.00	0.00	0.00	4.40	4.40
Estimated economic size (S.O.)	56,999				

Source: own processing;

In order to reach an optimal economic size of 56,999 S.O., the 2-person farm needs to cultivate 15.61 hectares taking into account the restrictions of option 1, 10.34 hectares taking into account the restrictions of option 2 and 4.40 hectares taking into account the restrictions of option 3 (where only vegetables and flowers are cultivated) (Table 4.).

Table 4. Scenario B1 (Objective function) - 3 members - 36,269 N/A

Subsistence and semi-subsistence farm	Cereal plants	Oil plants	Protein plants	Vegetable and flowering plants	Total
V1 Restrictions	0.25	0.25	0.25	0.25	1
Area (ha)	2.48	2.48	2.48	2.48	9.94
Estimated economic size (S.O.)	36,243				
V2 Restrictions	0.2	0.2	0.2	0.4	1
Area (ha)	1.32	1.32	1.32	2.63	6.58
Estimated economic size (S.O.)	36,243				
V3 Restrictions	0	0	0	1	1
Area (ha)	0.00	0.00	0.00	2.80	2.80
Estimated economic size (S.O.)	36,269				

Source: own processing;

To reach a minimum (normal) economic size of 36,269 SO, the 3-person farm needs to cultivate 9.94 hectares taking into account the restrictions of variant 1, 6.58 hectares taking into account the restrictions of variant 2 and 2.80 hectares taking into account the restrictions of variant 3 (where only vegetables and flowers are cultivated) (Table 5).

Table 5. Scenario B2 (Objective function) - 3 members - 85,498 N/A

Subsistence and semi-subsistence farm	Cereal plants	Oil plants	Protein plants	Vegetable and flowering plants	Total
V1 Restrictions	0.25	0.25	0.25	0.25	1
Area (ha)	5.86	5.86	5.86	5.86	23.42
Estimated economic size (S.O.)	85,319				
V2 Restrictions	0.2	0.2	0.2	0.4	1
Area (ha)	3.10	3.10	3.10	6.20	15.51
Estimated economic size (S.O.)	85,435				
V3 Restrictions	0	0	0	1	1
Area (ha)	0.00	0.00	0.00	6.59	6.59
Estimated economic size (S.O.)	85,496				

Source: own processing;

To reach an optimal economic size of 85,498 SO, the 3-person farm needs to cultivate 23.42 hectares taking into account the restrictions of option 1, 15.51 hectares taking into account the restrictions of option 2 and 6.59 hectares taking into account the restrictions of option 3 (where only vegetables and flowers are cultivated) (Table 6.).

Table 6. Scenario C1 (objective function) - 4 members - 48,358 N/A

Subsistence and semi-subsistence farm	Cereal plants	Oil plants	Protein plants	Vegetable and flowering plants	Total
V1 Restrictions	0.25	0.25	0.25	0.25	1
Area (ha)	3.31	3.31	3.31	3.31	13.25
Estimated economic size (S.O.)	48,292				
V2 Restrictions	0.2	0.2	0.2	0.4	1
Area (ha)	1.75	1.75	1.75	3.51	8.77
Estimated economic size (S.O.)	36,243				
V3 Restrictions	0	0	0	1	1
Area (ha)	0.00	0.00	0.00	3.73	3.73
Estimated economic size (S.O.)	48,358				

Source: own processing;

In order to reach a minimum (normal) economic size of 48,358 S.O., the 4-person farm needs to cultivate 13.25 hectares under the restrictions of option 1, 8.77 hectares under the restrictions of option 2 and 3.73 hectares under the restrictions of option 3 (where only vegetables and flowers are cultivated) (Table 7.).

Table 7. Scenario C2 (Objective Function) - 4 members - 113,998 N/A

Subsistence and semi-subsistence farm	Cereal plants	Oil plants	Protein plants	Vegetable and flowering plants	Total
V1 Restrictions	0.25	0.25	0.25	0.25	1
Area (ha)	7.81	7.81	7.81	7.81	31.23
Estimated economic size (S.O.)	113,843				
V2 Restrictions	0.2	0.2	0.2	0.4	1
Area (ha)	4.14	4.14	4.14	8.27	20.68
Estimated economic size (S.O.)	113,916				
V3 Restrictions	0	0	0	1	1
Area (ha)	0.00	0.00	0.00	8.79	8.79
Estimated economic size (S.O.)	113,998				

Source: own processing;

In order to reach an optimal economic size of 113,998 S.O., the 4-person farm needs to cultivate 31.23 hectares taking into account the restrictions of option 1, 20.68 hectares taking into account the restrictions of option 2 and 8.79 hectares taking into account the restrictions of option 3 (where only vegetables and flowers are cultivated) (Table 8.).

Table 8. Scenario D1 (Objective function) - 5 members - 60,448 N/A

Subsistence and semi-subsistence farm	Cereal plants	Oil plants	Protein plants	Vegetable and flowering plants	Total
V1 Restrictions	0.25	0.25	0.25	0.25	1
Area (ha)	4.14	4.14	4.14	4.14	16.56
Estimated economic size (S.O.)	60,366				
V2 Restrictions	0.2	0.2	0.2	0.4	1
Area (ha)	2.19	2.19	2.19	4.39	10.96
Estimated economic size (S.O.)	60,405				
V3 Restrictions	0	0	0	1	1
Area (ha)	0.00	0.00	0.00	4.66	4.66
Estimated economic size (S.O.)	60,448				

Source: own processing;

To reach a minimum (normal) economic size of 60,488 SO, the 5-person farm needs to cultivate 16.56 hectares under the restrictions of option 1, 10.96 hectares under the restrictions of option 2 and 4.66 hectares under the restrictions of option 3 (where only vegetables and flowers are cultivated) (Table 9.).

Table 9. Scenario D2 (Objective function) - 5 members - 142,497 N/A

Subsistence and semi-subsistence farm	Cereal plants	Oil plants	Protein plants	Vegetable and flowering plants	Total
V1 Restrictions	0.25	0.25	0.25	0.25	1
Area (ha)	9.76	9.76	9.76	9.76	39.04
Estimated economic size (S.O.)	142,304				
V2 Restrictions	0.2	0.2	0.2	0.4	1
Area (ha)	5.17	5.17	5.17	10.34	25.84
Estimated economic size (S.O.)	142,395				
V3 Restrictions	0	0	0	1	1
Area (ha)	0.00	0.00	0.00	10.99	10.99
Estimated economic size (S.O.)	60,448				

Source: own processing;

In order to reach an optimal economic size of 142,497 S.O., the 5-person farm needs to cultivate 39.04 hectares taking into account the restrictions of option 1, 25.84 hectares taking into account the restrictions of option 2 and 10.99 hectares taking into account the restrictions of option 3 (where only vegetables and flowers are cultivated) (Table 10.).

Table 10. Scenario E1 (Objective function) - 6 members - 72,538 N/A

Subsistence and semi-subsistence farm	Cereal plants	Oil plants	Protein plants	Vegetable and flowering plants	Total
V1 Restrictions	0.25	0.25	0.25	0.25	1
Area (ha)	4.97	4.97	4.97	4.97	19.87
Estimated economic size (S.O.)	72,440				
V2 Restrictions	0.2	0.2	0.2	0.4	1
Area (ha)	2.63	2.63	2.63	5.26	13.16
Estimated economic size (S.O.)	72,486				
V3 Restrictions	0	0	0	1	1
Area (ha)	0.00	0.00	0.00	5.59	5.59
Estimated economic size (S.O.)	72,538				

Source: own processing;

In order to reach a minimum (normal) economic size of 72,538 S.O., the 6-person farm needs to cultivate 19.87 hectares taking into account the restrictions of variant 1, 13.16 hectares taking into account the restrictions of variant 2 and 5.59 hectares taking into account the restrictions of variant 3 (where only vegetables and flowers are cultivated) (Table 11.).

Table 11. Scenario E2 (Objective Function) - 6 members - 170,997 N/A

Subsistence and semi-subsistence farm	Cereal plants	Oil plants	Protein plants	Vegetable and flowering plants	Total
V1 Restrictions	0.25	0.25	0.25	0.25	1
Area (ha)	11.71	11.71	11.71	11.71	46.84
Estimated economic size (S.O.)	170,765				
V2 Restrictions	0.2	0.2	0.2	0.4	1
Area (ha)	6.20	6.20	6.20	12.41	31.01
Estimated economic size (S.O.)	170,874				
V3 Restrictions	0	0	0	1	1
Area (ha)	0.00	0.00	0.00	13.19	13.19
Estimated economic size (S.O.)	170,997				

Source: own processing;

In order to reach an optimal economic size of 170,997 S.O., the 6-person farm needs to cultivate 46.84 hectares taking into account the restrictions of option 1, 31.01 hectares taking into account the restrictions of option 2 and 13.19 hectares taking into account the restrictions of option 3 (where only vegetables and flowers are cultivated) (Table 12.).

Table 12. Scenario F1 (Objective function) - 7 members - 84,627 N/A

Subsistence and semi-subsistence farm	Cereal plants	Oil plants	Protein plants	Vegetable and flowering plants	Total
V1 Restrictions	0.25	0.25	0.25	0.25	1
Area (ha)	5.80	5.80	5.80	5.80	23.18
Estimated economic size (S.O.)	84,512				
V2 Restrictions	0.2	0.2	0.2	0.4	1
Area (ha)	3.07	3.07	3.07	6.14	15.35
Estimated economic size (S.O.)	84,566				
V3 Restrictions	0	0	0	1	1
Area (ha)	0.00	0.00	0.00	6.53	6.53
Estimated economic size (S.O.)	84,627				

Source: own processing;

To reach a minimum (normal) economic size of 84,627 SO, the 7-person farm needs to cultivate 23.18 hectares under the restrictions of option 1, 15.35 hectares under the restrictions of option 2 and 6.53 hectares under the restrictions of option 3 (where only vegetables and flowers are cultivated) (Table 13.).

Table 13. Scenario F2 (Objective function) - 7 members - 199,496 N/A

Subsistence and semi-subsistence farm	Cereal plants	Oil plants	Protein plants	Vegetable and flowering plants	Total
V1 Restrictions	0.25	0.25	0.25	0.25	1
Area (ha)	13.66	13.66	13.66	13.66	54.65
Estimated economic size (S.O.)	170,765				
V2 Restrictions	0.2	0.2	0.2	0.4	1
Area (ha)	7.24	7.24	7.24	14.47	36.18
Estimated economic size (S.O.)	170,874				
V3 Restrictions	0	0	0	1	1
Area (ha)	0.00	0.00	0.00	15.39	15.39
Estimated economic size (S.O.)	170,997				

Source: own processing;

In order to reach an optimal economic size of 199,496 S.O., the 7-person farm needs to cultivate 54.65 hectares taking into account the restrictions of option 1, 36.18 hectares taking into account the restrictions of option 2 and 15.39 hectares taking into account the restrictions of option 3 (where only vegetables and flowers are cultivated) (Table 14.).

Table 14. Scenario G1 (Objective function) - 8 members - 96,717 N/A

Subsistence and semi-subsistence farm	Cereal plants	Oil plants	Protein plants	Vegetable and flowering plants	Total
V1 Restrictions	0.25	0.25	0.25	0.25	1
Area (ha)	6.62	6.62	6.62	6.62	26.49
Estimated economic size (S.O.)	96,586				
V2 Restrictions	0.2	0.2	0.2	0.4	1
Area (ha)	3.51	3.51	3.51	7.02	17.54
Estimated economic size (S.O.)	96,647				
V3 Restrictions	0	0	0	1	1
Area (ha)	0.00	0.00	0.00	7.46	7.46
Estimated economic size (S.O.)	96,717				

Source: own processing;

To reach a minimum (normal) economic size of 96,717 SSO, the 8-person farm needs to cultivate 26.49 hectares taking into account the restrictions of variant 1, 17.54 hectares taking into account the restrictions of variant 2 and 7.46 hectares taking into account the restrictions of variant 3 (where only vegetables and flowers are grown) (Table 15.).

Table 15. Scenario G2 (Objective Function) - 8 members - 227,995 N/A

Subsistence and semi-subsistence farm	Cereal plants	Oil plants	Protein plants	Vegetable and flowering plants	Total
V1 Restrictions	0.25	0.25	0.25	0.25	1
Area (ha)	15.61	15.61	15.61	15.61	62.46
Estimated economic size (S.O.)	227,686				
V2 Restrictions	0.2	0.2	0.2	0.4	1
Area (ha)	8.27	8.27	8.27	16.54	41.35
Estimated economic size (S.O.)	227,831				
V3 Restrictions	0	0	0	1	1
Area (ha)	0.00	0.00	0.00	17.58	17.58
Estimated economic size (S.O.)	227,995				

Source: own processing;

In order to reach an optimal economic size of 227,995 S.O., the 8-person farm needs to cultivate 62.46 hectares under the restrictions of option 1, 41.35 hectares under the restrictions of option 2 and 17.58 hectares under the restrictions of option 3 (where only vegetables and flowers are cultivated) (Table 1.16.).

CONCLUSIONS

The high number of subsistence and semi-subsistence farms is due to their small economic size, mainly due to the low efficiency of the crops grown in relation to the small area they cultivate.

This is also the case for family farms whose agricultural area is small and should therefore be oriented toward crops with a higher economic value, such as the cultivation of vegetables or flowers.

It can be seen that, in all scenarios, the larger the area under vegetables or flowers, the faster the economic size is reached. In addition, the optimistic variant, which requires a larger economic

size in order to provide family members with an average standard of living, requires 2.3 times more land than the minimum variant, which is quite difficult for them to achieve.

However, growing vegetables and flowers can be a viable alternative for small-scale farmers (including family farmers) to provide a normal standard of living, but involves a somewhat higher initial labour and expenditure than other crops. The subsidies available to them can also help reduce production costs, thus increasing profitability at the farm level.

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TRENDS IN AREA AND PRODUCTION OF VEGETABLES, FUTURE PROJECTIONS IN ROMANIA

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Abstract: *This study analyzes the state of vegetable cultivation and production in the European Union, with a focus on Romania. In 2022, Romania ranked 6th in the EU in terms of vegetable acreage but experienced a significant decline, and using SPSS, we forecast vegetable production and cultivation trends. Projections for 2030 suggest varying scenarios, reflecting the challenges and uncertainties in agriculture. This research underscores the need for innovation and sustainability to navigate the evolving agricultural landscape.*

Keywords: *agriculture, vegetable, SPSS, Romania.*

JEL classification: Q1, Q13.

INTRODUCTION

Horticulture is the branch that focuses on the cultivation of fruits, vegetables, flowers and trees, which in itself is an ancient discipline that focuses on cultivation on small and medium-sized plots (Andreica & Roman, 2023). Horticulture, in history, represents the practice that has played a key role in feeding the population, providing food as well as plants that contribute to the aesthetics of the environment.

Vegetables play a basic role in nutrition, supporting the health and functioning of biological systems, The nutritional balance that vegetables provide brings various benefits to our diet, supplying minerals, vitamins and antioxidants essential for the functioning of human body processes (Maxim et al., 2020). In addition to the nutritional components, vegetables contribute to the diversification of the diet, giving taste to food (Ana Ruxandra et al., 2018).

Vegetable farming involves complex techniques, starting from soil preparation, cultivation, protection against diseases and pests, to harvesting and distribution. From an ecological perspective, vegetable farming can be considered a sustainable and responsible method of agriculture, through which both the environment and natural resources can be protected (Ladaru et al., 2020).

Today, the agricultural sector faces various challenges in the context of ensuring food security and protecting the environment.

Climate change is the main major challenge farmers face and have to adapt to, encountering extreme weather events (Jankelova et al., 2018). Disease and pest resistance is another challenge, so insecticides and pesticides have become ineffective in the fight to keep plants healthy (Tudor et al., 2023).

Changes in food preferences as well as product quality are demands that consumers have become increasingly concerned with and to which farmers need to respond and adapt (Boca, 2021; Dumitru et al, 2023), Thus, that the vegetable sector, is in a continuous transformation, where new agricultural practices need to be adapted to ensure a suitable environment and high quality vegetables (Giuca & Petre, 2022).

Romania's vegetable supply chain requires a total reorganization in order to reach its true potential, i,e, to cover consumption needs and become competitive not only at national level but also at EU level (Drigă, 2018).

MATERIALS AND METHODS

The research is based on statistical information provided by Eurostat and NSI, on the basis of which estimates are made using SPSS statistical software.

SPSS is a data processing application and one of the most popular among researchers, assisting in organizing data, calculating statistical indicators, checking hypotheses and performing advanced statistical analyses.

The forecasting capabilities included in SPSS involve advanced methods that overcome the limitations of other traditional methods, allowing the use of advanced statistical techniques to generate forecasts.

The aim of this work is to provide an overview of the evolution of vegetable areas and production in the European Union and Romania and to make forecasts up to 2030.

RESULTS AND DISSCUSION

Romania ranks 6th in terms of the area cultivated with vegetables in 2022 in Europe, being ahead of countries such as Italy (385 thousand ha), Spain (366 thousand ha), France (274 thousand ha), Poland (160 thousand ha) or Germany (122 thousand ha) (Table 1).

Table 1. Evolution of areas under vegetables in Europe 2010-2022 (1000 ha)

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Italy	487,6	412,09	403,77	349,31	426,63	422,9	430	418,38	418,12	420,86	413,74	413,86	385,56
Spain	326,96	316,01	318,22	318,51	355,81	354,68	373,77	380,08	372,88	380,22	380,98	396,57	366,85
France	245,5	243,5	243,19	186,53	243,11	235,53	249,5	259,14	257,82	256,18	277,36	288,32	274,63
Poland	199,5	238,4	235,3	187,8	184,40	188,8	217,44	191,98	190,39	190,10	175,80	172,90	160,00
Germany	107,82	108,61	111,46	109,06	111,26	110,9	117,39	124,96	122,69	123,86	123,04	128,47	122,68
Romania	169,96	174,14	170,66	166,06	149,76	150,57	141,5	138,56	140,35	143,31	113,02	113,15	93,10

Source: Eurostat,eu database, accessed July 2023.

An analysis of the areas cultivated with vegetables in Romania shows that in the year 2022, it will decrease compared to 2014 by 37,8% and compared to 2021 by 17,7% (Table 1).

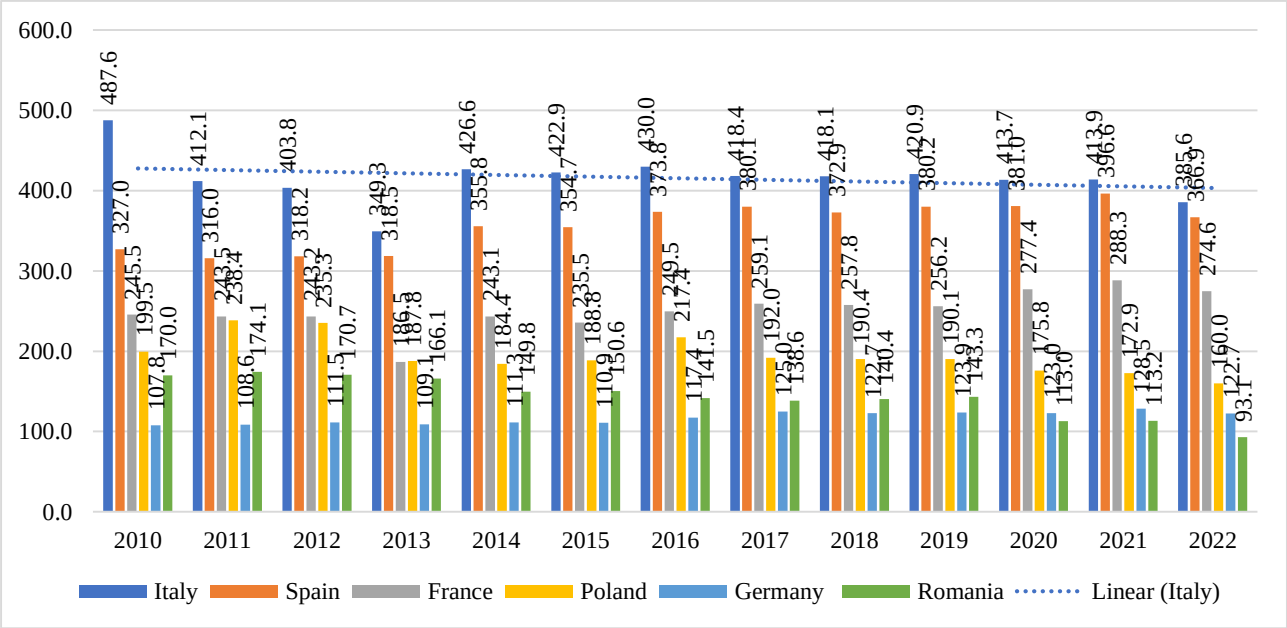

Figure 1. Evolution of areas under vegetables 2010-2022

Source: Eurostat,eu database, accessed July 2023.

At the regional level, it can be seen that in 2014, the South-Muntenia, North-East, South-West Oltenia and South-East regions each have a share of more than 15% of the total area under vegetables. In 2021, this ranking changes, with the North-East Region taking first place with a share of 20% of the total area under vegetables, In 2022 there is a decrease of 11,28% in the area under vegetables compared to the previous year, with the highest shares in the North-East Region with 20%, followed by the South-Muntenia Region with 19% (Table 2).

Table 2. Evolution of areas under vegetable cultivation in Romania by Development Regions in the period 2010-2022 (ha)

Development regions	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
TOTAL	262,692	263,359	258,910	259,029	239,474	239,494	228,124	224,571	226,328	227,720	200,501	197,677	177,632
NORTH-WEST Region	23,651	22,840	22,298	23,965	23,293	21,887	23,015	22,736	22,994	22,909	21,420	21,342	18,524
CENTRAL Region	17,418	17,765	17,171	18,786	17,566	19,951	18,623	18,502	18,703	18,561	16,139	16,410	14,561
NORTH-EAST Region	45,439	46,605	45,378	46,160	43,122	43,811	40,222	40,212	42,330	42,526	37,249	39,452	35,334
SOUTH-EAST Region	43,936	43,462	42,638	42,900	36,267	35,798	34,600	32,474	31,937	31,505	29,275	27,487	24,688
SUD-MUNTENIA Region	51,058	50,710	50,183	48,224	45,569	45,396	41,778	41,157	41,327	43,430	33,600	35,632	34,387
Bucharest - Ilfov Region	5,443	5,916	5,645	6,004	5,495	5,425	5,337	5,491	5,416	5,287	5,262	5,596	4,150
SOUTH-WEST OLTENIA Region	46,565	45,439	45,181	40,318	37,786	37,334	35,271	35,506	35,022	34,685	28,280	28,391	24,704
WEST Region	29,182	30,622	30,416	32,672	30,376	29,892	29,278	28,493	28,599	28,816	29,275	23,367	21,284

Source: NSI, accessed July 2023;

In 2022, Spain will have the highest vegetable production with 8,8 thousand tones, followed by Italy with 8,5 thousand tones and Poland with 2 thousand tons. In Greece there is a decrease of about 31% in 2022 (1,6 million tons) compared to the production in 2010 (2,4 million tons).

Romania ranks 8th in total vegetable production, with a production of 726 thousand tons in 2022, down 50% compared to 2010 (1,4 million tons) (Table 3).

Table 3. Evolution of vegetable (including melon) production in Europe 2010-2022 (1000 t)

Country	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*
Spain	-	-	-	-	-	9,285	9,767	9,885	9,485	10,088	9,616	10,309	8,799
Italy	-	-	-	-	-	8,668	8,807	8,320	8,161	8,200	8,707	9,115	8,544
Poland	568	579	630	623	1,549	1,498	1,652	1,705	1,735	1,697	1,702	1,988	2,078
Netherlands	1,675	1,642	1,629	1,649	1,647	1,729	1,708	1,784	1,770	1,842	1,883	1,871	1,720
Portugal	-	1,459	1,606	1,411	1,680	1,641	1,938	2,005	1,577	1,752	1,733	2,094	1,673
France	-	-	-	-	1,485	1,502	1,591	1,537	1,429	1,452	2,196	2,171	1,663
Greece	2,422	2,374	2,147	2,387	2,365	2,291	2,185	2,052	1,997	1,652	1,858	1,879	1,661
Romania	1,465	1,723	1,401	1,540	1,431	1,360	1,228	1,353	1,438	1,313	1,259	1,303	726

Source: Eurostat,eu database, accessed July 2023

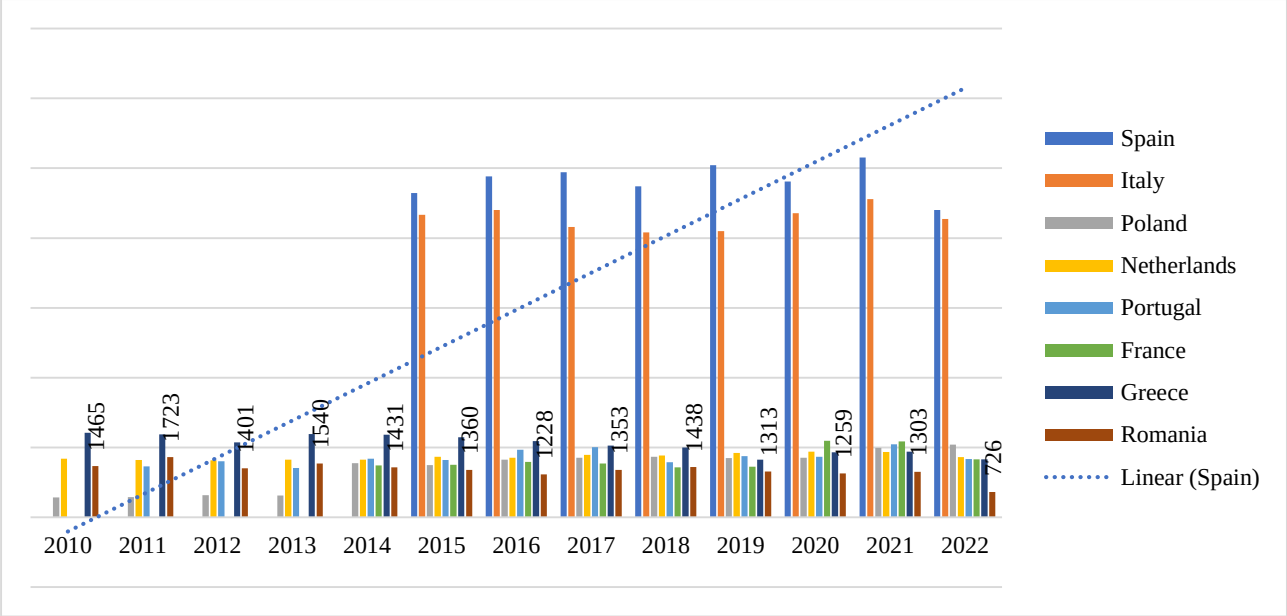

Figure 2. Vegetable (including melon) production in Europe 2010 - 2022 (1000 ha)

Source: Eurostat,eu database, accessed July 2023;

Table 4. Evolution of vegetable production in Romania by development regions in the period 2010-2022 (thousand tonnes)

Development regions	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
TOTAL	3,863.6	4,176.3	3,535.3	3,961.0	3,802.5	3,673.5	3,358.4	3,638.4	3,797.4	3,529.6	3,483.0	3,495.1	2,426.1
NORTH-WEST Region	342.7	354.0	314.1	352.5	358.2	339.3	344.1	366.5	368.1	341.3	381.5	342.4	246.2
CENTRAL Region	247.4	273.1	230.3	266.2	267.1	277.6	267.5	280.0	288.7	269.9	268.3	274.1	187.5
NORTH-EAST Region	610.4	665.2	571.7	666.7	644.0	596.7	498.2	534.5	602.6	557.8	583.4	646.1	440.4
SOUTH-EAST Region	750.9	791.2	605.3	726.0	636.1	623.1	581.1	611.4	624.0	577.9	567.8	564.0	373.7
SUD-MUNTENIA Region	769.3	813.0	703.0	755.8	781.1	776.3	681.9	724.1	732.4	712.9	605.9	625.1	489.3
Bucharest - Ilfov Region	90.3	122.2	89.9	108.3	91.1	91.2	72.6	81.5	87.7	74.9	92.9	102.5	54.7
SOUTH-WEST OLTENIA Region	675.8	722.8	644.3	633.5	601.7	565.6	528.6	614.3	645.0	587.7	515.3	565.0	343.0
WEST Region	376.8	434.8	376.7	451.8	423.3	403.8	384.4	426.1	449.0	407.1	468.0	376.0	291.3

Source: NSI, accessed October 2023;

Total vegetable production in Romania has been variable over the years, peaking in 2011 (4176,3 thousand tonnes) and decreasing significantly by 2012 (3535,3 thousand tonnes). A slight increase followed, but production levels were generally lower in the period 2012-2022.

In 2010, the South-Muntenia region ranked first in total vegetable production with 769,3 thousand tonnes, followed by the South-East region with 750,9 thousand tonnes and the North-East with 610,4 thousand tonnes. In the year 2022, the first places in vegetable production were occupied by the South-Muntenia region with 489,3 thousand tonnes, the North-East with 440,4 thousand tonnes

and he South-East with 373,7 thousand tonnes, It is worth mentioning that in 2022, all regions recorded decreases compared to the production recorded in 2010 (Table 4).

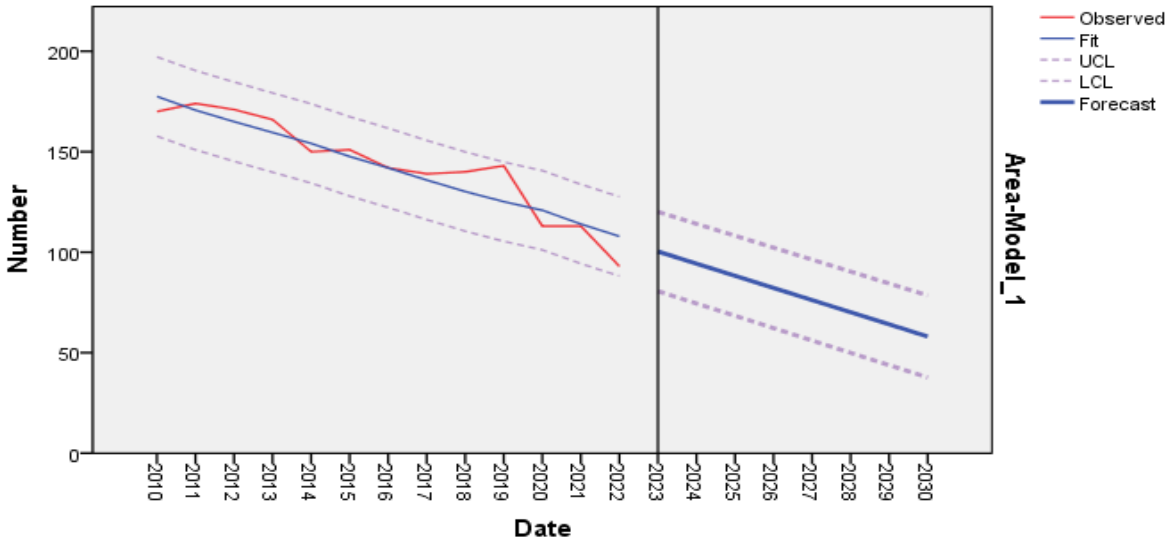

Figure 3. Estimated area under vegetables in Romania
Source: own processing based on Eurostat 2023;

In 2010, Romania cultivated 170 thousand hectares of vegetables, reaching 93 thousand hectares in 2022. According to estimates made in SPSS, the area under vegetable cultivation will reach 60 thousand hectares in 2030, while the optimistic variant estimates a production of 75 thousand hectares and the pessimistic variant estimates 40 thousand hectares (Figure 3).

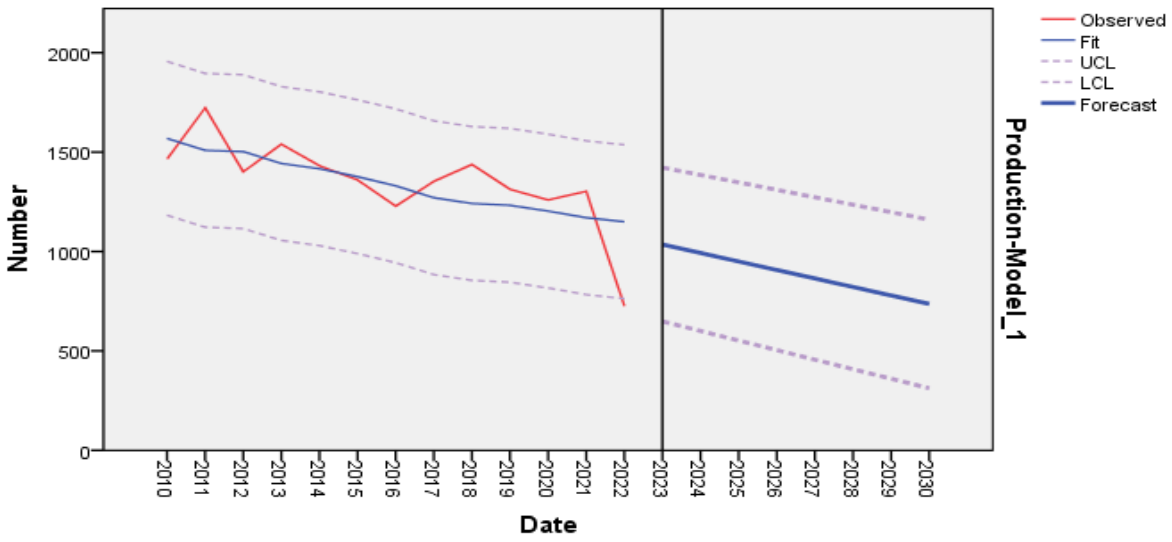

Figure 4. Estimated vegetable production in Romania
Source: own processing based on Eurostat 2023;

In 2010, Romania produced 1465 thousand tons of vegetables, reaching 726 thousand tons in 2022. According to estimates made in SPSS, vegetable production will reach 750 thousand hectares in 2030, while the optimistic variant estimates a production of 1200 thousand tonnes and the pessimistic variant estimates 400 thousand tonnes (Figure 4).

CONCLUSIONS

At the European Union level, according to data provided by Eurostat, Romania ranks 6th in 2022 in terms of the area cultivated with vegetables, being outranked by countries such as Italy, Spain, France. In 2022, there will be a decrease of 11,28% in the area cultivated with vegetables compared to the previous year, with the highest shares in the North-East Region with 20%, followed by the South-Muntenia Region with 19%.

In the case of EU vegetable production, Spain, Italy and Poland are in first place, with Romania in 8th place with a production of 726 thousand tonnes of vegetables in 2022. In the case of vegetable production by development regions of Romania, in 2022, the first places for vegetable production were occupied by the South Muntenia region with 489,3 thousand tonnes, North-East with 440,4 thousand tonnes and South-East with 373,7 thousand tonnes. In 2010, Romania's vegetable production reached 1465 thousand tonnes, but by 2022, it had fallen to 726 thousand tonnes. According to projections made using SPSS software, vegetable production is expected to develop as follows: in 2030, production is expected to reach 750 thousand tonnes in the baseline scenario, 1200 thousand tonnes in the optimistic scenario and 400 thousand tonnes in the pessimistic scenario.As for the area under vegetables, in 2010, this totalled 170 thousand hectares, and by 2022, it has been reduced to 93 thousand hectares. According to the projections made in SPSS, the following figures are projected for the area under vegetables: in 2030, an area of 60 thousand hectares is estimated in the baseline scenario, 75 thousand hectares in the optimistic scenario and 40 thousand hectares in the pessimistic scenario.Agriculture faces continuous challenges and transformations, which require technological innovations and sustainable practices to adapt to the changing market.

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THE EVOLUTION OF THE ECONOMIC DIMENSION OF AGRICULTURAL FARMINGS IN ROMANIA

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Abstract: *This paper presents a general analysis of agricultural holdings in Romania. Thus, in this study, the economic size of the agricultural holding, the used agricultural area, the total crop production and the gross income of the farms were analyzed, depending on the size of the agricultural holdings expressed in standard output. In addition, to clearly highlight the existing situation, statistical indicators such as standard deviation, coefficient of variation and growth rate were calculated. The current disparities are significant, and there is no clear evidence that they will be reduced or eliminated, because the structural problems facing Romanian agriculture can only be debated over a long period of time. The data used were extracted from the Agricultural Accounting Information Network (RICA), for the period 2007-2021. The obtained results support the fact that the average economic size at the level of agricultural holdings in Romania is relatively stable, as far as this indicator is concerned. At the same time, the agricultural areas used decrease and the total productions of the crops increase for all types of economic sizes, except for holdings between 8 000 and 25 000 euros.*

Keywords: *Agricultural holdings, economic dimension, Romania*

JEL classification: *Q10*

INTRODUCTION

Agriculture is the foundation of a country's economy because it is responsible for providing food resources, which is the main source of food for mankind, taking into account the demographic explosion found in most states with a less developed economy. Also, agriculture is the main supplier of raw material for various industries (Micu et al., 2013; Dumitru et al., 2020). However, at the level of the European Union, the agricultural sector is the main user of land, representing approximately 50% of the total area of the region (Giannakis and Bruggeman, 2015). Among the EU member states, in Romania, the agricultural structure is the most fragmented, with 31.8% of the total farms in the entire region, mostly small farms (under two hectares) (Sterie et al., 2020). The current situation of Romanian agriculture and implicitly of rural areas is linked to the agricultural structure of the country, being an important problem, both from a social and economic point of view, that Romania is currently facing (Otiman, 2012; Ciutacu et al., 2015; Feher et al., 2017). Fragmentation and the high number of small holdings are the result of the application of the laws regarding the privatization of companies in the agricultural sector as well as the application of the laws related to land.

As a result of the application of common agricultural policies for more than 50 years, family farms have been established and supported in all EU member states. Many EU member states are characterized by agricultural holdings with areas between 10 and 50 hectares and between 10 and 100 hectares, for example, in France they represent an important percentage of the agricultural area of the Union. The structure of French farms has developed over time under market conditions as well as with policy support, especially measures from the CAP policy program (Piet et al., 2012).

Large farms of over 1000 hectares can be found in Germany as well as in Portugal and Spain. Despite significant differences in their agriculture, they eventually reached a structure of similar size (Bašek and Kraus, 2011; Arnalte and Ortiz, 2013).

Also, the Netherlands is one of the countries where high-performance agriculture is practiced with high production efficiency. Production efficiency is greatly influenced by the large number of

livestock on the farm (Bašek and Kraus, 2011). The evolution and differences in the structure of farms in the European Union vary from state to state. While, in the Eastern part of Europe, the main differences between the agricultural structures of the states are represented, in general, by the situations and moments related to the history of the agricultural sector from the communist period, later these differences were the result of the emergence of agrarian reforms. In the states of Western Europe, these differences between agricultural structures are highlighted by both institutional and political factors, but also by market conditions (Choisis et al., 2012).

However, Romania will not be able to align itself with other member states, such as France, Germany or Germany, in terms of the agricultural system. The studies show that the value of the unitary agricultural production in Romania, until the year 2038, would be 1,390 euros/hectare, while in the other states it would exceed 2,000 euros/hectare. In this sense, a scenario was created, which was based on an increase in the production value of 3%/year, noting that by the year 2038, the unit production value should be 2297 euros/hectare, which which would mean that Romania would align with the average registered at the EU level. Also, another, optimistic scenario was realized, using as a base, a 4% increase in the value of production, which would mean that by 2038, Romania should have a unitary agricultural production of 2,868 euros/hectare, which is impossible to achieve, observing the average annual growth level of approximately 3% recorded in Romania from 1998 to the present (Feher et al., 2022).

In accordance with the legislation on the classification of farms and agricultural holdings (law 37/2015), there are a number of criteria according to which they are classified as follows:

- Farms that specialize in crops (field crops, permanent crops and horticulture);
- Farms that are specialized in animal production (breeding of herbivorous animals and breeding of granivorous animals)
- Farms specializing in mixed productions (mixed crops, animal husbandry, mixed crops and animal husbandry and unclassified holdings).

In addition, agricultural holdings are also classified according to economic size as follows:

- Farms with an economic size below 1,999 euros, are found under the name of semi-subsistence farms. Within these farms, the production obtained is totally used for own consumption.
- Farms with an economic size between 2,000 and 7,999 euros are found under the name of small commercial farms. Within these farms, more than half of the production obtained is subject to commercialization.
- Agricultural holdings with a size between 50,000 and 999,999 euros are found under the name of commercial farms or medium-sized agricultural holdings. Within these farms, 100% of the production obtained is marketed.
- Agricultural holdings with an economic size greater than 1,000,000 euros are found under the name of commercial farms or large agricultural holdings. Within these farms, production is 100% marketed.

MATERIAL AND METHOD

The data used to carry out the quantitative and qualitative analysis come from the Agricultural Accounting Information Network (RICA). This network was established in the European Union in 1965. The network uses data representing more than 5,000,000 holdings from the 27 EU Member States, a percentage of more than 90% of the total agricultural production of the European

Union. The purpose of this network is to collect data related to both the production and the economy of the holdings in order to be able to determine the incomes and business analyzes of the agricultural holdings.

Selected indicators at the level of Romania were analyzed according to the economic size of the holdings, for a period between 2007 and 2021, being the most recent data available, as follows:

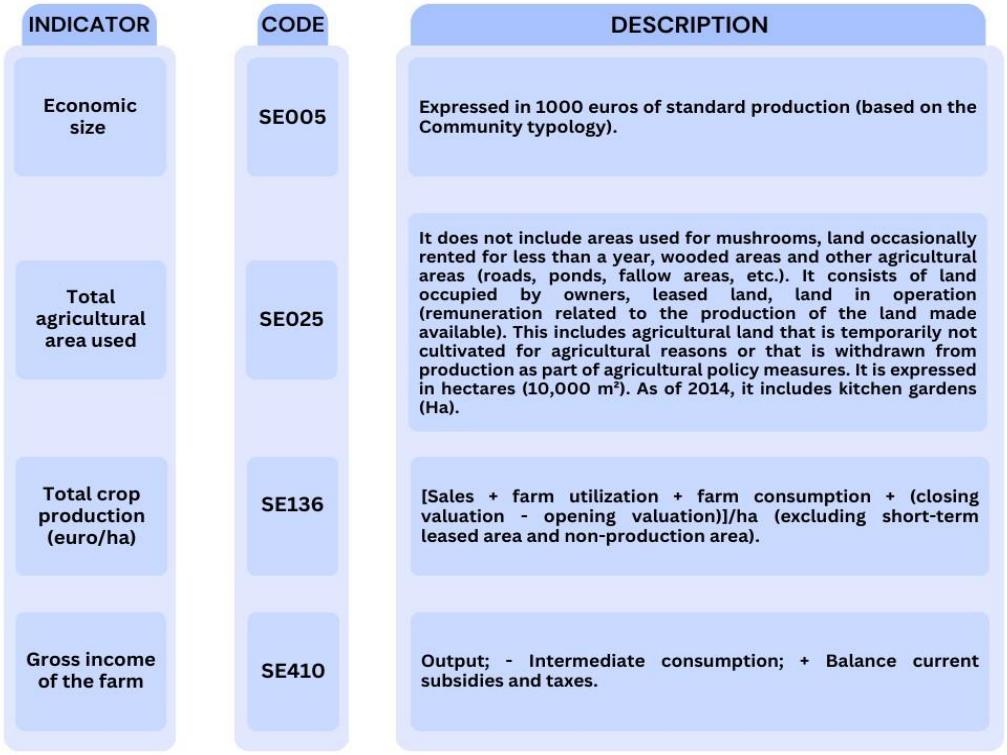

Figure 1. Description of indicators used

Source: Agricultural Accounting Information Network (RICA)

Based on the data, the statistical indicators were calculated as follows:

- Standard deviation: $\sigma = \sqrt{\frac{\Sigma(xi-\mu)^2}{N}}$ where;

  σ = standard deviation;
  xi= each value in the sample;
  N= sample size;
  μ= sample mean;
- Coefficient of variation CV= $\frac{\sigma_x}{|\bar{x}|}$ where;

  σ = standard deviation;
  $|\bar{x}|$**:** It is the mean of variable X in absolute value with $\bar{x} \neq 0$
- Growth rate $\overline{R} = (\bar{I} * 100) - 100$ where;

  $\bar{I}$= average global growth index;

RESULTS AND DISCUSSION

Analyzing the intervals regarding the economic size, it is observed that increases in the average economic sizes are recorded only for semi-subsistence holdings (2,000-8,000 euros) and for small holdings (8 000-25 000 euros). Thus, semi-subsistence holdings show the most pronounced

growth, of 40.5%, in 2007 the average economic size of holdings was 4.2 thousand euros, reaching 5.9 thousand euros in 2021. At the same time, the a more representative decrease can be found in the case of holdings between 25,000 and 50,000 euros, decreasing by 7.5% in 2021 compared to 2007, when the average of agricultural holdings was 37.3 thousand euros. And in the case of agricultural holdings with economic sizes between 50 000 – 1 000 000 euros, 100 000 – 500 000 euros and over 500 000 euros, there are decreases of 5.2%, 0.4% and 3.3% respectively in the last year compared to the values averages recorded in 2007 (Figure 2).

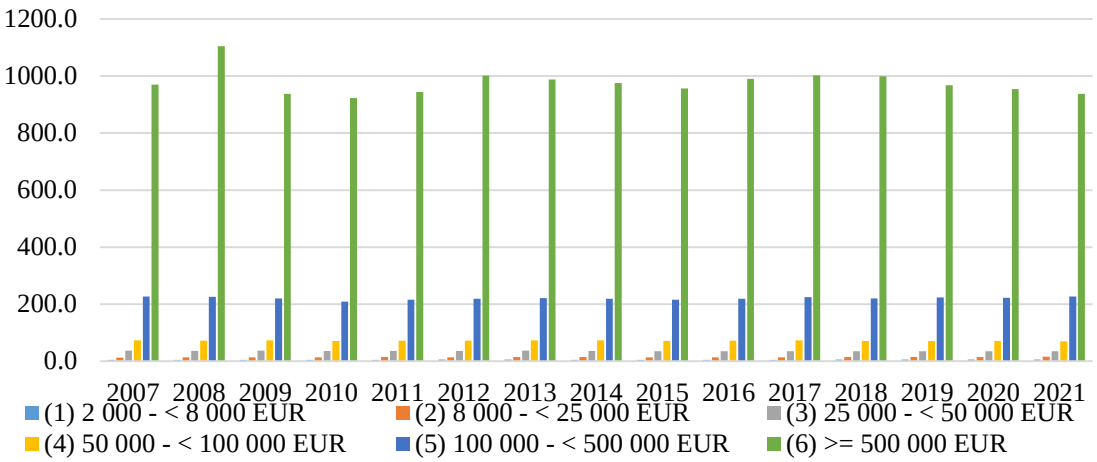

Figure 2. (SE005) The economic size of the holding expressed per 1,000 euros of standard production at the level of Romania (thousands of euros)

Source: Graphic representation based on data provided by FADN Public Database (SO);

From the analysis of the statistical indicators calculated for the economic size of the holding at the level of Romania, in the analyzed period the following results were obtained: the standard deviation registered limits between 0.67 hectares for the agricultural holdings whose economic size is between 2 000 – 8 000 euros and 43.54 hectares for large agricultural holdings, those with an economic size of over 500 000 euros.The coefficient of variation oscillated between 4% for agricultural holdings with an economic size of over 500 000 euros and 14% for small holdings, having an economic size between 2 000 – 8 000 euros.The growth rate is characterized by positive values only for agricultural holdings with an economic size between 2 000 – 8 000 euros and 8 000 – 25 000, this having the value of 2% and 1%, respectively. For the other intervals regarding the economic size of agricultural holdings, the pace was characterized by negative values, -1% for agricultural holdings with an economic size between 25 000 – 50 000 euros, -0.4% for those between 50 000 – 100 000 euros, -0 .03% for those between 100 000 – 500 000 euros and -0.2% for agricultural holdings over 500 000 euros (Table 1).

Table 1. Statistical indicators calculated for the economic size of the holding expressed per 1 000 euros of standard production at the level of Romania

Economic size	Min	Max	Average	Standard Dev.	Coef. Var (%)	Growth Rate (%)
(1) 2 000 - < 8 000 EUR	4	6	5	0.67	14%	2%
(2) 8 000 - < 25 000 EUR	12	15	14	0.77	6%	1%
(3) 25 000 - < 50 000 EUR	35	37	36	0.80	2%	-1%
(4) 50 000 - < 100 000 EUR	69	73	72	1.10	2%	-0.4%
(5) 100 000 - < 500 000 EUR	208	227	221	4.92	2%	-0.03%
(6) >= 500 000 EUR	924	1.105	977	43.54	4%	-0.2%

Source: FADN Public Database (SO);

The total agricultural area used, at the national level, registered significant decreases, with the exception of small holdings, those in the range of 8 000 – 25 000 euros, which registered increases of approximately 14% in 2021 compared to 2007. The most significant decreases were registered within holdings with an economic size between 100 000 – 500 000 euros and over 500000 euros, being 36% in 2021 compared to the first year analyzed (Figure 3).

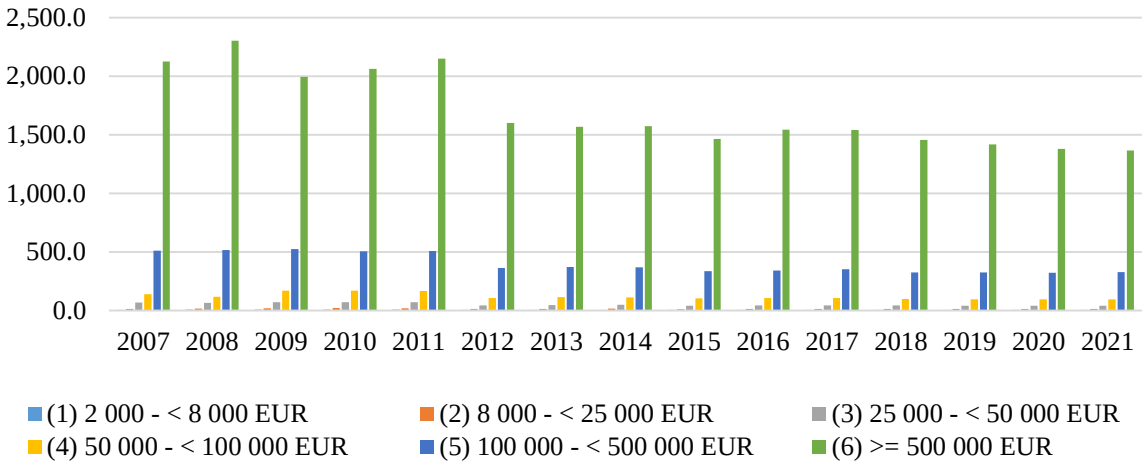

Figure 3. (SE025) - Total agricultural area used in Romania (ha)

Source: Graphic representation based on data provided by FADN Public Database (SO);

From the analysis of the statistical indicators calculated for the total agricultural area used at the level of Romania, in the analyzed period the following results were obtained: the standard deviation recorded limits between 0.91 hectares for agricultural holdings with an economic size between 2 000 – 8 000 euros and 323.93 hectares for large agricultural holdings, those with an economic size of over 500 000 euros.

The coefficient of variation oscillated between 15% for agricultural holdings with an economic size between 2 000 – 8 000 and 24% for agricultural holdings between 25 000 – 50 000 euros. The rate is characterized by negative values for all six intervals regarding the economic size of agricultural holdings, this having the value of 1% (Table 2).

Table 2. Statistical indicators calculated for the total agricultural area used in Romania

Economic size	Min	Max	Average	Standard Dev.	Coef. Var (%)	Growth Rate(%)
(1) 2 000 - < 8 000 EUR	5	8	6	0.91	15%	-0.6%
(2) 8 000 - < 25 000 EUR	12	21	15	2.50	16%	0.9%
(3) 25 000 - < 50 000 EUR	42	72	53	12.51	24%	-3.4%
(4) 50 000 - < 100 000 EUR	97	171	121	27.37	23%	-2.6%
(5) 100 000 - < 500 000 EUR	322	525	400	84.12	21%	-3.1%
(6) >= 500 000 EUR	1.365	2.302	1.702	323.93	19%	-3.1%

Source: FADN Public Database (SO);

Regarding the indicator regarding the total production of crops at the level of Romania. It's recording. in general. an upward trend. Total crop production refers to total sales along with farm utilization. holding consumption and closures assessment from which the opening assessment is reduced in relation to the number of hectares (except for the area leased for a short period of time and the area not in production).

So, at the level of categories of agricultural holdings. classified according to economic size. the most significant increases were registered in the case of large holdings. which have an economic dimension of over 500 000 euros, the total crop production being 86% higher in 2021 compared to 2007, when the production value was 376.9 euros/ha. Instead, total crop production obtained in small holdings, it decreased by 8% in 2021, compared to the production recorded at the level of the first year analyzed. Thus, the investments made in the technology of holdings through financing programs. their effects are felt (Figure 4).

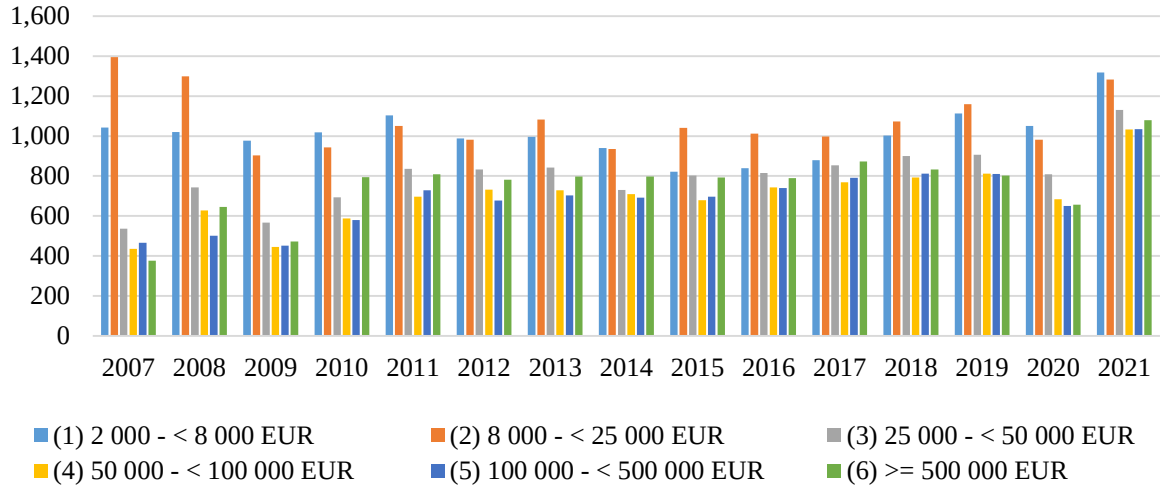

Figure 4. (SE136) – Total crop production in Romania (euro/ha)

Source: Graphic representation based on data provided by FADN Public Database (SO);

From the analysis of statistical indicators calculated for total crop production. in the analyzed period, the following results were obtained: the standard deviation recorded limits between 121.2 euros/hectare for agricultural holdings with an economic size of 2 000 – 8 000 euros and 165.4 euros/hectare for agricultural holdings with an economic size of over 500 000 euros.

The coefficient of variation oscillated between 12% for farms with an economic size between 2 000 – 8 000 euros and those over 500 000 euros and 22% for farms with an economic size between 100 000 and 500 000 euros and those over 500 000 euros.

The growth rate is characterized by positive values. with the exception of agricultural holdings whose economic size is between 8 000 – 25 000 euros, this having the value of -0.6% (Table 3).

Tabel 3. (SE136) – Indicatori statistici calculați pentru producția totală a culturilor

Economic size	Min	Max	Average	Standard Dev.	Coef. Var (%)	Growth Rate(%)
(1) 2 000 - < 8 000 EUR	821	1318	1007	121.2	12%	1.7%
(2) 8 000 - < 25 000 EUR	903	1395	1076	145.8	14%	-0.6%
(3) 25 000 - < 50 000 EUR	536	1130	800	141.6	18%	5.5%
(4) 50 000 - < 100 000 EUR	436	1032	698	144.9	21%	6.4%
(5) 100 000 - < 500 000 EUR	452	1035	689	151.1	22%	5.9%
(6) >= 500 000 EUR	377	1079	753	165.4	22%	7.8%

Source: FADN Public Database (SO);

In Romania, gross farm income by category of agricultural holding, at the level of the 2007 period, it decreased, for small agricultural holdings (8 000 – 25 000 euros) and for agricultural holdings with an economic size between 25 000 – 50 000 euros, of 0.3% and 41% respectively, in the

year 2021 compared to the year 2007. However, the most important increases were registered within holdings with an economic size of over 500,000 euros, being 49% in 2021 compared to the first year analyzed (Figure 5).

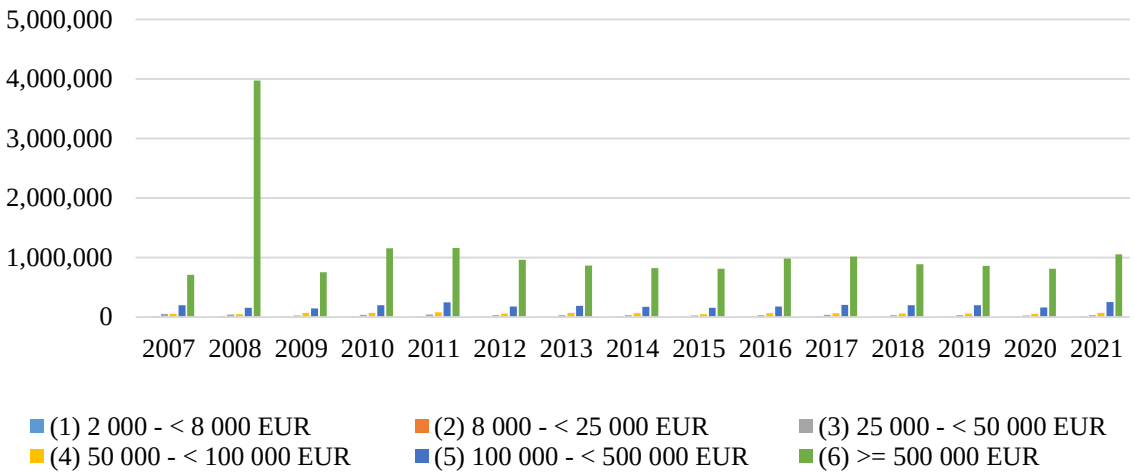

Figure 5. (SE270) - Total inflows (euro) at the level of Romania

Source: Graphic representation based on data provided by FADN Public Database (SO);

Following the analysis of the statistical indicators calculated for the gross income from the farm at the level of agricultural holdings in Romania, a standard deviation between 508 euros was noted for holdings with an economic size between 2 000 and 8 000 euros and 30 909 euros for holdings with an economic size greater than greater than or equal to 500 000 euros. Regarding the coefficient of variation, it was between 5% for holdings with an economic size of 8 000 - <25 000 euros and 15% for those with an economic size between 2 000 – 8 000 euros (Table 4).

Table 4. (SE270) - Statistical indicators calculated for total entries at the level of Romania (euro)

Economic size	Min	Max	Average	Standard Dev.	Coef. Var (%)	Growth Rate (%)
(1) 2 000 - < 8 000 EUR	2 199	4 267	3.474	508	15%	1.4%
(2) 8 000 - < 25 000 EUR	6 893	12 516	10.460	508	5%	0.0%
(3) 25 000 - < 50 000 EUR	21 906	53 186	32.095	1362	4%	-3.7%
(4) 50 000 - < 100 000 EUR	46 426	76 906	60.039	7559	13%	1.7%
(5) 100 000 - < 500 000 EUR	141 008	247 555	185.041	8167	4%	1.7%
(6) >= 500 000 EUR	706 537	3.974 723	1.119.434	30909	3%	2.9%

Source: FADN Public Database (SO);

CONCLUSIONS

The polarization between large and small agricultural holdings in Romania is a complex subject, with social, economic and environmental implications. On the one hand, small farms are crucial for rural communities. They not only provide a means of livelihood for a significant population, but also contribute to the preservation of a rural way of life and biological diversity through traditional agricultural practices. On the other hand, large agricultural holdings are essential for food security and competitiveness in the international market, often having access to more efficient technologies and practices. Maintaining a balance between these two types of agricultural

holdings is essential for sustainable development in order to ensure the sustainability of rural communities, food security, biological diversity and resilience, as well as social cohesion.

The average economic size at farm level in Romania registers significant increases only for agricultural holdings with an economic size between 2 000 and 8 000 euros, respectively 8 000 – 25 000 euros, while those of medium and large sizes show decreases. In the case of small holdings, this increase is attributed to the decrease in the number of subsistence and semi-subsistence agricultural holdings determined by the measures adopted in the last two development programs, an aspect that contributed to their merger. These types of holdings have been absorbed by medium-sized and large ones.Although the agricultural areas used in Romania decreased in general for most of the intervals analyzed, the total production of crops (euro/ha) registered considerable increases for all types of economic sizes, except for small agricultural holdings, those with an economic size between 8 000 – 25 000 euros.

The decrease in areas and the increase in total crop production simultaneously can be attributed to the increase in crop yield, which is possible due to the increase in the degree of mechanization, as well as the rational use of new agricultural techniques.

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MARKET ANALYSIS OF THE VEGETABLE SECTOR

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Abstract: *The Romanian vegetable market is in continuous development, with consumers preferring local vegetables to the detriment of imported ones. Even though there is a very good potential and a fairly varied supply of fresh vegetables on the domestic market, some of the producers have given up making major investments, being discouraged by the massive imports of vegetables. The major objective of the paper is to carry out an analysis of the main indicators of the production, consumption and trade of vegetables in Romania. Thus, aspects related to the evolution of the areas cultivated with vegetables, the dynamics of productions in the vegetable sector, the evolution of vegetable consumption as well as the distribution of imports and exports of vegetables will be followed. These data will be analyzed for the period 2010-2022, using statistical calculation methods. With the help of the calculated indicators, a clearer situation on this sector will be highlighted.*

Keywords: *market, vegetable sector, statistical methods.*

JEL classification: Q11,Q13,Q17

INTRODUCTION

With a strategic importance for agriculture, the vegetable sector contributes to ensuring the food security of the population through diversified offers of accessible vegetables but also of raw materials for the processing and export industry (Zbancă and Negritu, 2020). The geographical extension of vegetable cultivation as well as the structure of the areas occupied with vegetable species should be put in line with the capacities of the main consumers (Movileanu, 2010).

The vegetable sector in Romania consists mainly of small and medium-sized producers who grow vegetables on their own or leased land, but there are also some large farms that use modern cultivation techniques. Vegetable production is mainly carried out by farmers who still use traditional cultivation methods (Sterie, 2023; Necula, 2015).

Being considered a resource and labor ntensive activity, the commercial production of vegetables requires the use of quite a large number of labor in the stages of production, processing and marketing (Dias, 2010).

The inclusion of vegetables in the diet not only increases the diversity of the diet, but also maintains the normal functioning of the human body, favoring a better assimilation with other foods (Dumitrescu, 1998). The sale of consumer goods on the Romanian market is concentrated in supermarkets and hypermarkets. Romanian producers face difficulties in supplying large commercial centers with vegetables and fruits. This is mainly due to the seasonal production of vegetables and fruits, which results in low production and quality far below that imposed by the big operators (Ilie, 2020).

Fruit and vegetable trade is one of the most dynamic sectors of international trade, resulting in increased income and consumer interest in variety, freshness, quality and availability of products (Diop, 2005).

MATERIALS AND METHODS

The working documents used to carry out the study refer to a series of key information, through which the trends in the evolution of the market of the vegetable sector were identified. Thus,

in the analysis of the evolution of the vegetable sector, annual time series from the period 2010-2022 were used, for the following indicators: areas, productions, consumptions, imports and exports of vegetables. The study includes both brief analysis and statistical data on the vegetable sector market. Statistical information was provided by the Eurostat database, the Tempo Online database of the National Institute of Statistics and TradeMap – Trade Statistics for International Business Development.

RESULTS AND DISSCUSION

I. Analysis of cultivated areas and productions obtained with vegetables

According to Eurostat data, 1,891.21 thousand hectares were used for growing vegetables in 2022, which meant 1.2% of the agricultural area used at EU level (161,088.93 thousand hectares). Italy (20.39% of the area cultivated with vegetables at EU level), Spain (19.4%) and France (14.5%) have the largest area cultivated with vegetables in the EU. The area cultivated with vegetables in Romania represents 5.1% of the total EU (Table 1, Figure 1).

Table 1. Evolution of areas with vegetables (including melons) in Europe in the period 2010-2022 (1000 ha)

	eu	Italy	Spain	France	Poland	Germany	Romania	Netherlands	Hungary	Belgium	Greece
2010	-*	487.60	326.96	245.50	199.50	107.82	169.96	89.57	68.36	60.50	103.33
2011	1,981.77**	412.09	316.01	243.50	238.40	108.61	174.14	74.71	76.06	53.67	98.45
2012	1,951.44**	403.77	318.22	243.19	235.30	111.46	170.66	72.43	77.54	52.14	92.01
2013	1,791.58**	349.31	318.51	186.53	187.80	109.06	166.06	73.87	76.38	45.97	95.19
2014	2,069.41	426.63	355.81	243.11	184.40	111.26	149.76	75.31	79.88	47.05	97.59
2015	2,074.06	422.90	354.68	235.53	188.80	110.90	150.57	86.80	84.48	58.44	82.00
2016	2,167.53	430.00	373.77	249.50	217.44	117.39	141.5	87.94	92.53	59.63	81.69
2017	2,148.61	418.38	380.08	259.14	191.98	124.96	138.56	92.50	94.11	64.29	82.70
2018	2,126.43	418.12	372.88	257.82	190.39	122.69	140.35	92.18	91.01	65.62	78.66
2019	2,143.23	420.86	380.22	256.18	190.10	123.86	143.31	97.40	89.31	67.33	69.52
2020	2,004.18	413.74	380.98	277.36	175.80	123.04	113.02	96.53	83.22	68.68	73.26
2021	2,051.18	413.86	396.57	288.32	172.90	128.47	113.15	104.02	80.96	70.15	77.04
2022	1,891.21	385.56	366.90	274.63	160.00	122.68	97.51	92.84	76.91	64.39	58.28
2022/2021	-7.80	-6.84	-7.48	-4.75	-7.46	-4.51	-13.82	-10.75	-5.00	-8.21	-24.35
2022/2010	-	-20.93	12.22	11.87	-19.80	13.78	-42.63	3.65	12.51	6.43	-43.60

Source: Eurostat.eu database, accessed November 2023,* - data not available, ** - European Union data – 27 countries (from 2020)

At the level of the EU countries, there was a decrease in the areas cultivated with vegetables in 2022 by 7.8% compared to 2021. This was mainly due to the unfavorable weather but also to the increase in the costs of all inputs. According to Eurostat data, the area cultivated with vegetables in Romania fell in 2022 to the lowest level since 2010, registering a decrease of -24.4% compared to 2021 and -43.6% compared to 2010 (Figure 1).

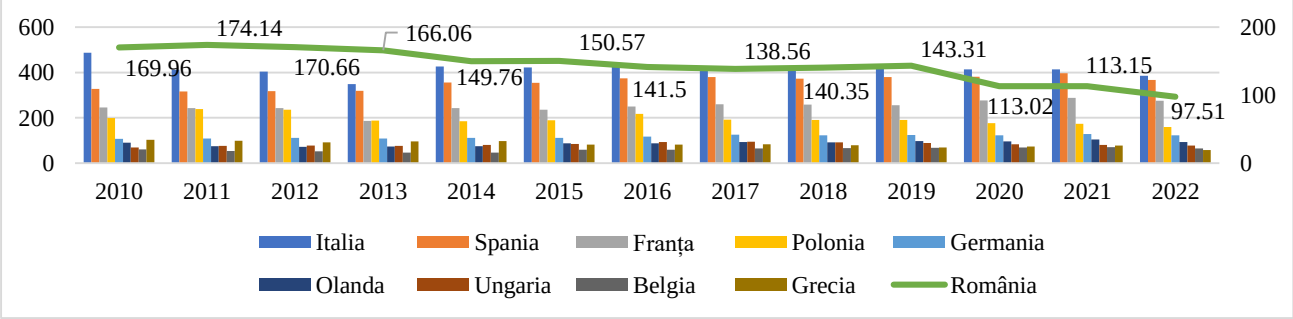

Figure 1. Evolution of areas with vegetables (including melons) in Europe in the period 2010-2022 (1000 ha)

The largest producers of vegetables at the level of the EU countries in 2022 were Spain (24.13% of the total production of vegetables harvested in the EU) and Italy (20.40%). Thus, in 2022, a production of 13.8 million tons was recorded in Spain from an area of 366900 cultivated ha and an average yield of 3.78 kg/m2. In second place in the list of the largest producers of vegetables at EU level is Italy with 12.35 million tons on a cultivated area of 385560 hectares and a yield of 3.20 kg/m2. In third place is France with a production of 5.92 million tons from 274630 cultivated ha and an average yield of 2.15 kg/m2. Romania ranks 10th in the list of vegetable producers with a production of 1.43 million tons obtained from an area of 97510 ha and an average yield of 1.46 kg/m2 (Table 2).

Table 2. Evolution of production obtained with vegetables (including melons) in Europe in the period 2010-2022 (1000 t)

	eu	Spain	Italy	France	Poland	Netherlands	Germany	Portugal	Belgium	Greece	Romania
2010	-*	-*	13972.85	6893.63	4278.45	4742.00	3290.70	-*	-*	3921.98	2486.01
2011	-*	-*	13350.52	6102.93	4305.00	-*	3531.62	1976.83	-*	3370.45	2888.11
2012	-*	-*	-*	6211.98	-*	4680.00	3767.81	2125.29	-*	3130.47	2478.56
2013	-*	-*	12108.42	5308.72	-*	4849.00	3356.21	1977.09	-*	3405.85	2712.83
2014	-*	-*	-*	5376.26	5639.30	4918.00	3702.62	2284.20	-*	3175.15	2644.59
2015	62732.17	14123.24	13119.94	5297.41	4823.70	4922.60	3391.73	2214.70	1942.51	3093.16	2491.31
2016	65264.02	15003.61	13313.76	5444.25	5634.31	4833.00	3672.66	2523.39	2012.89	2968.29	2276.89
2017	65864.29	15039.96	12754.54	5549.35	5733.91	5339.04	3952.43	2577.16	2104.80	2794.47	2471.26
2018	62738.67	14533.96	12648.24	5653.68	5284.71	4596.41	3449.76	2111.59	2040.57	2668.73	2614.96
2019	64469.87	15438.91	12778.25	5552.00	5036.00	5327.56	3904.49	2344.62	2221.84	2201.25	2383.53
2020	62652.60	14827.27	13185.73	6033.35	5189.60	5267.01	3887.98	2492.11	2187.90	2450.91	2303.25
2021	66018.04	15927.02	13446.54	6428.82	5285.40	5597.23	4258.58	2929.63	2494.74	2457.37	2323.37
2022	58644.11	13871.09	12348.81	5924.74	5321.70	4782.05	3767.74	2350.64	2189.71	2113.25	1433.27
2022/2021	-11.17	-12.91	-8.16	-7.84	0.69	-14.56	-11.53	-19.76	-12.23	-14.00	-38.31
2022/2010	-	-	-11.62	-14.05	24.38	0.84	14.50	-	-	-46.12	-42.35

Source: Eurostat.eu database, accessed November 2023,* - data not available

At the level of the EU countries, there was a decrease in production recorded in 2022 by 11.2% compared to 2021. This was mainly due to the decrease in cultivated areas, but also in the yield per hectare. At the same time, the period of the Covid-19 pandemic but also the geopolitical instability in Eastern Europe led to an increase in costs in terms of the price of agricultural inputs (phyto-sanitary products for plant protection, fertilizers, electricity, fuels, etc.). According to Eurostat data, Romania's vegetable production fell in 2022 to the lowest level since 2010, registering a decrease of -38.3% compared to 2021 and -42.3% compared to 2010 (Figure 2).

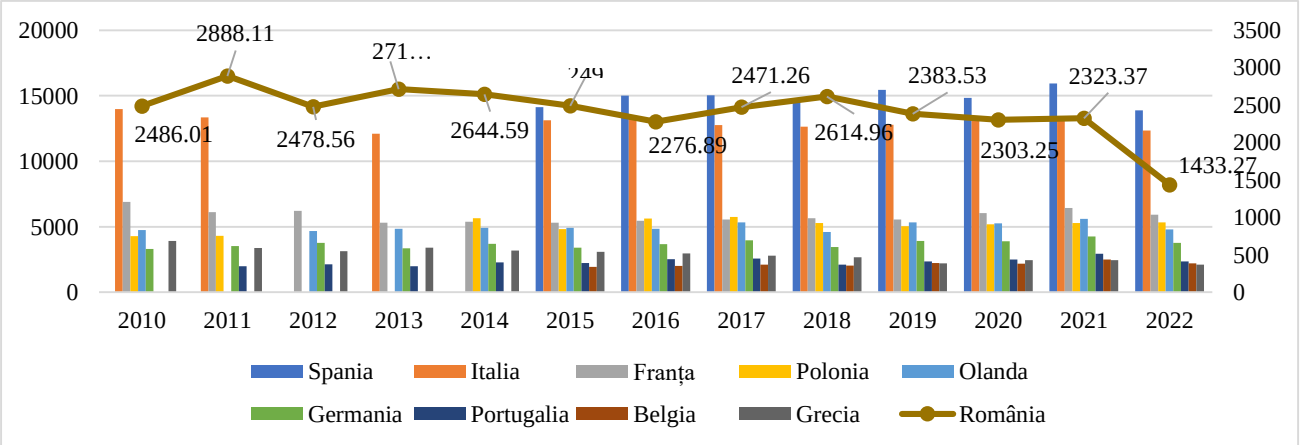

Figure 2. Evolution of productions obtained with vegetables (including melons) in Europe in the period 2010-2022 (1000 t)

II. Average consumption of vegetables

Increasing vegetable intake is an important public health issue and is the subject of nutritional recommendations across Europe. The WHO (World Health Organization) recommends that each person consumes at least 400 g of fruits and vegetables daily. According to the latest consumption monitoring report by Freshfel Europe, the average consumption of fruit and vegetables in the EU increased to 364.6 grams/person/day in 2021, an increase of 2.19% compared to 2020 and 1.27 % above the average of the last 5 years. This increase is due to the change in the lifestyle of Europeans during the COVID-19 pandemic but also to the decision of each individual regarding environmental causes and climate change This report is based on official statistics from EUROSTAT (trade) and FAOSTAT (production). It can be seen that only 7 EU countries reach the threshold recommended by the World Health Organization of 400 g of fruits and vegetables/day/person (Table 3).

Table 3. Average consumption g/person/day of fresh fruit and vegetables in the EU-27 Member States in the period 2020-2021

EU-27 Member States	Average consumption g/person/day 2020	Average consumption g/person/day 2021	% 2020/2021
Portugal	490.30	539.00	9.93
Belgium	519.55	531.44	2.29
Romania	503.33	525.89	4.48
Greece	486.62	463.21	-4.81
Italy	443.49	431.10	-2.80
Poland	407.29	419.00	2.88
Spain	377.50	416.11	10.23
Netherlands	327.65	366.26	11.78
TOTAL ME	**356.77**	**364.58**	**2.19**
Bulgaria	330.08	362.44	9.80
CYPRUS	329.44	341.55	3.68
France	309.03	323.84	4.79
Austria	326.39	319.34	-2.16
Lithuania	299.12	318.03	6.32
Germany	296.61	288.69	-2.67
Estonia	285.78	285.54	-0.09
Hungary	268.80	285.30	6.14
Malta	245.91	276.75	12.54
Slovenia	349.88	273.76	-21.76
Denmark	258.24	273.09	5.75
Luxembourg	276.89	269.22	-2.77
Lithuania	299.11	265.29	-11.31
Sweden	257.17	253.20	-1.54
Finland	261.22	251.92	-3.56
Croatia	252.12	251.85	-0.11
Czech Republic	247.35	251.26	1.58
Ireland	254.46	249.25	-2.05
Slovakia	218.28	216.08	-1.01

Source: Freshful Europe – Fresh Fruit and vegetable Production, Trade, Supply, and Consumption Monitor in the EU-27, based on statistical data up to 2021, accessed November 2023; https://freshfel.org/what-we-do/consumption-monitor/

III. Import and export of vegetables in Romania

In Romania, the situation of vegetable imports and exports shows a significant imbalance. The net higher values of imports compared to export values indicate that Romania has an increased demand for imported vegetables compared to what it manages to export. This situation can have economic and strategic implications, which requires a careful approach and the development of appropriate strategies for each group of vegetables. In this context, the Ministry of Agriculture and Rural Development has decided to grant a minimum aid for the cultivation of certain groups of vegetables, in order to ensure, as far as possible, a year-round market for vegetables produced in

Romania. It can be observed that the value of vegetable imports in Romania increased constantly until 2019. In 2010, the value of vegetable imports was 144 million euros, and in 2022 it reached the level of 632 million euros, representing an increase impressive over 338%. During 2022, according to the TradeMap database, Romania imported vegetables worth 632.2 million euros and exported more than 4 times less, worth 142.6 million euros.

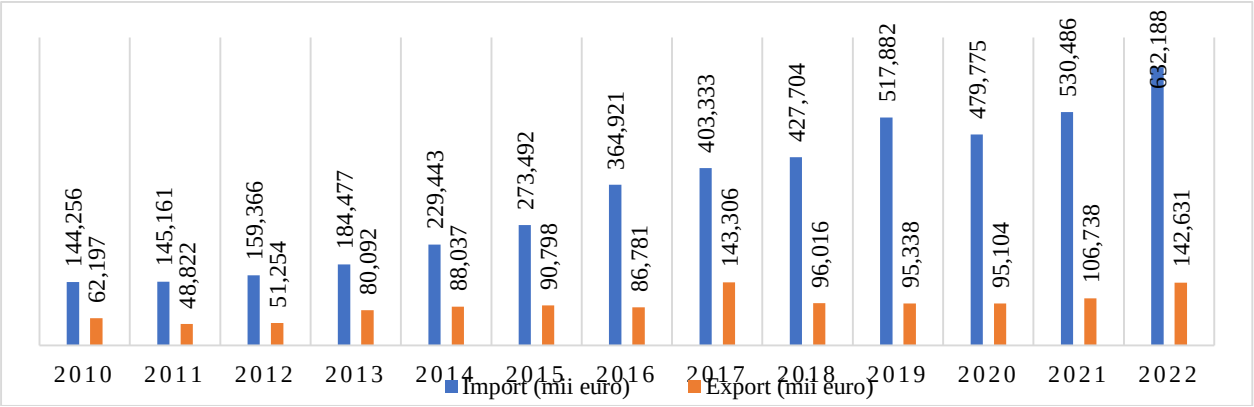

Figure 3.The evolution of the import and export of vegetables in Romania in the period 2010-2022 (thousands of euros)

Source: TradeMap database, accessed October 2023, product code 07
https://www.trademap.org/Bilateral_TS.aspx?nvpm=1%7c642%7c%7c642%7c%7cTOTAL%7c%7c%7c2%7c1%7c1%7c1%7c2%7c1%7c1%7c1%7c1% 7c1

As for the value of exports, it fluctuated between 2010-2022. The fluctuations can be explained by the variations in the total production of vegetables obtained in different periods, which influenced the selling price of vegetables and, implicitly, the volume of exports. In 2010, the value of vegetable exports was 62 million euros, and in 2022 it reached the level of 142 million euros, representing a significant increase of over 129% (Figure 3).

According to the trade data provided by the TradeMap database, the main countries from which Romania imports vegetables are Turkey, from where vegetables worth 134 million euros entered in 2022, the Netherlands (92.4 million euros), Germany (90.8 million euro), Poland (52.8 million euro) and Spain (40.8 million euro) (Table 4).

Table 4 – The main countries from which Romania imported vegetables in the period 2010-2022 (thousands of euros)

	Romania	IMPORT				
		Turkey	Netherlands	Germany	Poland	Spain
2010	144,256	43,539	16,076	6,647	7,622	3,860
2011	145,161	26,370	19,354	11,646	8,045	5,479
2012	159,366	23,578	20,398	13,920	15,060	7,987
2013	184,477	16,570	25,924	14,597	20,754	14,807
2014	229,443	30,252	29,755	14,553	18,772	16,457
2015	273,492	34,306	35,761	24,551	22,904	24,404
2016	364,921	55,478	46,273	34,320	36,551	26,738
2017	403,333	69,380	47,537	41,493	44,366	28,034
2018	427,704	81,127	46,706	46,302	48,476	28,454
2019	517,882	75,916	73,037	62,408	56,258	42,006
2020	479,775	92,225	67,570	58,928	41,626	35,549
2021	530,486	113,442	71,445	70,216	42,563	37,020
2022	632,188	134,119	92,418	90,798	52,785	40,823
2022/2021	19.17	18.23	29.36	29.31	24.02	10.27
2022/2010	338.24	208.04	474.88	1266.00	592.53	957.59

Source: TradeMap database, accessed October 2023, product code 07
https://www.trademap.org/Country_SelProductCountry_TS.aspx?nvpm=1%7c642%7c%7c%7c%7c07%7c%7c%7c2%7c1%7c1%7c1%7c2%7c1%7c2%7c1%7c1% 7c1

Vegetable exports in 2022 are lower in value, with Romania exporting to Italy (66.5 million euros), Germany (13.5 million euros), Poland (11.1 million euros), Ukraine (10.1 million euros) and Hungary 97.8 million euros) (Table 5).

Table 5. The main countries from which Romania exported vegetables in the period 2010-2022 (thousands of euros)

	Romania	EXPORT				
		Italy	Germany	Poland	Ukraine	Hungary
2010	62,197	34,903	5,458	611	0	2,801
2011	48,822	19,345	6,067	306	0	3,984
2012	51,254	22,276	4,880	397	7	5,288
2013	80,092	37,089	7,516	1,823	51	7,401
2014	88,037	40,204	11,550	1,355	0	4,934
2015	90,798	47,063	12,483	1,423	9	3,720
2016	86,781	37,459	10,943	1,761	16	3,364
2017	143,306	50,904	11,265	2,467	29	3,935
2018	96,016	44,859	11,375	3,047	5	4,167
2019	95,338	45,307	10,641	4,418	15	4,285
2020	95,104	48,953	8,387	6,437	832	5,754
2021	106,738	51,026	12,143	9,034	1,043	6,537
2022	142,631	66,512	13,564	11,162	10,158	7,816
2022/2021	33.63	30.35	11.70	23.56	873.92	19.57
2022/2010	129.32	90.56	148.52	1726.84	-	179.04

Source: TradeMap database, accessed October 2023, product code 07
https://www.trademap.org/Country_SelProductCountry_TS.aspx?nvpm=1%7c642%7c%7c%7c%7c07%7c%7c%7c2%7c1%7c1%7c2%7c2%7c1%7c2%7c1%7c1% 7c1

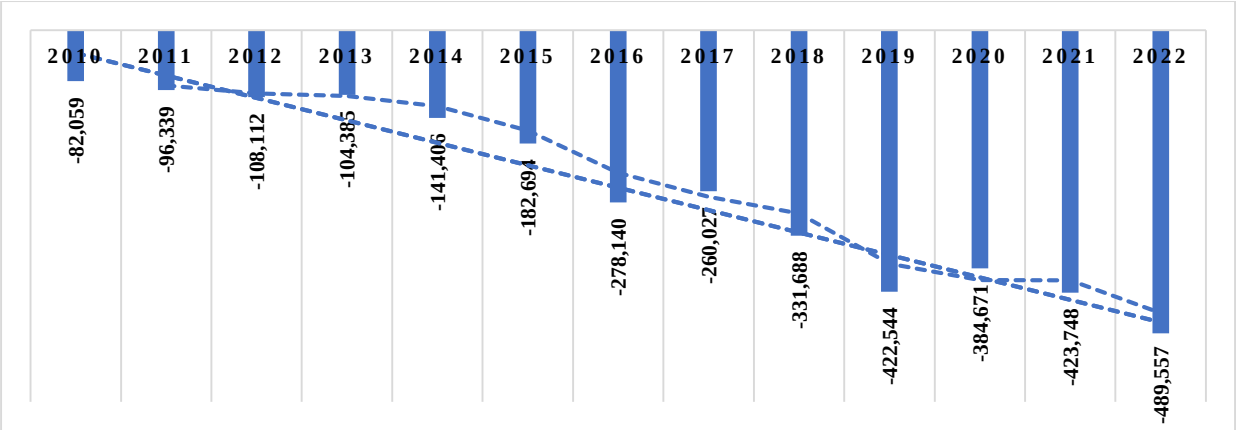

Figure 5.Trade balance with vegetables in Romania in the period 2010-2022 (thousands of euros)
Source: TradeMap database, accessed October 2023, product code 07

Romania's vegetable trade balance deficit increased by 104 million euros in the last 3 years (2020-2022). In 2022, the commercial deficit with vegetables was 489.5 million euros, 15% more than the previous year. (Figure 5).

CONCLUSIONS

According to data provided by Eurostat, the areas with vegetables were reduced by -7.8% in 2022, to 1891.21 thousand hectares (1.2% of the agricultural area used at EU level). Italy (20.39%), Spain (19.4%) and France (14.5%) are in the top of the countries with the largest areas cultivated with vegetables. Romania is in 6th place with a percentage of 5.1% of the area cultivated with vegetables at the EU level. Regarding the productions obtained, 58644.11 thousand tons were harvested at the

EU level in 2022, down by -11.17% compared to the previous year. The main producers of vegetables in 2022 were Spain (24.13% of the total production of vegetables in the EU) and Italy (20.40%). Romania reported a production of 1433.27 thousand tons, respectively 3.52% of the total production obtained at EU level. The Covid-19 pandemic has brought about a change in the behavior of consumers of vegetables and fruits towards basic products. According to the consumption monitoring report by Freshfel Europe, the average consumption of fruit and vegetables in the EU in 2021 increased to 364.6 grams/person/day, 2.19% more than in 2020 and 1.2% above the average of the last 5 years.

According to the TradeMap database, in 2022, vegetable imports in Romania reached an all-time high of 632,188 thousand euros, up 19.2% compared to the previous year and 338% compared to 2010. Exports increased 33.6 compared to of 2021, but they increased by only 129% compared to 2010, to 142,631 thousand euros. The trade deficit in 2022 increased by 15% from 2021 and was 497% above the 2010 level.

ACKNOWLEDGEMENT

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ANALYSIS OF THE DEGREE OF RURALIZATION AT THE TERRITORIAL LEVEL

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Abstract: *This paper presents the main characteristics of the workforce in rural areas. The primary objective of the study is to highlight the importance of the workforce resource in the Romanian rural space, as a key element of sustainable development, given that 47.7% of the population resides in rural areas. The study aims to analyze the implication of the degree of ruralization at the territorial level for the 41 counties, on the workforce and the level of economic development. According to the conducted statistical-economic analysis at the national level, it is observed that in regions where the process of ruralization is pronounced, economic outcomes are less impressive, and this trend can largely be attributed to the lower average productivity level of the workers. Stimulating the development of rural areas in Romania is considered necessary, as is enhancing the quality of the workforce in the rural environment.*

Keywords: *ruralization, rural development, workforce, agriculture, correlation*

JEL Classification: Q01, O12, O15

INTRODUCTION

Rural regions adopt diverse developmental models to accommodate specific characteristics such as low population and economic activity density. This diversity underscores the need for a typology of different rural definitions, including: i) rural areas within functional urban zones; ii) rural areas adjacent to functional urban zones; and iii) rural areas situated far from functional urban zones, isolated (OECD Regional,2016).

The demographic component plays a crucial role in rural development. The rural population acts as a dynamic element for rural communities and the local economy. Demographic factors influence rural development by shaping trends, contributing to spatial structure, affecting public and private services, determining economic vitality, and influencing cultural identity.

Exploring socio-economic and demographic aspects in rural areas constitutes a widely studied topic in scientific literature. However, a significant portion of research on this theme is connected to the progress of the agricultural sector (Popescu A., Condei R., 2015, Popescu A., Dinu T. A., Stoian E., 2018, Popovici (Barbulescu), A., 2012).

Rural regeneration is a crucial necessity for rural areas facing economic and demographic decline, urban migration, and deindustrialization. These challenges often result in limited opportunities for the youth and can lead to social and physical isolation of rural communities. Therefore, implementing rural regeneration strategies can play an essential role in improving the situation in these areas (Aisling M. 2020)

MATERIAL AND METHOD

To fulfill the main objective of the study, the following steps were undertaken:

- The first part of the paper presents an analysis of the territorial degree of ruralization at the national level, the evolution of the active and employed population by residency areas, as well as the trends

of key labor market indicators (activity rate and employment rate) in both urban and rural areas. To assess the quality of life, the indicator regarding the level of education was also analyzed.

- The second part of the study analyzed a set of variables characterizing territorial economic development and the labor force. The description of these variables can be found in Table No. 1. In order to study the intensity of the relationship between the proposed variables, statistical data were processed using the Correl function, resulting in the Pearson correlation coefficient. To carry out the proposed research, the statistical data processing was conducted for all 41 counties in Romania.

Table 1. Description of the technical indicators used in the study

Variables	Description	Period	Source
Degree of Ruralization (%)	The degree of ruralization represents the proportion of the rural population in the total population at the county level.	2021	National Institute of Statistics, Statistical Yearbook of Romania.
Average gross earnings (thousands of lei).	The average gross monthly earnings per capita, at the county level.	2021	National Institute of Statistics, Statistical Yearbook of Romania.
Employees in agriculture (thousands of persons).	The average number of employees in the agricultural sector includes individuals employed under fixed-term or indefinite contracts/agreements, at the county level.	2021	National Institute of Statistics, Statistical Yearbook of Romania.
Unemployment rate (%).	The registered unemployment rate represents the ratio between the number of unemployed individuals and the civilian labor force at the county level.	2021	National Institute of Statistics, Statistical Yearbook of Romania.
GDP per capita (thousand lei per capita).	The Gross Domestic Product (GDP) at the county level per capita.	2021	National Institute of Statistics, National Commission of Prognosis

The correlation coefficient is a numerical value that quantifies the level of relationship between two variables in a dataset (M. I. Aceleanu, 2012). This coefficient indicates to what extent changes in one variable are correlated with changes in another variable. The range of variation for the correlation coefficient is between -1 and 1 (Opariuc, 2009). The formula for calculating the correlation coefficient is as follows:

$$Correl(X,Y) = \frac{\sum (x-\bar{x})(y-\bar{y})}{\sqrt{\sum (x-\bar{x})^2 \sum (y-\bar{y})^2}},$$

A correlation coefficient close to 1 or -1 suggests a stronger correlation, while a coefficient close to 0 indicates a weaker correlation. However, it's essential to understand that correlation doesn't always imply a causal relationship between variables. They might be correlated due to other factors or have a complex relationship (Petcu, N., 2003).

RESULTS AND DISCUSSION

According to statistics provided by Eurostat in the year 2021, approximately 21% of the European Union's population lived in rural areas, while 39% lived in small towns and suburbs, which act as transition zones between rural and urban spaces. Rural areas constituted about 83% of the total

land area of the European Union. Despite the significant coverage of rural areas, both the socio-economic development level and the challenges faced are not uniform across them (Eurostat, 2023).

In Romania, rural areas exhibit significant disparities compared to urban areas, influenced by their proximity to larger cities and the economic performance of the region. The differences between the two areas pertain to labor production, access to healthcare, education, and public utilities.

The national territory has a substantial share of rural zones, with a rural land area of 207,633 km², accounting for 87% of the total country's land area. In the year 2021, the resident population stood at 19.04 million people, with consistent declines over the past decade. The rural population accounted for 47%, making Romania one of the European countries with the highest rural population share, alongside Slovenia and Ireland.

In rural areas, as of the year 2021, there were 8.9 million resident individuals. Analyzing the territorial distribution of the rural population reveals that it is not evenly spread, showing regional differentiations.

Counties with a high degree of ruralization in the year 2021 were Dâmbovița with 72.7%, Giurgiu with 71.2%, Teleorman with 67.5%, Neamț with 64.71%, and Călărași with 63.92%. On the other end of the spectrum are counties like Hunedoara (26.3%), Brașov (30.18%), Constanța (33.02%), and Cluj (35.45%) (Figure 1).

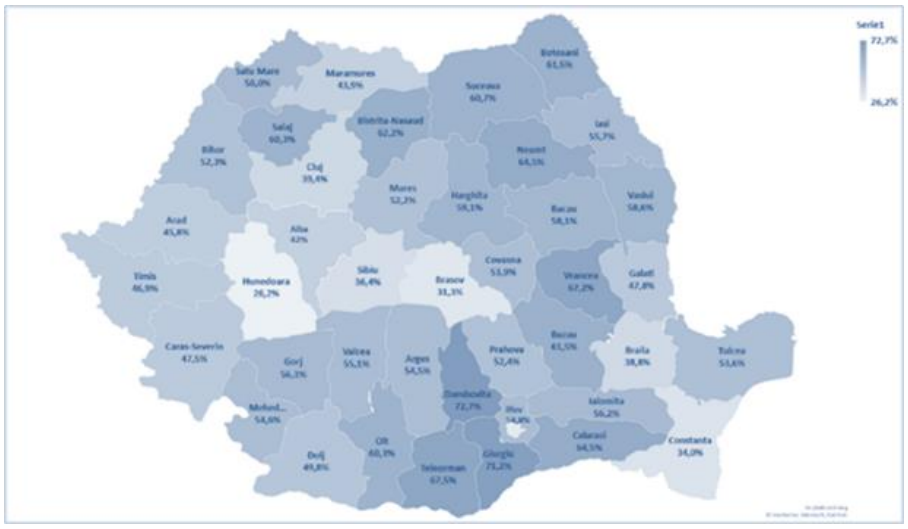

Figure 1. Territorial Degree of Ruralization, 2021 (%)

Source: Data from INSSE, as of June 20, 2023

The human factor as well as labor are essential for economic and social progress; labor market theories and models directly contribute to economic growth. To analyze the labor market in Romania, it's crucial to consider that it's influenced by various factors: economic, institutional, social, and demographic, leading to two significant outcomes. The labor market presents national-specific traits, and its functioning is influenced not only by the variation in aggregate labor demand and supply but also by regulations, the national economic structure, and the education and vocational training system. The second consequence relates to technical and technological changes, which have different effects on employment and qualification structures, depending on local and regional conditions.

Assessing the overall state of labor force participation involves analyzing key statistical indicators that can measure the labor market: the active population, the employed population, the number of unemployed individuals, and the number of employees. These mentioned indicators provide crucial insights into the dynamics and characteristics of the labor market in Romania.

The proportion of the employed population at the national level represented 94.4% of the total active population in the year 2022, with the difference accounting for the category of unemployed individuals.

In Figure 2, the evolution of the active and employed population in urban and rural areas can be observed. Both the trend of the active and employed population in these two residency areas show a decrease during the period 2010-2022. The active population in both urban and rural areas decreased in 2022 compared to 2010 by 5.4% and 19.1%, respectively. Regarding the employed population, it followed a similar trend, with a sharp decrease in 2021 compared to 2020. In the rural areas, the employed population decreased by 16.9%. These reductions in the employed population can be attributed to various factors such as rural-to-urban migration in search of more varied and better-paid job opportunities, modernization of agriculture, inadequate infrastructure making rural areas less attractive for residence and employment, limited access to education, and quality.

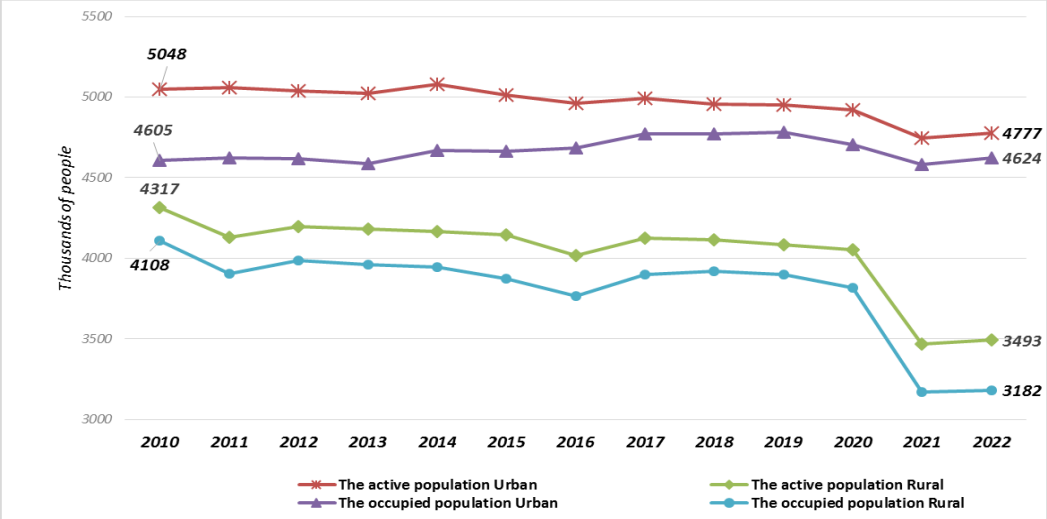

Figure 2. Evolution of Active and Employed Population by Residency Areas

Source: Data from INSSE, as of June 20, 2023

Analyzing the employed population by type of occupation reveals intriguing conclusions. At the end of the analysis period, a significant increase in the proportion of employees in the agricultural sector is notable, while the number of self-employed workers decreased by 46%. Additionally, there is a considerable decrease of 73% in unpaid family workers (INSSE Data).

From the perspective of the nature of the activity carried out by the employed population, Romania demonstrates a higher level of engagement in the primary sector (agriculture, forestry, and fishing), with a rate of 9.81% in the year 2021. It's important to highlight that its trend has been decreasing, reducing by 70%, from 2.5 million people in 2010 to 763 thousand people in 2021 (INSSE Data).

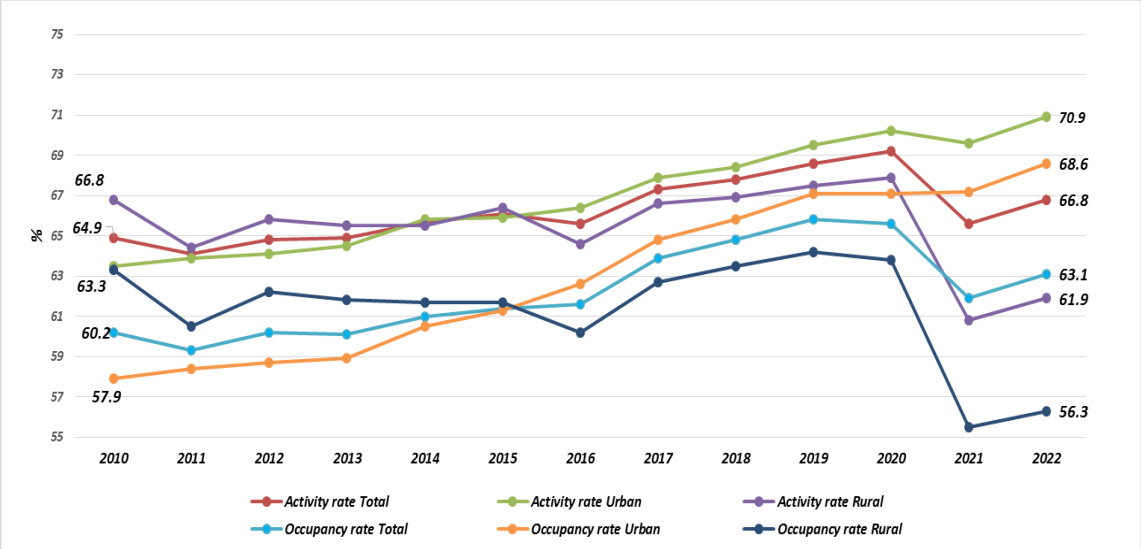

Figure 3. Evolution of Activity and Employment Rates by Residency Areas (%)

Source: Data from INSSE, as of June 20, 2023

In the year 2021, the employed population in the Agriculture, Forestry, and Fishing sector in rural areas accounted for the dominant proportion, namely 89% of the total, while in urban areas, it represented only 11%. Analyzing the derived labor market indicators, it's evident that during the period of 2010-2022, the figures reflecting the labor market condition in urban areas, namely the activity rate in this zone, exhibited a consistent upward trend compared to the national and rural levels.

In rural areas, both the activity rate and the employment rate showed oscillatory trends, with a sharp decline in 2021 compared to 2020.

Due to demographic aging in rural areas and the attractiveness of urban labor markets, both rates followed a downward trajectory.

In rural regions, there can often be a situation where unemployment or underemployment is not immediately visible, especially in areas with lower economic levels.

This situation arises when there are no alternative employment options, and one possibility is to work on the family farm with low productivity. This is especially true when the agricultural sector is substantial, and there's a significant presence of self-employment on farms or in traditional services, often of small scale. The effect of these aspects is that the number of employed individuals in rural areas of Romania is overestimated (Herman E., 2012,).

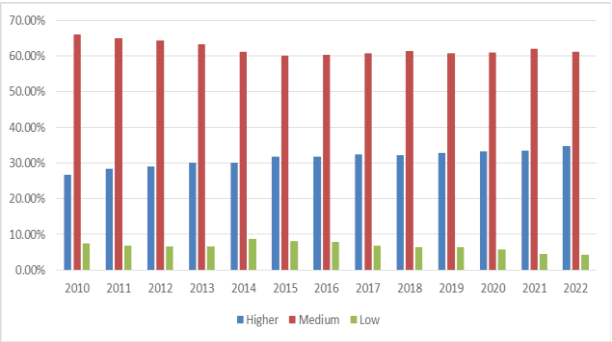

Figure 4. Education Level of the Employed Population in Urban Areas

Source: Data processed by INSSE, as of June 20, 2023

Figure 5. Education Level of the Employed Population in Rural Areas

Source: Data processed by INSSE, as of June 20, 2023

In assessing the quality of life, both at the individual and societal levels, a series of indicators are used, including those related to education and employment, due to the close link between education, employment, and the standard of living.

In the labor market of Romania, significant differences in terms of education level are evident. Figures 4 and 5 present information about the proportion of the employed population at different education levels in urban and rural areas, highlighting substantial disparities between the two settings. In rural areas, there is a predominance of the employed population with medium and low levels of education, while in urban areas, about 35% of the employed population has a higher education level and over 60% have a medium education level.A high level of education enhances labor market participation and provides individuals with the opportunity to earn higher incomes (Aceleanu, 2012).

Higher education plays a crucial role in ensuring that the number of graduates matches the demand for jobs in the country's economy and meets the requirements imposed by international competition (Popovici (Barbulescu), A., 2012)

Performance related to territorial economic development is evident in counties with a high degree of urbanization, showcasing a direct link between socio-economic development and urbanization. Conversely, a totally opposite relationship is highlighted between socio-economic development and the degree of ruralization.

Table 2. Results

Correlations							
		degree_ rural	**salary_ earnings**	**agric_ employees**	**unemployment_ rate**	**GDP**	**employees_ total**
degree_ruralization	**Pearson Correlation**	1	-.421**	.395*	.394*	-.528**	-.567**
	Sig. (2-tailed)		.006	.011	.011	.000	.000
	N	41	41	41	41	41	41
salary_earnings	**Pearson Correlation**	-.421**	1	-.437**	-.505**	.646**	.821**
	Sig. (2-tailed)	.006		.004	.001	.000	.000
	N	41	41	41	41	41	41
unemployment_rate	**Pearson Correlation**	.394*	-.505**	.420**	1	-.573**	-.558**
	Sig. (2-tailed)	.011	.001	.006		.000	.000
	N	41	41	41	41	41	41
GDP	**Pearson Correlation**	-.528**	.646**	-.463**	-.573**	1	.682**
	Sig. (2-tailed)	.000	.000	.002	.000		.000
	N	41	41	41	41	41	41
employees_total	**Pearson Correlation**	-.567**	.821**	-.633**	-.558**	.682**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	41	41	41	41	41	41
agricultural_employees (%)	**Pearson Correlation**	.395*	-.437**	1	.420**	-.463**	-.633**
	Sig. (2-tailed)	.011	.004		.006	.002	.000
	N	41	41	41	41	41	41
**. Correlation is significant at the 0.01 level (2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

Source: data processing by the author, SPSS

The statistical data analyzed at the territorial level reveals that in counties with a higher degree of ruralization, the level of economic development is lower. The most economically developed

counties with low ruralization rates are Cluj, Satu-Mare, Timiș, and Brașov, with GDP values per capita of 87.01 thousand lei, 79.6 thousand lei, 77.7 thousand lei, and 72.5 thousand lei, respectively. Counties with a higher degree of ruralization are situated in underdeveloped areas with a GDP below 40 thousand lei per capita, such as Vaslui, Giurgiu, Teleorman, and Botoșani. The analysis resulted in a strong negative correlation between the variables of ruralization degree and economic development level (GDP), with a Pearson correlation coefficient of -0.528.

Similarly, in the case of the relationship between the ruralization degree and the average wage, it can be observed that the values are inversely proportional. The correlation is of medium intensity, yet negative, with a Pearson correlation coefficient of -0.421. The wage situation is an important factor characterizing the level of territorial development, also serving as a strong incentive for population migration and financial comfort. Counties with high wage values are Cluj, Timiș, and Brașov, with wages exceeding 6,000 lei, while the lowest values are in Vrancea, Covasna, and Vâlcea, slightly above 4,300 lei.

A direct and positive correlation is found between the degree of ruralization and the unemployment rate, with both variables varying in the same direction. The correlation coefficient of 0.394 indicates a medium level of intensity between the two variables. This suggests that counties with high ruralization values also have high unemployment rates. Among these are Vaslui, Teleorman, Mehedinți, and Dolj, with unemployment rates ranging from 8.6% to 6.8%. On the other hand, counties like Ilfov, Cluj, and Timiș have rates ranging between 0.4% and 1.3%.

Considering labor resources and economic sectors, it becomes evident that these can be key indicators in the development of rural areas.

Analyzing the relationship between the degree of ruralization and the employed population, it can be observed that the intensity of the connection is moderate and negative, resulting in a Pearson correlation coefficient of -0.567. This highlights that in counties with a higher number of employees, the degree of ruralization is lower. However, if we examine the degree of ruralization at the territorial level and the employment in the agricultural sector, a moderate positive correlation is evident, as indicated by the Pearson correlation coefficient of 0.395. As the degree of territorial ruralization increases, the workforce in the agricultural sector also increases, given that it is the primary sector of activity.

From a statistical perspective, a negative relationship between agricultural labor (employees in agriculture) and the characteristic economic development indicator (GDP) can be identified, with a Pearson correlation coefficient of -0.463. Therefore, in counties where the number of employees in agriculture is higher, the recorded GDP is lower. This indicates that counties with higher GDP are economically and industrially developed.

In summary, the analysis reveals complex interdependencies between ruralization, employment, economic development, and sectoral dynamics, which together contribute to shaping the socio-economic landscape of the analyzed regions.

CONCLUSIONS

Although the urban areas have significantly higher rates of employment and activity compared to rural areas, and the unemployment rate is lower, statistical and economic analysis based on national-level data shows that issues related to employment in rural Romania are still unresolved.

In order for employment in rural areas to have a significant impact on improving the residents' quality of life, it is imperative to develop and implement employment policies that stimulate

increased employment in non-agricultural sectors within rural communities, ensuring income stability and optimizing work processes in these areas. Thus, the improvement of employment quality in rural areas is considered necessary.

To enhance the standard of living in rural regions and promote economic development, it is essential to develop employment policies that support increased employment in non-agricultural sectors, guarantee stable incomes, and optimize working conditions. The challenges of low education levels and specialization in sectors with low added value must also be addressed.

Furthermore, a negative correlation between the degree of ruralization and economic development is evident, suggesting that regions with a higher degree of ruralization tend to exhibit modest economic performance. This could be influenced by multiple factors, including the lower productivity of the workforce, lower education levels, high unemployment rates, and the presence of elderly individuals.

In conclusion, overcoming the challenges of rural employment requires a holistic approach that encompasses investments in education, the development of high-value-added economic sectors in rural areas, and the implementation of employment-stimulating policies alongside improved working conditions. This approach will contribute to promoting sustainable and equitable development in rural Romania.

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COMPARATIVE ANALYSIS OF THE LEVEL OF SATISFACTION WITH THE FINANCIAL SITUATION IN ROMANIA AND EU COUNTRIES

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Abstract: *The paper analyzes the satisfaction regarding the financial situation in Romania compared to the rest of the member countries of the European Union. The work analyzed indicators that express the material well-being of a society such as: GDP and Median Income, but also satisfaction regarding the financial situation, based on the latest statistical data available on the Eurostat website for the years 2013 and 2018 (data from 2021 are not published). With the help of the scores obtained by the semantic differential method, it was possible to evaluate the degree of satisfaction with the financial situation of the population of the EU member countries, as well as Romania's position among them. The conclusion of this paper was that Romania is among the last places in terms of GDP per capita or median income, and despite this the population of our country has an average degree of satisfaction with regard to the financial situation, obtaining a higher score compared to other countries that have a higher median income or GDP.*

Keywords: *quality of life, well-being, financial situation, GDP, Median income*

JEL classification: I31, Q01, R11

INTRODUCTION

Quality of life research is of particular importance, both at European and international level (Buligescu Bianca, Toc Sebastian, 2021). In the Treaty establishing the European Community in Rome of 1957 and in the consolidated versions of 1992, 1997 and 2002, the Union's objectives include raising the standard of living and quality of life (European Parliament, 2023).

For each person, the quality of life represents the value of his life, how good or bad it is, evaluated as a whole and on particular components: health, financial resources, work, family, leisure, etc. (Zamfir C., 2022). Each factor influencing quality of life has a different weight, for example poverty affects part of the population, while pollution affects everyone's life (Scrigroup.com). Quality of life represents the quality of all objective conditions of which life is composed, as well as the subjective way in which each person evaluates his life - the degree to which it produces satisfaction, happiness, fulfillment (Zamfir C., 2022), (David Mihaela, Năstase Sorina, 2012).

The concept of quality of life is closely related to standard of living and lifestyle. Social indicators have an increasing importance in assessing the quality of life, given that the role of the economy in assessing the well-being of a nation ignores precisely the assessments made by the human factor on this well-being (Amariei Lenuta, 2019).

Viewed from a subjective perspective, quality of life represents the individual's perception of his own life, happiness, well-being, such as satisfaction with the standard of living (Ghenţa Mihaela et al., 2020). Most people's perception of life satisfaction is closely related to a good situation in major spheres of life: health, work, income, spirituality, etc. (Solonaru Larisa, 2023), (Hîncu Rodica, Conencov Olga, 2017). When one of these spheres is disturbed, it is possible to totally alter life satisfaction. Usually, people who score high on this indicator have good health, a job that brings them satisfaction, and free time is spent with family or friends (Solonaru Larisa, 2023). For people, life satisfaction is their own evaluation of life and how they feel about their future choices and decisions (Lupu Ana-Maria, 2017).

A particular area of satisfaction with life is satisfaction with the financial situation. This, according to research, is strongly correlated with life satisfaction (Márton Medgyesi, Eszter Zólyomi, 2016). This paper aims to analyze the level of satisfaction with the financial situation in the EU Member States in 2013 and 2018, by age categories of population.

MATERIAL AND METHODS

In the paper for the level of GDP and median income, EUROSTAT data from 2021 were used. For the comparison of countries, a relevant aspect is the GDP/capital ratio expressed in euro to the EU average (Marin Pana, 2021) and the volume index of GDP expressed in PPS (standard purchasing power), i.e. in a common currency, in order to eliminate differences between price levels between countries (INS, 2023). In addition to these indicators, median income was also analyzed, indicating that half of citizens are above this indicator and the other half below it (Pana M., 2021).
Data from the 2013 and 2018 EU-SILC survey were used to analyse financial satisfaction, and for 2021 they are not yet available. In order to assess the level of satisfaction with the financial situation, the scaling method (semantic differential) with 3 levels was used. Each level of the scale was assigned scores from 1 to 3, where 1 - low satisfaction and 3 - high satisfaction, these being subsequently used in the data processing process (Ţimiraş Laura Cătălina, 2016).

RESULTS AND DISCUSSION

A first relevant aspect for comparing member countries with the EU average is the GDP/capita ratio expressed in euros. The EU average in 2021 was 32400 euros, and this report places Romania on the penultimate place, with 39% of the EU average, surpassing Bulgaria by 7%.
The highest value of GDP per capita is registered by Luxembourg, which holds the leading position, with a GDP 4.5 times higher than the EU average and almost 9 times higher than that of Romania. In second place is Ireland, with a GDP per capita 2.6 times higher than the EU average, followed by Denmark, which exceeds the EU average by 77%.

Other Member States that had a GDP at least 30% above the EU level in 2021 were: Sweden (59%), the Netherlands (51%), but also Austria, Finland, Belgium and Germany.

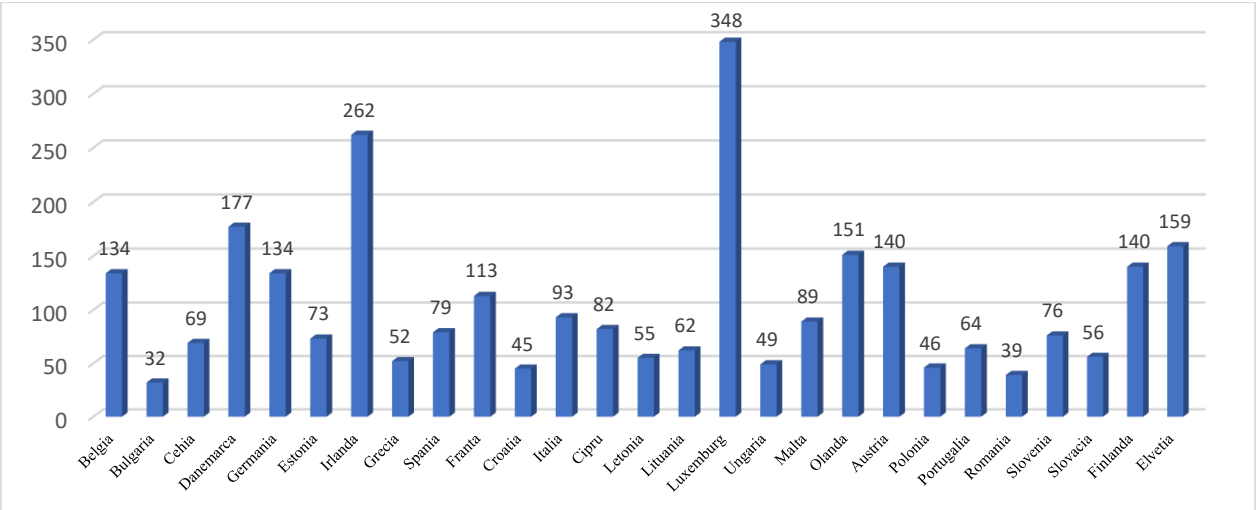

Figure 1 Gross domestic product (GDP) per capita compared to the EU average (%) in 2021
Source: Eurostat data, accessed June 2023,
https://ec.europa.eu/eurostat/databrowser/view/nama_10r_3gdp/default/table?lang=en

To eliminate differences in price levels across countries, the GDP/capita ratio is expressed in standard purchasing power (PPS), highlighting that 16 Member States are below the EU average. Among these countries is Romania, which registers a GDP/capita, according to purchasing power parity, 26% below the EU average. Romania surpasses countries such as Latvia, Croatia, Slovakia, Greece and Bulgaria, which are in last place.

At the opposite end, with the highest GDP/capita expressed in PPS is Luxembourg and Ireland, which exceed the EU average by 168% and 119% respectively.

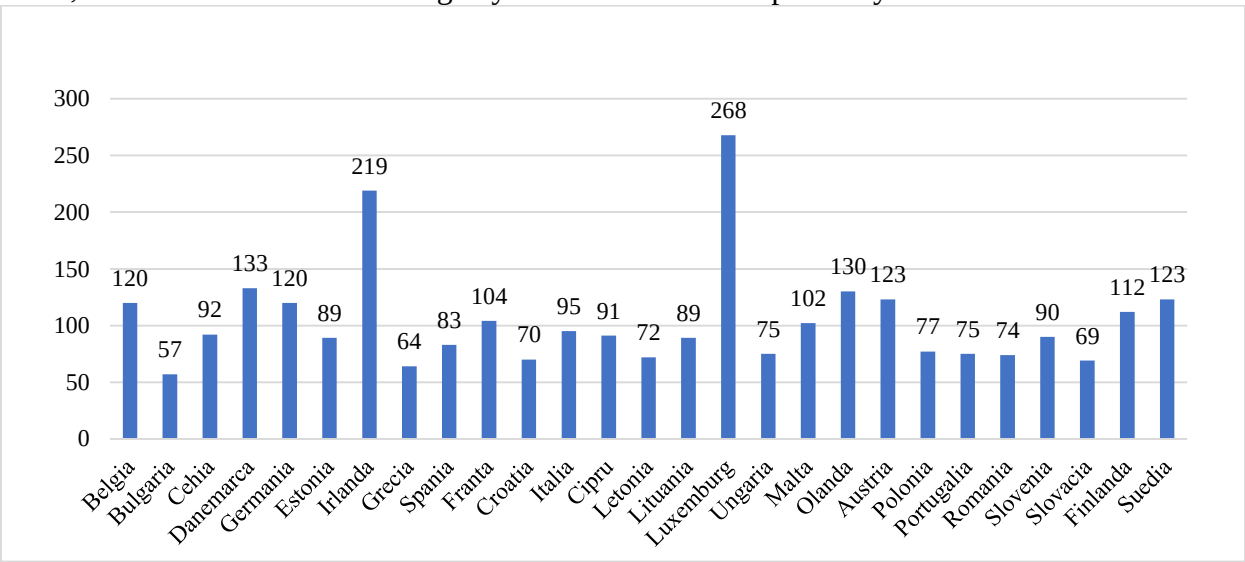

Figure 2. Gross domestic product (GDP) per capita by purchasing power standard (PPS) as a percentage of the EU average

Source: Eurostat data, accessed June 2023,
https://ec.europa.eu/eurostat/databrowser/view/nama_10r_3gdp/default/table?lang=en

The median income of a country indicates that half of citizens rank above this indicator and the other half below it (Pana Marian, 2021). In 2021, Eurostat data shows that median disposable income was €18372 in the EU. Analyzing the median income in the 27 EU Member States, we notice a significant difference between them, from from 42482 euros in Luxembourg to 4816 euros in Romania. In 2021, Romania registered an equivalent median income representing only 26.21% of the EU average and 11.34% of Luxembourg's median income respectively (42482 euros, + 131.2% above the EU average), thus ranking last among member countries.

Table No 1. Median income in 2021 in EU Member States

Median equivalent income			
	2021	**% of EU average**	**% Ro/other state**
EU-27	18.372	100%	26,21%
Belgium	25.855	140,73%	18,63%
Bulgaria	5.157	28,07%	93,39%
Czech Republic	10.625	57,83%	45,33%
Denmark	32.088	174,66%	15,01%
Germany	24.946	135,78%	19,31%
Estonia	12.623	68,71%	38,15%
Ireland	28.130	153,11%	17,12%
Greece	8.752	47,64%	55,03%
Spain	15.892	86,50%	30,30%
France	22.732	123,73%	21,19%
Croatia	8.061	43,88%	59,74%
Italy	17.532	95,43%	27,47%
Cyprus	16.686	90,82%	28,86%
Latvia	9.437	51,37%	51,03%

Median equivalent income			
	2021	**% of EU average**	**% Ro/other state**
Lithuania	9.669	52,63%	49,81%
Luxembourg	42.482	231,23%	11,34%
Hungaria	6.619	36,03%	72,76%
Malta	17.036	92,73%	28,27%
Netherlands	28.441	154,81%	16,93%
Austria	27.428	149,29%	17,56%
Poland	8.295	45,15%	58,06%
Portugal	11.089	60,36%	43,43%
Romania	4.816	**26,21%**	100,00%
Slovenia	15.415	83,90%	31,24%
Finland	25.456	138,56%	18,92%
Sweden	25.429	138,41%	18,93%

Source: Processing by Eurostat data, accessed June 2023,
https://ec.europa.eu/eurostat/databrowser/view/ilc_di03/default/table?lang=en

Other Member States that in 2021 had a median income equivalent to at least 30% above the EU level were Denmark (74.66%), the Netherlands (54.81%), Ireland (53.11%) but also Austria (49.29%), Belgium (40.73%), Finland (38.56%), Sweden (38.41%), and Germany (35.78%)(table 1).

As mentioned in the methodology, in order to rank countries according to the average grade of satisfaction with the financial situation, the scaling method was used - semantic differential, which was noted with: 1 - low satisfaction, 2 - average satisfaction, and 3 - high satisfaction.

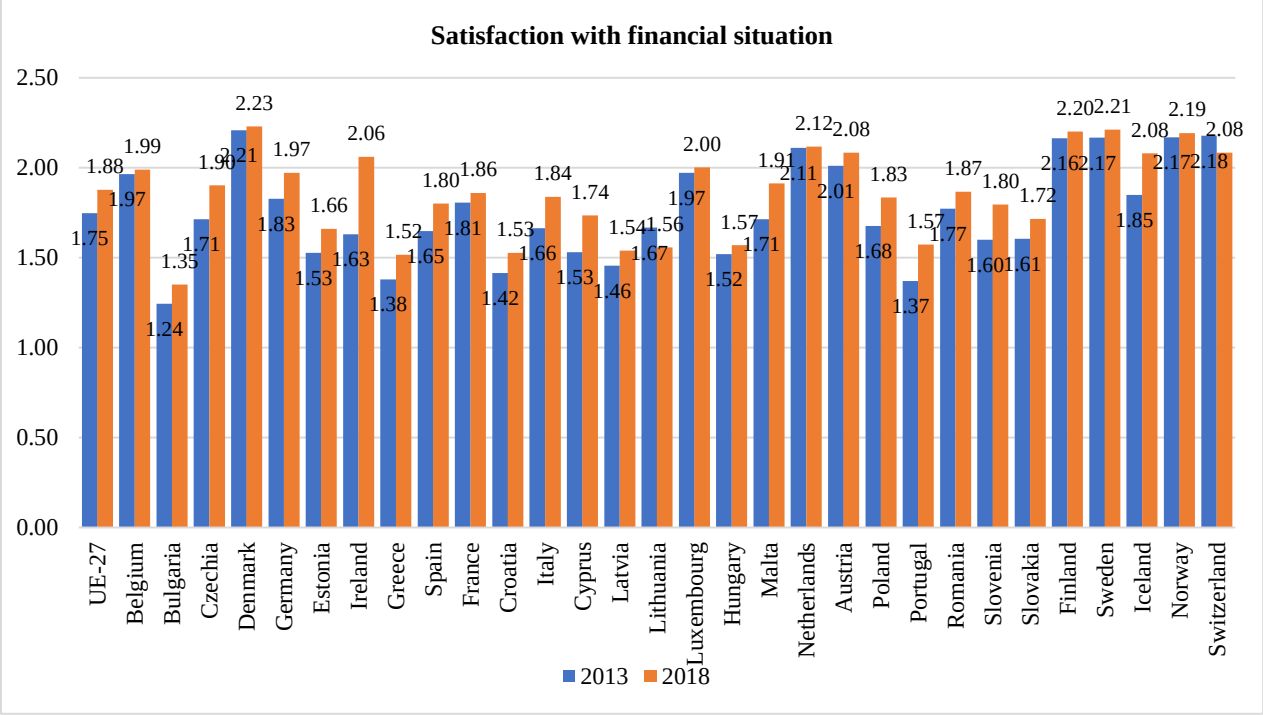

Figure 3. Determination of the average grade on satisfaction with the financial situation in the population aged 16 and over

Source: processing by Eurostat data, accessed June 2023,
https://ec.europa.eu/eurostat/databrowser/view/ilc_pw05$dv_535/default/table?lang=en

As a result of data processing, it resulted that in 2018 (Figure 3), in EU Member States, satisfaction with the financial situation registered among people aged 16 and over decreased in 2 Member States compared to 2013. The biggest decrease was registered in Lithuania of (-0.11), which already had a rather low satisfaction score with the financial situation of 1.67, followed by

Switzerland (-0.10), but in this case the score remained around grade 2, which corresponds to an average satisfaction, the Swiss being satisfied rather than dissatisfied.

In the remaining member countries, satisfaction with their financial situation has increased, and Denmark tops the list with a score of 2.23 (0.02 higher than in 2013), which means that a large part of the population is very satisfied with their financial situation.

In Romania, satisfaction with the financial situation obtained a score of 1.87 in 2018, resulting in an increase of 0.10 compared to 2013. This note indicates an increase in satisfaction with the financial situation, which tends to reach the 2-medium threshold satisfied.

By age group, satisfaction for 16-19year olds decreased in 3 Member States in 2018 compared to 2013, namely: Luxembourg (-0.18), Lithuania (-0.09) and the Netherlands (-0.05) (Figure 4).

In Romania's case, satisfaction with the financial situation has increased, reaching almost the medium scale. Sweden, Finland and Austria are on the first places in terms of satisfaction with the financial situation, and at the opposite pole, well below the average, is Bulgaria, with 1.38 in 2018.

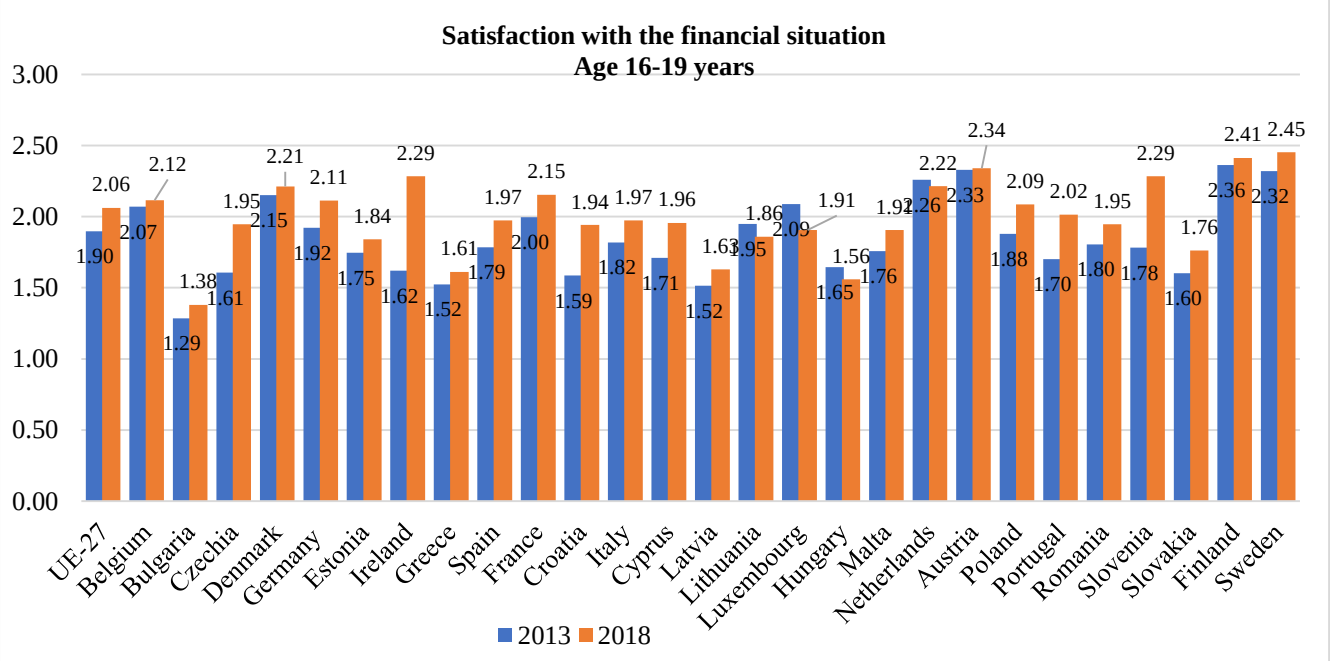

Figure 4. Determining the average grade on satisfaction with the financial situation in the age group 16-19 years

Source: Processing by Eurostat data, accessed June 2023,
https://ec.europa.eu/eurostat/databrowser/view/ilc_pw05$dv_535/default/table?lang=en

In the 20-24 age group (Figure 5) it can be seen that satisfaction with the financial situation increased in all EU countries, Ireland registering the biggest jump since 2013 to 2018 of 0.5 points, approaching the average level of satisfaction. In this age category, Austria scores the highest with an average mark of 2.17, increasing the percentage of those who have a high degree of satisfaction, while at the opposite pole, Bulgaria gets a grade of 1.37, due to the high percentage of people who have a low degree of satisfaction with their financial situation (about 70%).

Romania is below the average level of satisfaction, with a score of 1.89 in 2018, exceeding by 0.10 points the score obtained in 2013. This note indicates an increase in the share of people with

a medium and high degree of satisfaction, but data shows that a quarter of those aged 20-24 have a low satisfaction with their financial situation.

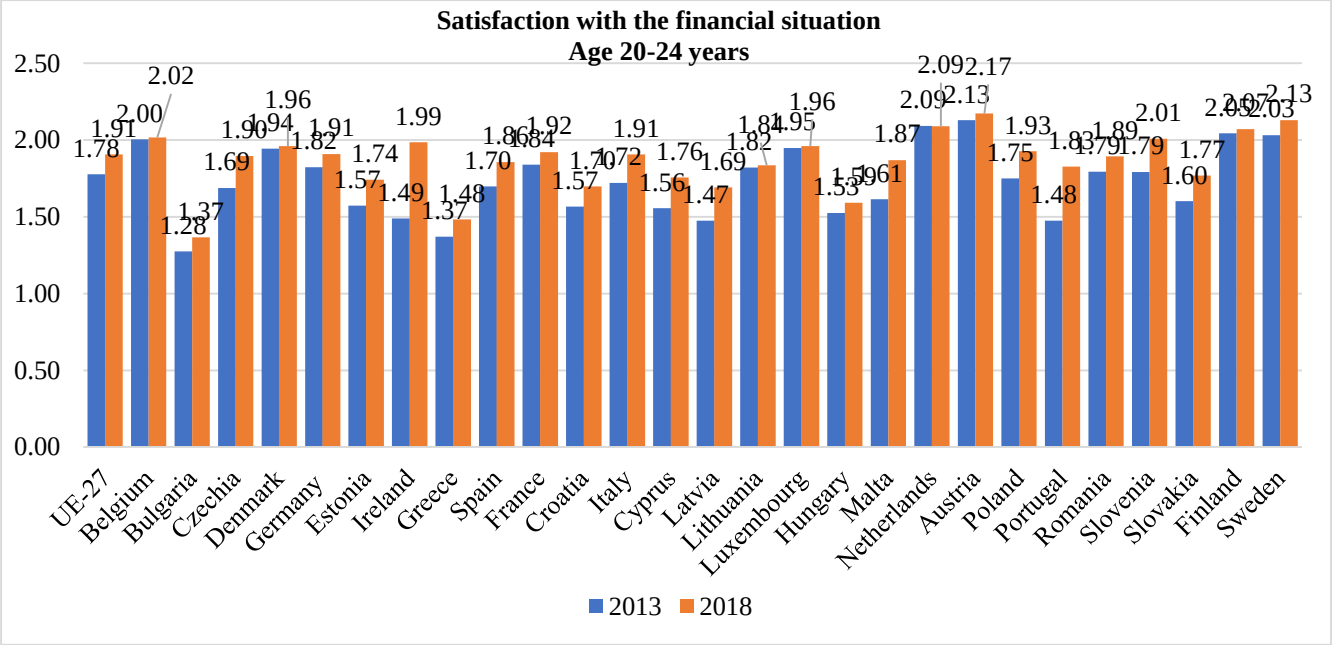

Figure 5 Determining the average grade on satisfaction with the financial situation in the age group 20-24 years

Source: Processing by Eurostat data, accessed June 2023, https://ec.europa.eu/eurostat/databrowser/view/ilc_pw05$dv_535/default/table?lang=en

For young people aged 25-34, satisfaction with the financial situation increased in most countries in 2018 compared to 2013, only in Finland there is a slight decrease of -0.02. Romania does not reach the average level, being just below it, with a score of 1.98 (+0.15 points compared to 2013).

Ireland also recorded an increase in the average grade for satisfaction with financial situation, from 1.53 to 1.97.

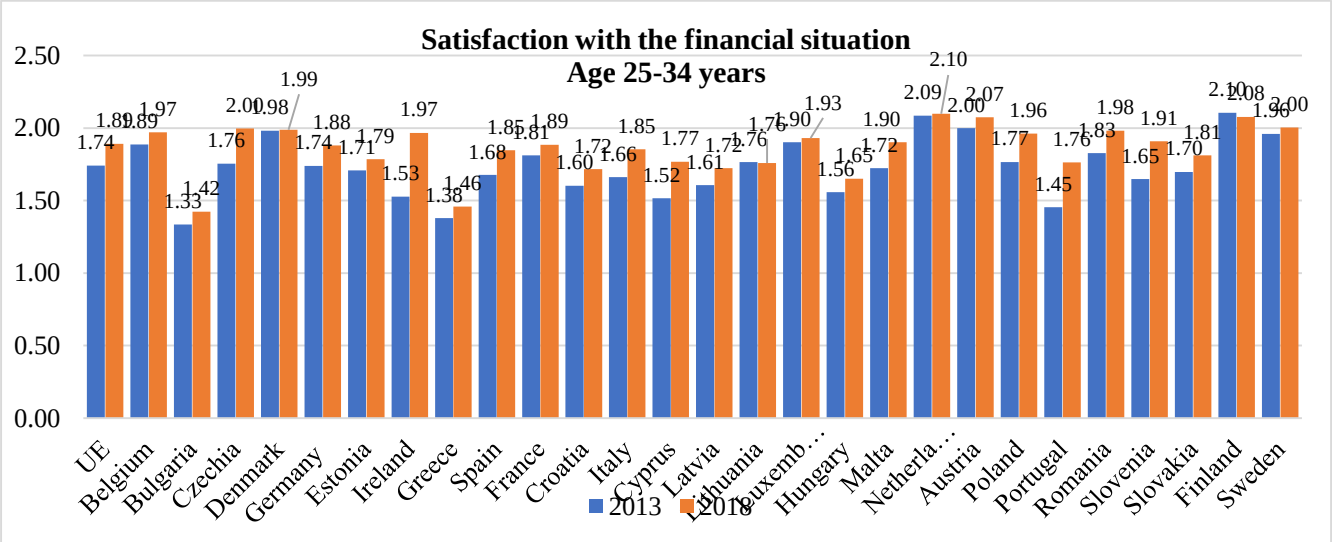

Figure 6. Determining the average grade on satisfaction with the financial situation in the age group 25-34 years

Source: Processing by Eurostat data, accessed June 2023, https://ec.europa.eu/eurostat/databrowser/view/ilc_pw05$dv_535/default/table?lang=en

Among people aged 35-49, satisfaction with their financial situation increased in 2018 compared to 2013 in all countries studied (Figure 7). Denmark and Finland rank first, with an average mark of 2.15 in 2018, registering an increase of 0.03 and 0.04 points, respectively, compared to 2013. Romania registers a grade of 1.91, which indicates that the percentage of those with an average degree of satisfaction is very high, while those with a high degree are still at a fairly low level. In this age group, the percentage of people with a high degree of satisfaction with the financial situation is quite low in most member countries, higher shares registering the average degree of satisfaction, and, as is the case in Bulgaria, a higher share is held by people with a low degree of satisfaction, thus placing it at the bottom of the ranking.

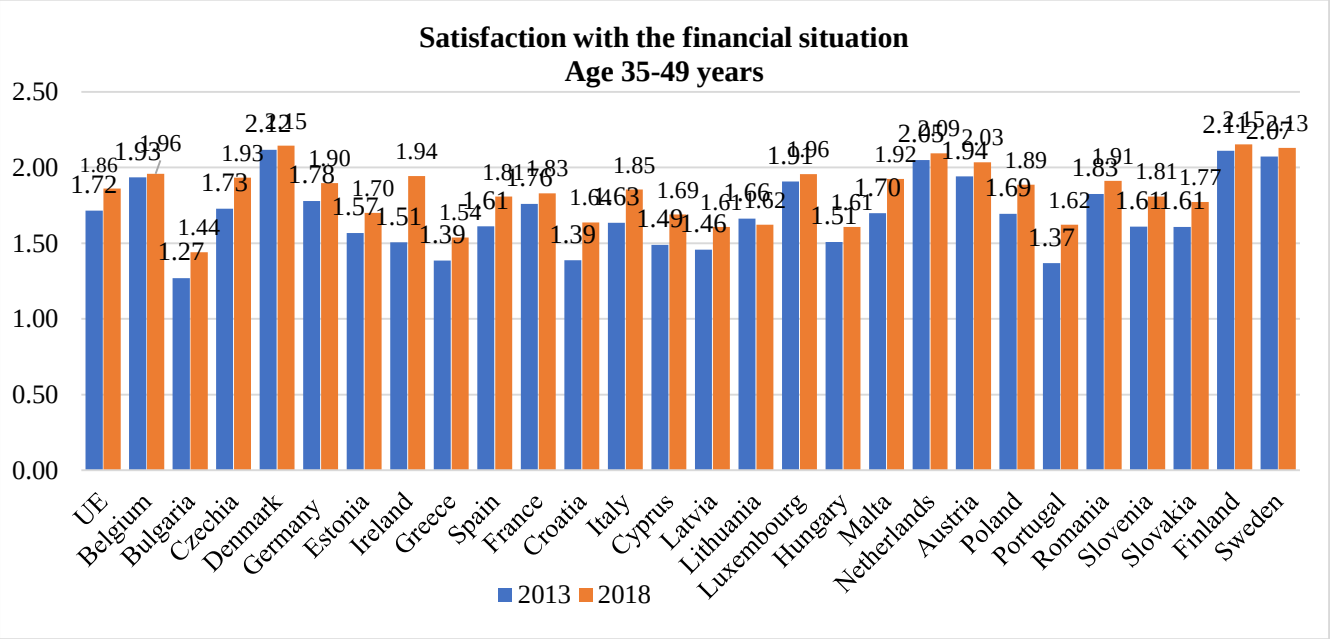

Figure 7. Determination of the average grade on satisfaction with the financial situation in the age group of 35-49 years

Source: processing by Eurostat data, accessed June 2023, https://ec.europa.eu/eurostat/databrowser/view/ilc_pw05$dv_535/default/table?lang=en

It is observed in some countries that, with age, satisfaction with the financial situation increases. In Sweden, the average grade obtained was 2.26 in 2018, increasing by 0.04 compared to 2013 in this age category. In Denmark, the mark recorded in 2018 is 2.26, indicating a higher degree of satisfaction, but decreased by 0.04 compared to 2013. In Ireland, there is a significant increase of 0.48 points, due to a large increase in the percentage of people who have a high and medium degree of satisfaction with their financial situation, significantly decreasing the percentage of those with a low grade. Romania obtains an average grade of 1.85, higher by 0.10 compared to 2013, but compared to previous age categories it is lower.

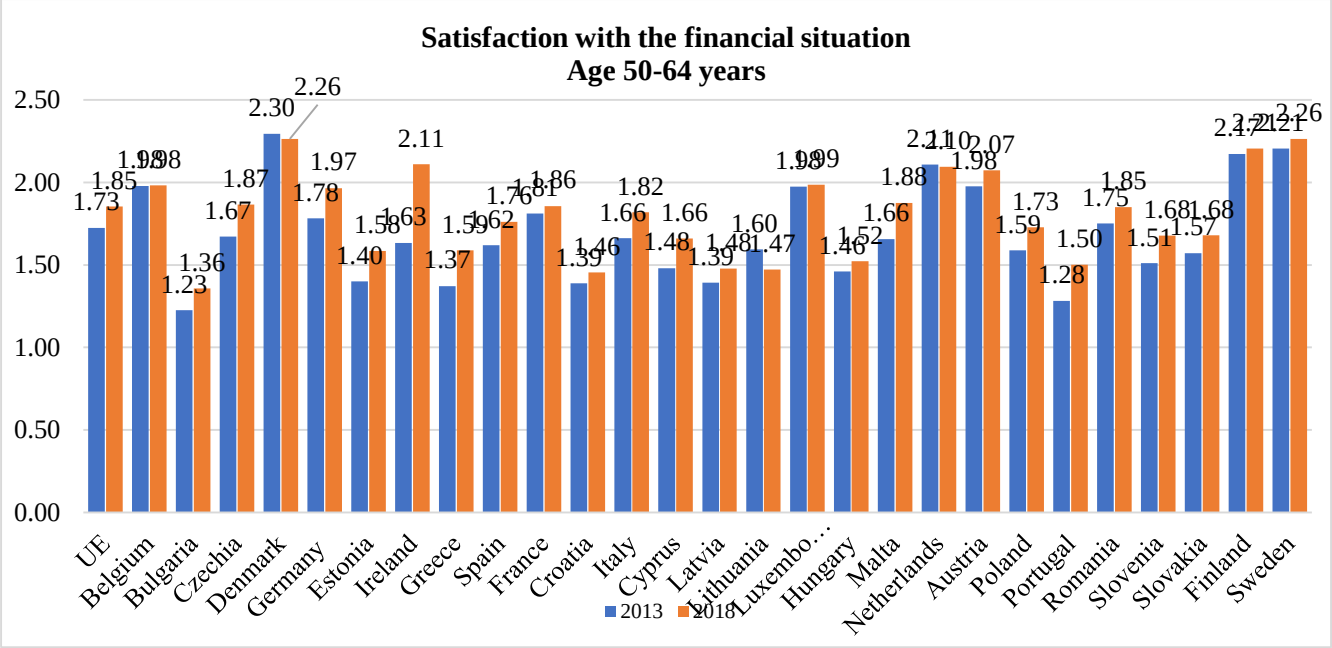

Figure 8. Determining the average grade on satisfaction with the financial situation in the age group 50-64 years

Source: processing by Eurostat data, accessed June 2023, https://ec.europa.eu/eurostat/databrowser/view/ilc_pw05$dv_535/default/table?lang=en

In the age groups 65-74 years and over 75 years (Figure 9 and Figure 10), increases in the level of satisfaction with the financial situation are observed in almost all countries, except Switzerland, the Netherlands and Luxembourg, which register slight decreases, however placing above the average level of satisfaction.

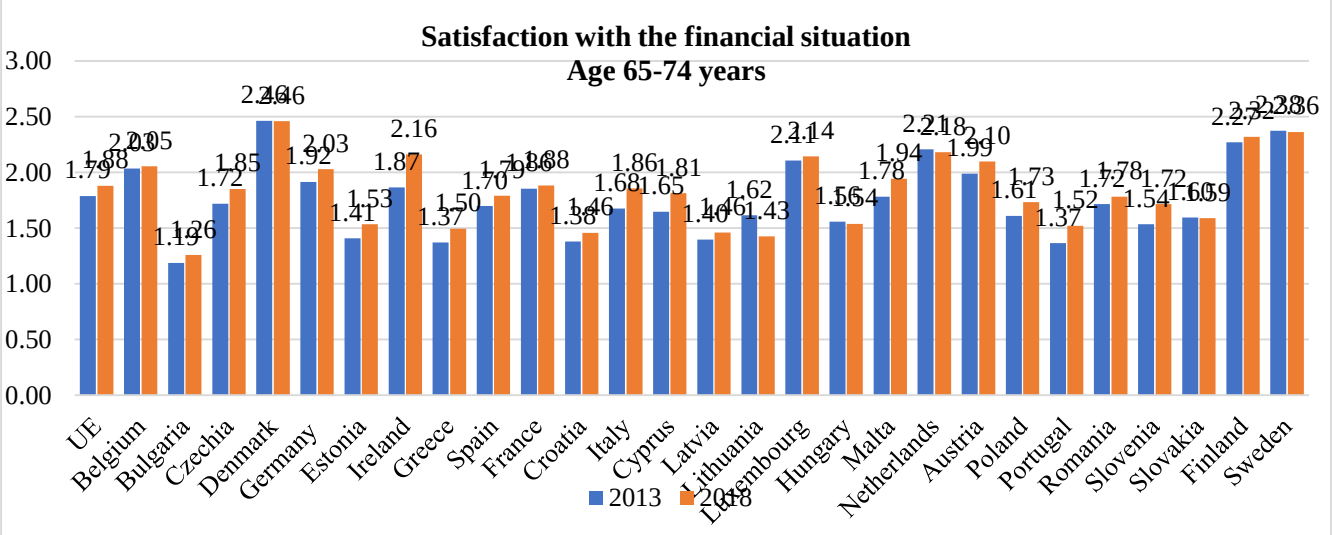

Figure 9. Determining the average grade on satisfaction with the financial situation in the age group 65-74 years

Source: processing by Eurostat data, accessed June 2023, https://ec.europa.eu/eurostat/databrowser/view/ilc_pw05$dv_535/default/table?lang=en

The highest degree of satisfaction in both age groups is found in Denmark (2.46 and 2.56), quite exceeding the average level of satisfaction.

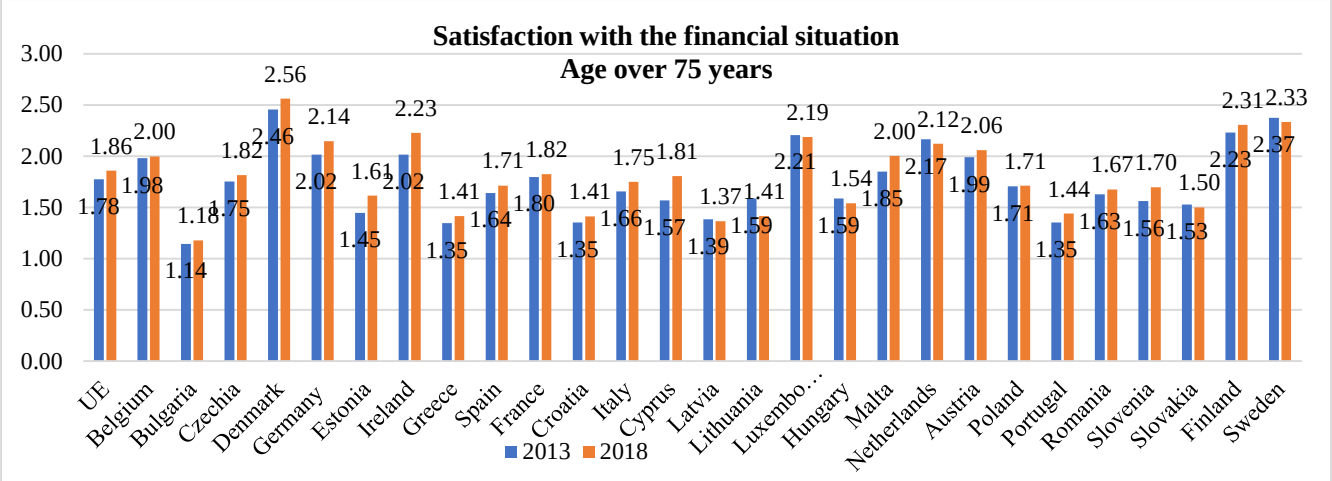

Figure 10. Determination of the average grade on satisfaction with the financial situation in the age group over 75 years

Source: processing by Eurostat data, accessed June 2023, https://ec.europa.eu/eurostat/databrowser/view/ilc_pw05$dv_535/default/table?lang=en

Romania does not fare very well in the older age categories, being well below the average level of satisfaction, much more than in the other age categories previously studied.

CONCLUSIONS

The data presented place Romania on the last places among the member countries in terms of GDP/capita ratio and even on the last place after the equivalent median income.

The GDP/capita report at purchasing power parity, which shows the standard of living adjusted according to the level of local prices, shows Romania at 74% of the EU average, ahead of countries such as Croatia, Greece, Bulgaria.

Due to the uneven distribution of incomes, i.e. the rather large discrepancy between rich and poor, median income places Romania on the last place, with a share of 26.2% of the EU average.

In terms of satisfaction with the financial situation, it was observed at EU level that the most satisfied are young people up to 19 years old, exceeding threshold 2 - equivalent to an average degree of satisfaction. In the other age groups, the level of satisfaction does not reach this threshold, with an average score between 1.85-1.91.

Although these data indicate a lower standard of living, the analysis of satisfaction with the financial situation revealed that Romanians are quite satisfied with their situation. From 2013 until the last survey in 2018, Romanians' satisfaction with the financial situation increased, due to the higher share of those who have a high and medium degree of satisfaction.

By age group, it was found that the percentage of young people who are satisfied with their financial situation compared to those over 50 years old is higher and decreases with age, so pensioners are the most dissatisfied with their situation, a situation similar to many other Member States, such as Portugal, Slovakia, Czechia, Greece, Croatia, Bulgaria.

In countries such as Denmark, Finland, Ireland, Germany, Sweden, young people up to 19 years old are most satisfied with their financial situation, compared to those in the age groups between 20-34 years, probably because they are financially supported by their parents. From the age of 35, satisfaction with the financial situation in these countries is increasing, reaching that people over 65 obtain an above-average grade, which indicates a high degree of satisfaction with their financial situation.

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THE EVOLUTION OF CONVERGENCE NET ADDED VALUE PER CONVENTIONAL WORKER (EURO/WORKER) IN THE COUNTRIES OF THE EUROPEAN UNION, OVER THE PERIOD 2007-2021

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Abstract: *Apart from the aspects of legislative and institutional convergence, we believe that convergence, more than 14 years after Romania's accession to the EU, can also be measured quantitatively through statistical indicators. For the study, the indicator of the value of net agricultural production per worker (VAN) was taken in the countries of the European Union, for the period 2007-2021. The paper is divided into three sections, of which, in the first section, the evolution of the VAN per agricultural worker is described, in the second, the convergence tendency of the VAN indicator per agricultural worker is analyzed, to fall within the confidence limits of the EU average, for different degrees of probability and in the last section of the paper the evolution of the VAN convergence per agricultural worker is presented, through the value and percentage differences of the net added value per conventional agricultural worker compared to the average of the European Union, for the period 2007-2021. The VAN/AWU analysis, by comparing the growth rates through the value and percentage dispersion around the average and by the statistical positioning of the countries, against the intervals of the confidence limits of 95%, 99% and 99.9%, demonstrates that in the analyzed period 2007 -2021, has increased in value in all countries but they did not have a tendency to converge, respectively to reduce the discrepancies that exist between the countries of the European Union.*

Keywords: *convergence, value of net agricultural production, probability, rhythm, confidence limits.*

JEL classification: Q19, O47

INTRODUCTION

Although agricultural incomes are influenced by a number of factors such as: "cost-price influence, uncertain conditions of demand and supply"; "heterogeneous nature of agricultural farms"; "natural conditions", we believe that the present analysis gives the possibility to evaluate the convergence, the discrepancies between farmers' incomes.

Cohesion must be achieved mainly by promoting the conditions for economic growth and by reducing the disparities between the development levels of the EU regions and the member states, ensuring a high level of employment and a balanced and sustainable development (Albu,L., et al.,2017).

Economic convergence is one of the main objectives of the accession treaty of Romania and other countries (Iancu, 2007), which aims to recover the gaps compared to the highly developed EU countries (Necula, Raluca et al., 2016).

Convergence is also a condition for joining the single currency, because if there is a big convergence gap, there is a risk of complicating the management of economic cycles (Isărescu, M., 2015).

Romania, from the point of view of real convergence, compared to the average gross domestic product (GDP) per inhabitant expressed by standard purchasing power (PCS), compared to the European average (EU-28), had the perspective that on the Horizon 2020 it would reach 70% of the European average compared to 57.1% recorded in 2015 (Government of Romania, 2017).

In 2022, nine countries had a per capita consumption (GDP) higher than the EU average: Luxembourg (38% above the EU average), Germany (19%), Austria (18%), the Netherlands (16%),

Belgium (15%), Denmark (11%), France and Finland (both 9%) and Sweden (8%). Our country was at 77% of the European Union average, just like Portugal and Hungary. The lowest GDP was in Bulgaria (41% below the EU average), Slovakia and Greece (both 32%) (Cioba, Laura-Georgiana, 2023).

The first section of the paper describes the evolution of the VAN/agricultural worker and its evolution through the coefficient of variation and the growth rate by European Union countries, for the period 2007-2021.

The second section of the paper analyzes the convergence tendency of the VAN/agricultural worker indicator, to fall within the confidence limits of the EU average, for probabilities of 95%, 99% and 99.9%. The third section of the paper presents the evolution of the VAN/agricultural worker convergence, through the value and percentage differences of the net added value per conventional agricultural worker compared to the European Union average, for the period 2007-2021.

MATERIAL AND METHOD

The indicator net value added (VAN) per unit of annual work, is a different concept from that of business profit and even from personal or household income. VAN represents the reward for all "fixed" factors of production (all land and all capital, whether or not owned by the farmer, and all labor employed or part of the farmer's family).

The Annual Work Unit (AWU) represents, from 2011, 2120 annual work hours (until 2010, it represented 2200 annual work hours).

As indicators of the convergence of the net added value per conventional worker (€/AWU) were calculated: the annual growth rate of the net added value per conventional worker (€/AWU); coefficient of variation; the average net value added per conventional worker at EU level and the confidence limits for 95%, 99% and 99.9% probabilities, the evolution of the number of countries lying between the confidence limits for different probabilities; value and percentage difference of net value added per conventional worker (€/AWU), by country, compared to the EU average.

The coefficient of variation was calculated according to the formula:

C var (%) = (AbSt /Mean) *100

The growth rate was calculated with the formula:

R(rate%)=(geomean (VAN0/VAN1, VA1/VAN2),..VAN(n-1)/ VANn)-1)*100

Deviations by country and by year of VAN/AWU, in absolute figures and percentages compared to the average of the European Union, according to the formula:

Absolute deviations: VAN (country/year) - Average VAN/EU and

The relative deviations: (VAN (country/year)/ Average VAN/EU) *100

Confidence limits for a given probability were calculated with the formula: Average UE (VAN/AWU) (+/-) AbST / (1/ sqrt (n)) * tp, where:

n= number of observations; tp = tabulated values of t for 95%, 99%, and 99.9% probabilities.

These indicators analyzed in dynamics over the analyzed period show us the tendency of the VAN/AWU indicator towards the proximity or distance from the EU average.

The data subject to the study on the evolution of net value added per conventional worker (€/AWU) were taken from: Eurostat 2023, FADNP, for the period 2007 to 2021, at the level of the EU and the component countries.

RESULTS AND DISCUSSION

(a) Trend of the annual growth rate of net value added per conventional worker (€/AWU) at the level of European Union countries over the period 2007-2021

Net Value Added (VAN/AWU) depends on the factors that compose it: Net Value Added per farm and Annual Number of Workers (AWU) which it influences increasing by increasing VAN per farm and also increasing by decreasing the number of workers per farm.

Table no. 1. The evolution of net value added per worker (€/AWU) and the growth rate over the period 2007-2021, in the countries of the European Union.

Area/ UM	Net Value Added per farm (2007-2021)			Annual number of workers (2007-2021)			Net Value Added per worker (2007-2021)		
	Average	Coeff. var.	rhythm	Average	Coeff. var.	rhythm	Average	Coeff. var.	rhythm
	thousand €/farm	%	%	AWU/farm	%	%	thousand €/AWU	%	%
EU-28	32.25	24.7	4.34	1.61	5.4	-0.49	20.06	22.8	**4.86**
AND	7.02	21.4	**1.31**	1.41	15.4	**-2.64**	5.12	30.8	4.05
EN	8.87	58.0	**10.74**	1.38	21.0	**-2.41**	6.47	52.2	**13.47**
HR	11.98	32.1	**10.42**	1.65	5.9	**-1.13**	7.34	34.9	**11.68**
for	12.42	21.0	3.41	1.65	5.0	-1.04	7.58	25.3	**4.51**
Lt	16.56	25.7	**2.68**	1.71	6.9	**-1.74**	9.80	31.9	**4.50**
MT	14.23	27.0	**-0.27**	1.42	5.5	-0.10	9.97	24.6	**-0.16**
IV	20.51	26.6	**2.82**	2.07	6.8	**-1.54**	10.03	30.8	4.44
BG	28.16	63.7	**16.98**	2.66	9.9	1.56	10.19	55.4	**15.18**
CY	14.94	22.6	3.51	1.43	6.8	0.76	10.38	18.4	**2.73**
for	18.17	21.1	**4.92**	1.60	4.1	**-1.09**	11.45	23.5	**6.04**
HE	14.75	8.2	**-0.27**	1.14	8.2	**-1.28**	13.02	8.1	**1.00**
SK	165.13	34.6	3.79	12.39	24.3	**-5.22**	14.69	51.1	**9.51**
EE	36.24	33.1	3.98	2.03	11.3	**-2.57**	18.34	39.5	**6.71**
CZ	121.17	23.0	**4.36**	6.02	12.2	**-1.33**	20.50	26.2	**5.78**
IV	33.83	26.9	**5.02**	1.65	6.4	-0.78	20.58	27.7	**5.86**
AT	36.42	20.6	**2.94**	1.51	5.8	0.63	24.03	17.9	**2.28**
IE	28.68	19.5	3.15	1.15	2.4	0.06	24.85	19.1	3.07
ES	40.16	32.0	**4.30**	1.54	11.0	1.73	25.52	20.9	**2.52**
IT	37.75	22.7	3.84	1.33	2.9	0.37	28.29	20.1	3.41
BE	37.78	23.5	3.36	1.31	6.4	0.25	28.67	18.7	3.08
FR	69.75	14.5	**1.91**	2.05	2.0	0.24	34.04	13.8	**1.66**
it	54.39	24.0	**4.21**	1.51	5.3	0.99	35.74	19.9	3.20
UK	81.02	9.7	**-0.07**	2.15	2.4	0.07	37.76	9.5	**-0.16**
OF	90.02	18.5	3.08	2.26	2.6	0.35	39.84	16.8	**2.71**
IU	69.96	22.4	**2.01**	1.73	4.5	0.00	40.47	23.6	**2.03**
BE	87.17	12.5	**1.27**	2.08	3.3	0.60	42.02	12.3	**0.66**
when	156.39	23.2	**4.85**	2.86	8.5	1.53	54.19	16.7	3.27
D.K	150.05	36.2	**6.54**	1.92	15.0	2.54	76.78	25.0	3.87

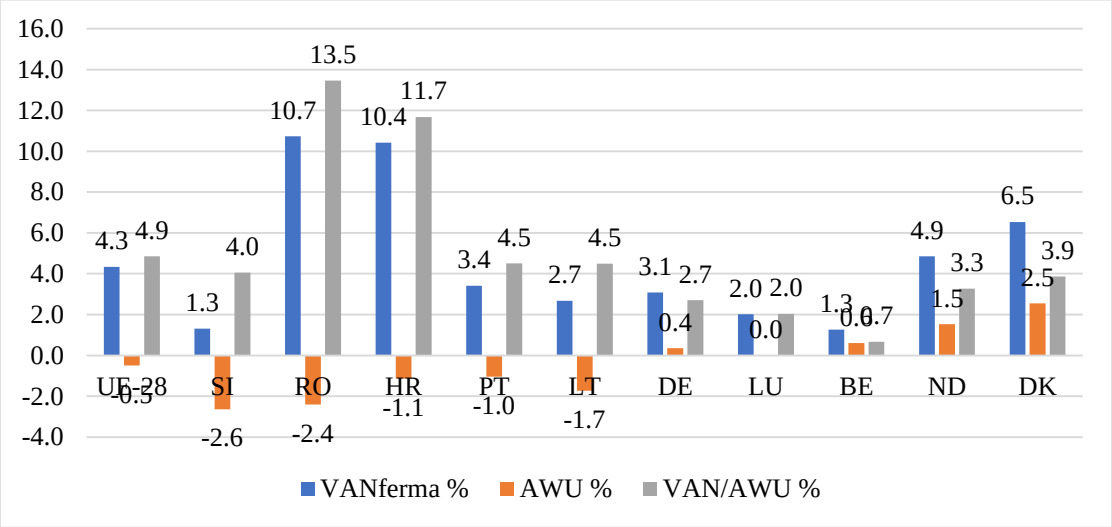
Source: Eurostat, 2023, FADNP, https://agridata.ec.europa.eu/extensions/FADNPublicDatabase/FADNPublicDatabase.html

The increase in Net Value Added on the farm is the result of both the increase in total agricultural production and the rational, efficient use of inputs at the farm level, and is subject to the influence of natural and economic conditions. The average number of workers at the farm level is

also a result of the degree of mechanization of the farm's production profile and the level of professional training.

It is also worth noting that the growth rate of VAN/AWU is given by the sum of the rates of the two factors, but where the rate of the annual number of workers is taken with the opposite sign.
From the analysis of the evolution of the growth rates of VAN/farm, AWU and VAN/AWU, for the period 2007-2021 for the last five countries with the lowest value and the first five countries with the highest value of VAN/AWU, it is found:

- the countries with the lowest VAN/AWU, from 5.12 thousand €/AWU in SI, to 6.47 thousand €/AWU in RO and to 9.80 thousand €/AWU in LT, all have a negative growth rate, respectively decrease in the number of workers, from -2.6% in SI, to -2.6% in RO to 1% in PT. It is worth noting that the growth rate of VAN/AWU is higher than or equal to the growth rate of the EU; (Table 1 and Chart 1);



Graph 1. The evolution of the growth rates of VAN/farm, AWU and VAN/AWU, for the period 2007-2021, of the last 5 countries with the lowest VAN/AWU and the first 5 countries with the highest VAN/AWU value

- the countries with the highest VAN/AWU, from 39.84 thousand €/AWU in DE to 76.78 thousand €/AWU, in DK, all have a positive growth rate of the number of AWU, from 0.66% in BE to 3.87 in BE; (Table 1 and Graph 1).

- thus, the idea that reducing the number of workers would lead to an increase in VAN/AWU, in order to reduce the discrepancies, is not true. This can be explained by the great diversity of agricultural farms, by the great difference in operating capital, by the diversity of the activities carried out, by the size of the farms and of course the place that agricultural products occupy in the market.

(b). Difference in value and percentage of net value added per conventional worker (€/AWU), by country, compared to the EU average.

An indicator of the convergence of the net added value per worker (€/AWU), is the difference expressed in absolute and relative figures of this indicator compared to the EU average (Table no. 4).

From the analysis for the years 2007, 2015 and 2021, of the evolution of this indicator, the following can be found:

- the countries that are above average with VAN/conventional worker are 13, the same in the three years analyzed, namely AU, ES, IE, IT, FI, FR, BE, LU, DE, SE, ND, DK and UK, to which CZ is added in the years 2015 and 2021 and EE in the year 2021;

Table no. 2. Evolution of value and relative deviations of net added production per worker (€/AWU), by country, compared to the EU average, for the years 2007 and 2021

Years/MU/ Area	2007			2015			2021		
	Thousands of €/AWU	(+/-)€/AWU	%	Thousands of €/AWU	(+/-)€/AWU	%	Thousands of €/AWU	(+/-)€/AWU	%
eu	15.0	0.0	100.0	18.8	0.0	100.0	29.1	0.0	100.0
MT	13.3	-1.7	88.9	9.3	-9.5	49.4		-29.1	0.0
AND	4.4	-10.5	29.7	3.7	-15.1	19.6	7.7	-21.4	26.6
Hr		-15.0	0.0	5.4	-13.4	28.7	10.4	- 18.7	35.8
CY	8.2	-6.7	55.0	8.6	-10.2	45.7	12.0	-17.1	41.3
PL	6.7	-8.3	44.8	6.3	-12.5	33.5	12.4	-16.7	42.7
EN	2.2	-12.8	14.8	4.2	-14.6	22.2	13.0	-16.1	44.8
IV	8.2	-6.8	54.6	10.6	-8.2	56.3	14.7	-14.5	50.3
HE	13.3	-1.7	88.6	11.9	-6.9	63.3	15.3	-13.9	52.4
Lt	8.7	-6.3	58.0	9.2	-9.6	49.1	17.2	-11.9	59.1
for	7.6	-7.4	50.7	12.5	-6.3	66.5	17.3	-11.8	59.4
BG	3.3	-11.7	21.8	9.5	-9.3	50.3	23.6	-5.5	81.2
SK	8.1	-6.9	54.0	14.5	-4.3	77.2	28.8	-0.3	99.1
CZ	13.6	-1.4	90.7	19.7	0.9	104.8	29.8	0.7	102.4
EE	13.5	-1.5	89.8	15.9	-2.9	84.7	33.4	4.3	114.7
HAVE	23.8	8.9	159.1	19.2	0.4	102.2	32.7	3.6	112.3
ES	23.7	8.8	158.5	25.9	7.1	137.9	33.6	4.5	115.5
IE	23.3	8.4	155.8	25.8	7.0	137.4	35.0	5.9	120.2
IT	23.2	8.3	155.2	31.0	12.2	165.1	37.2	8.1	127.7
BE	26.1	11.2	174.6	26.6	7.8	141.7	40.0	10.9	137.3
FR	34.4	19.5	229.9	33.8	15.0	180.0	43.4	14.3	149.1
BE	42.5	27.5	283.6	35.7	16.9	190.1	46.6	17.5	160.0
IU	37.7	22.7	251.8	41.0	22.2	218.0	52.1	23.0	179.1
OF	36.0	21.0	240.1	36.3	17.5	193.2	52.3	23.2	179.6
it	33.8	18.8	225.5	34.1	15.3	181.5	52.5	23.4	180.3
when	45.0	30.0	300.4	52.8	34.0	281.2	70.6	41.5	242.4
D.K	60.3	45.3	402.4	64.6	45.8	343.9	102.6	73.5	352.4
UK	40.6	25.6	270.7	31.2	12.4	165.8			
Average deviations		**-7.0**	**53.0**	**x**	**-9.4**	**57.8**	**x**	**-14.7**	**49.4**
above the EU average		**19.7**	**231.4**	**x**	**15.3**	**181.6**	**x**	**18.2**	**162.4**

Source: Eurostat, 2023, FADNP, https://agridata.ec.europa.eu/extensions/FADNPublicDatabase/FADNPublicDatabase.html

- the value exceedance was 19.7 €/AWU/worker in 2007, decreased to 15.3 €/AWU/worker in 2015 and increased again to 18.2 €/AWU/worker in 2021;

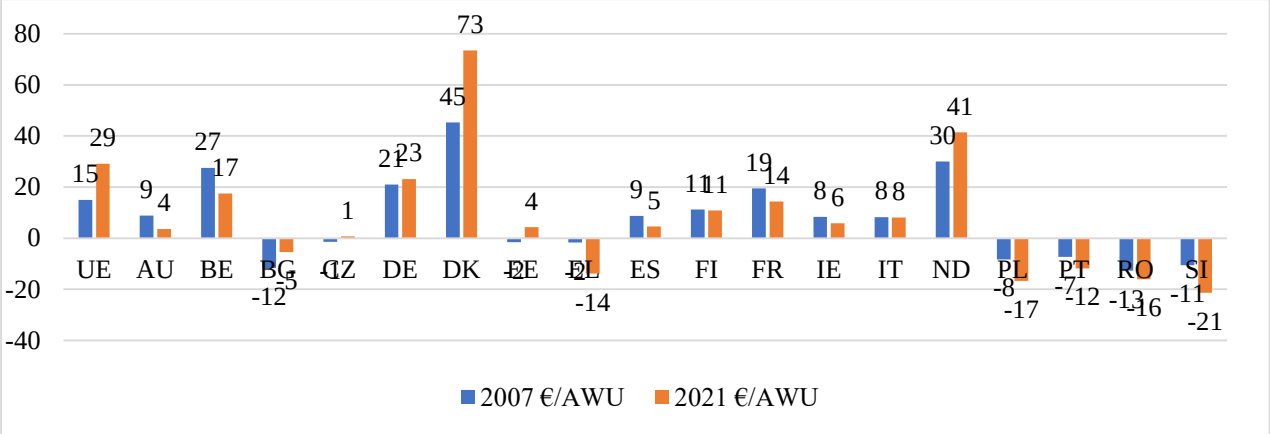
- the percentage exceedance was decreasing from 231.5% in 2007, to 181.6% in 2015 and to 162% in 2021;

- the countries that are below the average with a value deviation are 14 in 2007, with an average of -7.0 €/AWU, 13 in 2015 with -9.4 €/AWU and 12 in 2021 with -14.7 €/AWU;

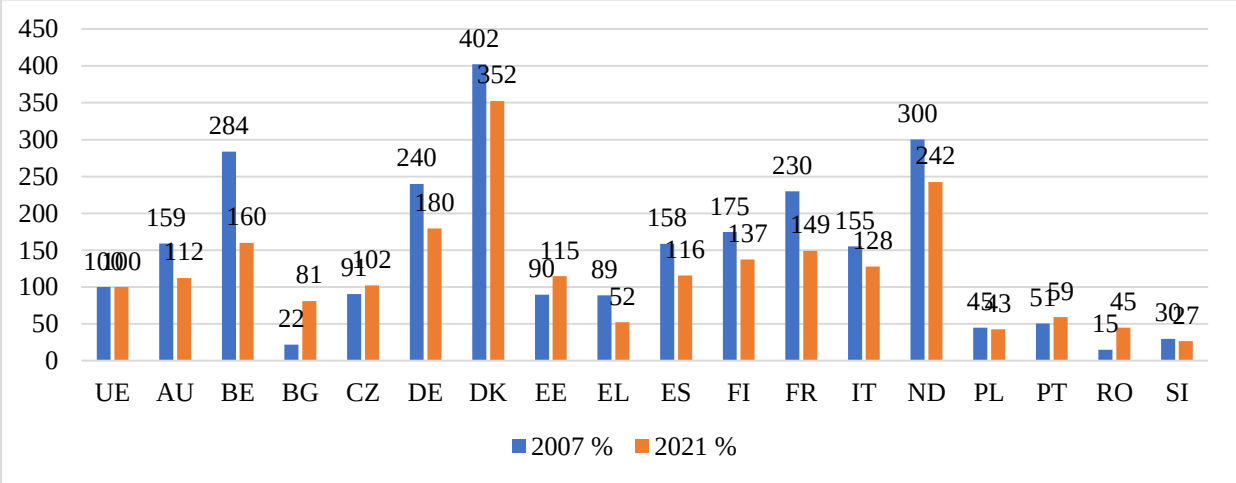
By percentage, the number of countries, as an average of deviations from the average, is 53.0% in 2007, 57.8 in 2015 and 49.4% in 2021.

Thus, for Bulgaria over the entire period, the net added value was below the average with values between €8.2/AWU (62.6%) in 2017 and €27.8/AWU (19.82%) in 2011.
The closest to the EU average was in 2021 of 81.17%.

For Romania in the same period, the lowest difference was €10.6/AWU (22.3%) in 2009 and the highest €29.5/AWU in 2011 (15%). The closest to the EU average was 44.8% in 2021.
For Denmark the difference compared to the EU average ranged between €29.9/AWU (318.7%) in 2009 and €75.5/AWU (389.5%), and for the Netherlands between €11.2/AWU (132.2%) in 2011 and €43.3/AWU (297.9%) in 2017.



Graph 2. Evolution of value deviations of net added production per worker (€/AWU), by country, compared to the EU average, for the years 2007 and 2021

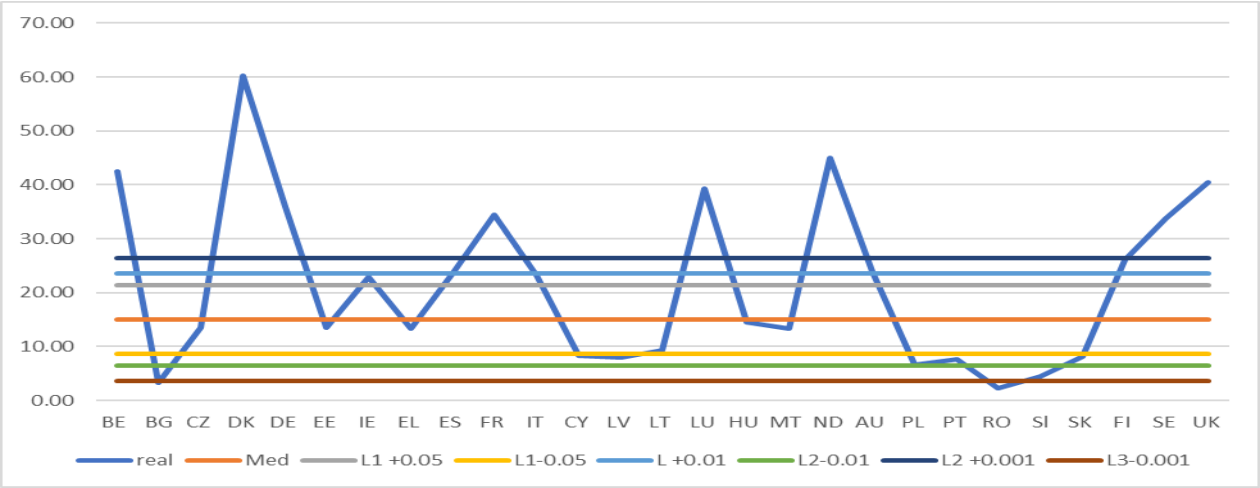


Graph 3. Evolution of percentage deviations of net added production per worker, by country, compared to the EU average (EU=100%), for the years 2007 and 2021

(c) Confidence limits for 95%, 99% and 99.9% probabilities, evolution of the number of countries lying between the confidence limits for different probabilities

Thus, for the year 2007, confidence limits were calculated around the EU average for probabilities of 95% (between €21.33/AWU and € 8,621 /AWU), 99% (between €23,564 /AWU and €6,394/AWU) and for 99.9% (between €26,411/AWU and €3,547/AWU) (Graph no. 1).

Using a Count IF command in Excel, the countries that are within these confidence limits, as well as those that are outside of these limits, at the top and at the bottom, were counted.



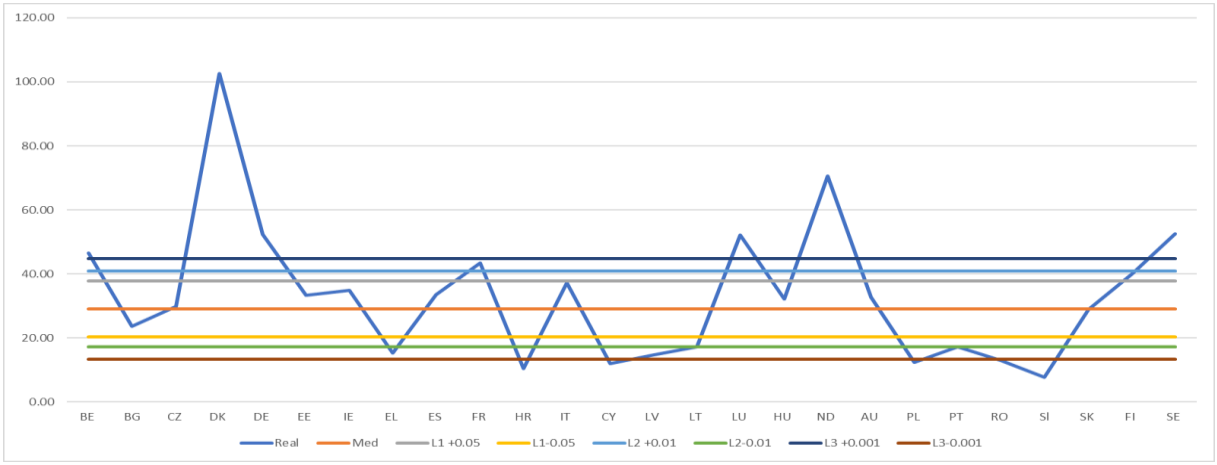
Graph no. 4. The comparison with the confidence limits of the EU average, of the net added values per supplier, of the EU countries, in 2007

Table no. 3. Confidence limits of average net value added per worker, by confidence intervals, of the EU average, 2007-2021

Limits/ Years/ MU	EU Average	Prob Limits 95%		Prob Limits 99%		Prob limits 99.9%	
		L1 (Sup,0.05)	L1 (Inf,0.05)	L2 (Up,0.01)	L2 (inf,0.01)	L3 (Sup,0.001)	L3 (Inf,0.001)
	Th.€/AWU	Th. €/AWU	Th. €/AWU	Th. €/AWU	Th. €/AWU	Th. €/AWU	Th. €/AWU
2007	14.98	21.34	8.62	23.56	6.39	26.41	3.55
2008	14.67	20.04	9.30	21.92	7.42	24.33	5.01
2009	13.66	18.29	9.03	19.92	7.40	21.99	5.33
2010	17.47	24.31	10.63	26.70	8.24	29.77	5.17
2011	34.7	25.65	10.86	28.25	8.27	31.56	4.96
2012	18.95	25.31	12.59	27.53	10.37	30.38	7.52
2013	18.13	25.93	10.33	28.66	7.60	32.15	4.11
2014	18.39	24.75	12.02	26.98	9.79	29.83	6.94
2015	18.79	24.86	12.73	26.98	10.60	29.70	7.89
2016	19.78	25.90	13.66	28.04	11.52	30.78	8.78
2017	21.90	29.48	14.32	32.14	11.66	35.53	8.27
2018	24.60	30.78	18.41	32.95	16.25	35.72	13.48
2019	26.00	33.95	18.05	36.74	15.26	40.30	11.70
2020	26.14	33.93	18.34	36.66	15.61	40.15	12.12
2021	29.11	37.88	20.34	40.95	17.27	44.87	13.35

Source: Eurostat, 2023, FADNP, https://agridata.ec.europa.eu/extensions/FADNPublicDatabase/FADNPublicDatabase.html

The same was done for the other years. We also exemplify for the year 2021, where the confidence limits for probabilities of 95% (between €21.33/AWU and €8,621/AWU), 99% (between €23,564/AWU and €6,394/AWU) and for 99.9% (between 26,411€/AWU and 3,547€/AWU) (Graph no. 2).



Graph 5. The average of EU in the confidence limits of the net value added per worker, of EU countries in 2021

From the analysis of the scatter of countries around the EU average (€/AWU), for 95% confidence limits, it is found that:

- in the period 2007-214 the number of countries that were within these limits was of 7 countries (CZ0, EE, IE, EL, LT, HU, MT), a number that is also maintained for the period 2015-2021 (BG, CZ, EE, IE, IT, AU, SK);

- during the same period, of course, the number of countries that are outside the confidence limits, delimited by the 95% confidence probability, has also been maintained;

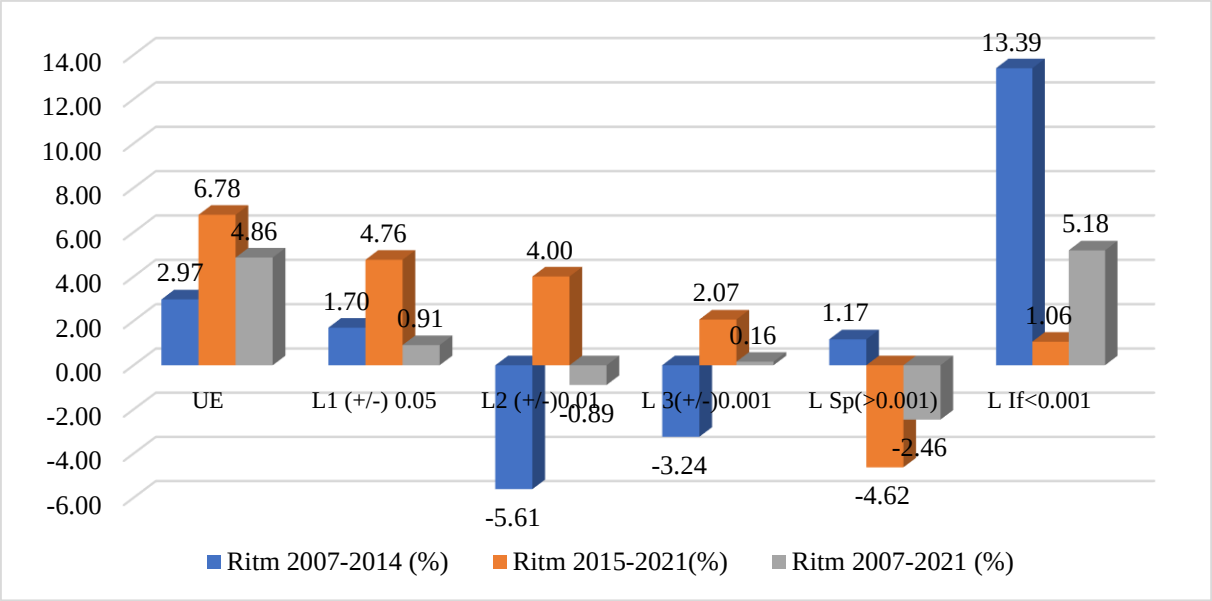
Table no. 4. The net value added per worker by confidence intervals, EU average, EU countries, 2007-2021 and sub-periods (2007-2014 and 2015-2021)

Indicators/Years	EU(€/AWU)	L1 (+/-) (0.05)		L2 (+/-) (0.01)		L3 (+/-) (0.001)		etc (>0.001)		Lif (<0.001)	
		No.	%	No.	%	No.	%	No.	%	No.	%
2007	14.98	6	22.2	13	48.1	17	63.0	8	29.6	2	7.4
2008	14.67	5	18.5	13	48.1	15	55.6	9	33.3	3	11.1
2009	13.66	4	14.8	10	37.0	14	51.9	8	29.6	5	18.5
2010	17.47	9	33.3	10	37.0	18	66.7	7	25.9	2	7.4
2011	34.65	9	33.3	13	48.1	18	66.7	8	29.6	1	3.7
2012	18.95	7	25.9	8	29.6	16	59.3	8	29.6	3	11.1
2013	18.13	11	39.3	16	57.1	20	71.4	7	25.0	1	3.6
2014	18.39	7	25.0	9	32.1	14	50.0	9	32.1	5	17.9
2007-2014 average	18.86	7	26.78	11.5	43.61	17	62.06	8	28.97	2.75	8.98
Rhythm 2007-2014 (%)	2.97	2.23	1.70	-5.12	-5.61	-2.74	-3.24	1.70	1.17	13.99	13.39
2015	18.79	5	17.9	10	35.7	15	53.6	9	32.1	4	14.3
2016	19.78	6	21.4	8	28.6	14	50.0	8	28.6	6	21.4
2017	21.90	6	21.4	13	46.4	17	60.7	7	25.0	4	14.3
2018	24.60	7	25.0	8	28.6	12	42.9	7	25.0	9	32.1
2019	26.00	8	28.6	10	35.7	17	60.7	6	21.4	5	17.9
2020	26.14	7	25.0	12	42.9	18	64.3	6	21.4	4	14.3
2021	29.11	9	34.6	11	42.3	15	57.7	6	23.1	5	19.2
Average 2015-2021	22.87	7	24.84	10	37.17	15	55.69	7.00	25.24	5.29	19.07
Rhythm 2015-2021(%)	6.78	10.29	4.76	1.60	4.00	0.00	2.07	-6.53	-4.62	3.79	1.06
Average 2007-2021	21.15	7	25.76	10	39.84	15	58.28	7	27.44	5	14.28
Rhythm 2007-2021 (%)	4.86	5.87	0.91	-2.07	-0.89	-1.48	0.16	-2.19	-2.46	9.16	5.18

Source: Eurostat, 2023, FADNP, https://agridata.ec.europa.eu/extensions/FADNPublicDatabase/FADNPublicDatabase.html

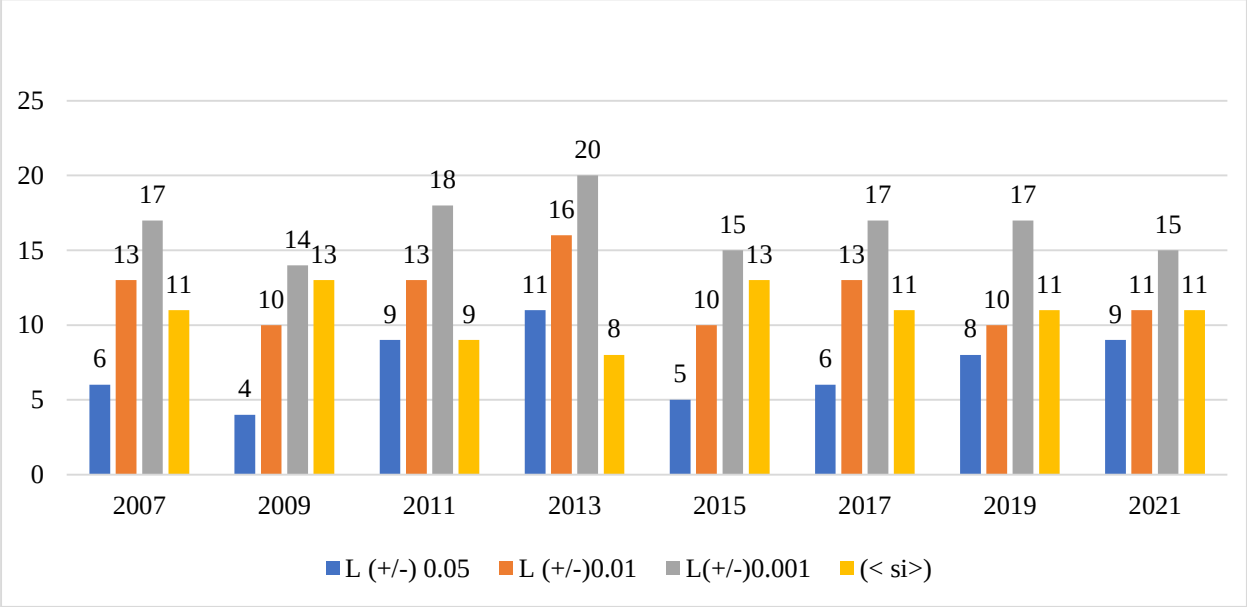
- it is noted that, for the period 2007-2014, the number of countries that are above the confidence limit with a probability of 95% is 12 (BE, DK, DE, ES, FR, IT, LU, ND, AU, FI, SE, UK)

of which above the limit of 99.9%; and for the period 2015-2021, the number of countries that are above the confidence limit with a probability of 95% is 8 (BE, DK, DE, FR, LU, ND, FI, SE);



Graph 6. Growth rates of the number of countries, by confidence intervals, for the period 2007-2021 and by sub-periods, at the level of EU countries

- as a statistical significance, the number of countries that are significantly above the average, i.e. exceed the 99.9% limit, is 7 (BE, DE, FR, LU, ND, SE, UK) in 2007 and 6 (BE, DK, DE, LU, ND, SE) in 2021;



Graph 7. Distribution of the number of countries according to the size of the net added value per worker, by confidence intervals, for the period 2007-2021

- regarding the number of countries that are below the average with a very significant negative significance, below the limit given by the probability of 99.9%, there are 2 in 2007 (BG, RO) and 5 in 2021 (HR, CY, PL, RO, SI).

CONCLUSIONS

1. Net added value per worker (VAN/AWU) in the period 2007-2021, has a growth rate of 5%, at EU level, from -0.16% in Malta, to 3.87% in Denmark, to 13.45% in Romania and at 15.18% in Bulgaria.

As components of VAN/AWU, net value added per farm also has different rhythms, from -0.27% in Malta and Greece, to 6.54 in Denmark and 10.74 in Romania and 16.98 in Bulgaria, and the average annual number of workers also has very different rhythms from -5.22 in SK to -2.41 in Romania, to 1.73 in Italy and 2.54% in Denmark.

The growth rate of VAN/AWU cannot define convergence, because in the first 5 countries with the highest VAN/AWU, they have increases in the rate of the number of workers, while the last countries in terms of VAN/AWU level have decreases of the growth rate, which demonstrates the diversity of VAN/AWU growth paths.

2. Analyzing the number of countries *that have a VAN/AWU value above the average for the three representative years, they are 13, in these years, namely AT, ES, IE, IT, FI, FR, BE, LU, DE, SE, ND, DK and UK, to which CZ is added in 2015 and 2021 and EE in 2021*.

3. Analyzing the convergence of VAN/AWU, of the EU countries, compared to the average, it is found that there are 7 countries within the confidence limits with 95% probability, both in 2007 and in 2021. Regarding the number of countries that were above the mean with a very significant positive significance, above the limit given by the probability of 99.9%, they were 6 in the year 2007 and 6 in the year 2021, and the number of countries that were below the limit given by the probability of 99.9% %, were 2 (BG, RO) in 2007 and 5 in 2021 (HR, CY, PL, RO, Sl).

4. VAN/AWU analysis, by comparing the rhythms of growth of VAN/AWU, by the value and percentage scatter around the average and by placing the countries from a statistical point of view, between confidence limits of 95%, 99% and 99.9%, demonstrates that during this period, 2007-2021, it increased in value in all countries, but they did not have a tendency to converge, respectively to reduce the discrepancies that exist between the countries of the European Union.

PROPOSALS

1. Due to the importance of convergence in the economic and social cohesion of our country in general and agriculture in particular, we consider it necessary for the institutions empowered with scientific research to define the indicators of convergence, in order to analyze them and make them available to administrative and political institutions.

2. It is necessary to analyze and disseminate the trend of convergence indicators in the countries of the European Union, in order to know the multitude of development paths, in order to reduce the discrepancies that separate the countries of the European Union.

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THE WORLD MARKET OF THE WINE SECTOR

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Abstract: *The increased share of horticultural crops in the world economy of agricultural production is due to the role that grapes, fruits and vegetables have in the rational nutrition of man and in increasing the national income of the cultivating countries, as well as in improving the microclimatic living conditions of of man. Viticulture, held and holds a well-defined place in the agricultural economy and the national economy, whose importance can be appreciated from several points of view. The research is based on data provided by the National Institute of Statistics and OIV regarding the area of vines intended for the production of wine grapes, table grapes or dried grapes, the production and consumption of wine by traditional producers and the trade of the producing countries of the world with an emphasis on the period 2018-2022. The following research methods were used in the elaboration of this research: monograph, analysis and synthesis with the help of statistical indicators.*

Keywords: *viticulture, production, consumption, trends*

JEL classification: Q10, Q12, Q14, Q19.

INTRODUCTION

Wine is a kind of fruit wine made from grapes. Science has proven that wine has an effect on the health of the human body, especially in terms of cardiovascular, anti-aging and other aspects. Wine has a long history in the world, and in recent years, as people pay more attention to their health, the performance of wine is increasing.

The purpose of the study is to study the current situation of the wine sector on a national and global level.

Romania is an important European wine-producing country, with rich cultural traditions, most of them directly related to this drink, which is rightly considered a divine liquor. The European Commission has adopted exceptional measures to address the current imbalances in the wine market in several EU regions.

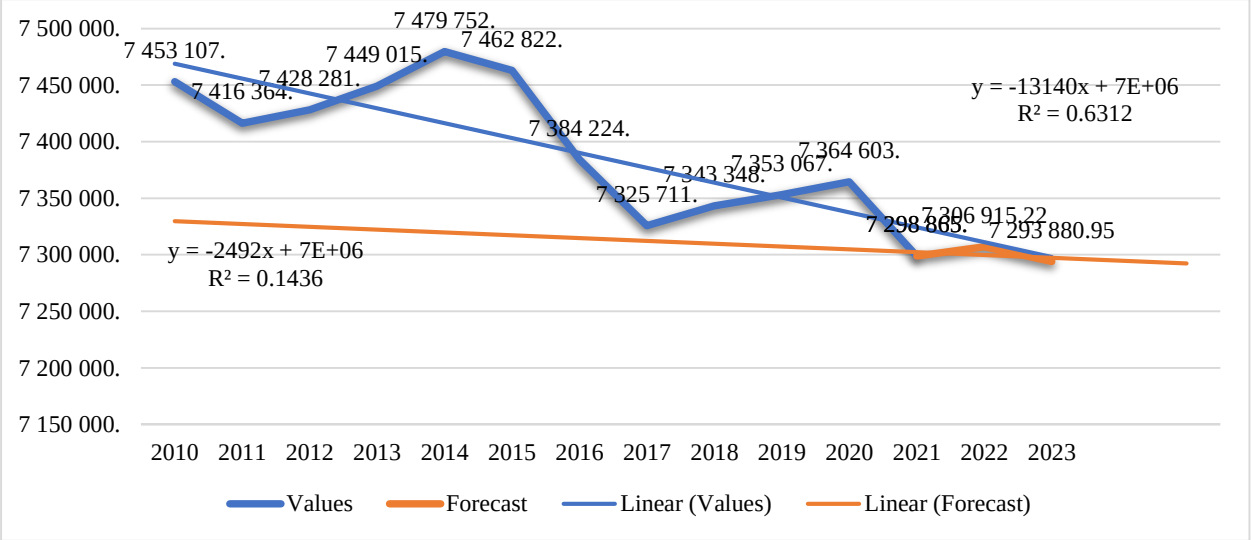
Within national wine support programmes, Member States will now be able to include crisis distillation to remove excess wine from the market. Flexibility is also granted in the implementation of support programs for wine, allowing more flexibility for green harvesting this summer and increasing the EU co-financing rate of measures related to restructuring, green harvesting, promotion and investment.

RESULTS AND DISCUSSION

The world vineyard area is estimated at 7.3 million hectares in 2022, only slightly lower compared to 2021 (-0.4%). The world area under vines refers to the total area planted with vines for all purposes (wine and juice, table grapes and dried grapes-raisins), including young vines that are not yet productive. As can be seen in figure 1, the world vineyard area seems to have stabilized since 2017. However, the current stabilization hides heterogeneous developments in the main grape growing countries.

In the year 2022, contrasting trends in three main blocs of countries. On the one hand, countries such as Moldova, Turkey, Spain, Argentina and the USA are causing a decrease in the

world's wine-growing areas. On the contrary, France, along with other important wine-growing countries such as India, Russia and Brazil, experienced an increase in wine-growing areas. The other major grape growing countries such as China, Italy, Chile and Australia recorded stable areas with no significant changes compared to 2021. These different directions tend to balance their effects worldwide.



Graph 1. Evolution of the world surface

Source: data processing according to OIV

Wine plantations in the European Union have reached a stabilization in recent years, being 3.3 million hectares. This stability can be attributed to the management and management of the wine production potential, since 2016, the authorization of new plantings with an annual increase of up to 1% of the wine area already planted in the Community countries.

As for Spain, the world's largest wine-growing country, with 955 kha in 2022, decreased by 0.8% compared to 2021. In contrast, France, the second largest area under vines -vine of the World, increased the size of its plantations (+ 0.8%) compared to 2021 and stands at 812 kha. Italy has 718 kha of area under vines, stabilizing after the expansion recorded between 2016 and 2020. Most of the other important wine-growing countries in the EU remained stable compared to 2021: Portugal (193 kha, - 0.5% / 2021), Romania (188 kha, -0.3% compared to 2021) and Germany (103 kha, 0.0% / 2021).

Outside the EU, Moldova continues the trend that started in 2018, with a significant decrease in the vineyard area to 122 kha in 2022 (-11.6% / 2021). This decline is determined by the effects of the restructuring of the wine sector. Russia increased the size of its plantations for the fifth consecutive year, reaching 99 kha in 2022 (+1.4% / 2021). Turkey has an estimated 410 kha of wine-growing area and remains the fifth largest wine-growing country in the world in 2022, even though its vine area has continued to decline since 2000.

After a long period of significant expansion, the growth of China's wine-growing area (third in the world) is slowing down in recent years and in 2022, it is estimated to be in line with that of 2021, at 785 kha. In the United States, plantings have been steadily declining since 2014, and in 2022 its vineyard area is estimated to be 390 kha, which is slightly less than the previous year. Among other factors, this size reduction was requested in recent years to overcome an oversupply problem of grapes in California.

In South America, the wine area of Argentina has been decreasing since 2015 and reaches 207 kha in 2022. It records a reduction of 4 kha, i.e. -2% compared to 2021. Reduction of vine areas in Argentina can be explained by climate factors such as water scarcity, rising temperatures and extreme drought-like conditions.

Chile's wine-growing area remained almost unchanged compared to 2021, reaching 196 kha in 2022. After eight consecutive years of continuous decline, Brazil increases the size of its plantations in 2022 by 0.8%, reaching 81 kha.

World wine production, excluding juices and musts, in 2022 is estimated at 258 mhl, which marks a decrease of almost 3 mhl (-1%) compared to 2021. This is due to a larger than expected harvest volume in Europe and the USA (despite drought and heat waves during the spring and summer) and average production levels in the Southern Hemisphere.

Table no. 1. Wine production (excluding juices and musts) in the main wine-growing countries (thousand hl)

COUNTRY	2018	2019	2020	2021	2022
Italy	54783	47533	49066	50232	49843
France	49186	42193	46673	37643	45590
Spain	44933	33676	40949	35471	35703
USA	26074	25562	22750	24070	22385
Argentina	14522	13019	10796	13436	12444
Chile	12898	11939	10337	12482	11451
Germany	10268	8218	8405	8448	8940
China	9269	7824	6587	7359	6777
Portugal	6060	6527	6418	5908	4700
Romania	5088	4620	4433	4797	4182
Russia	4293	3808	3984	4522	3889
Hungary	3699	2743	2913	3082	3200
Brazil	3084	2465	2398	2928	2900
Austria	2753	2425	2283	2469	2327
Greece	2235	2176	2257	2460	2135
Moldova	1900	1760	1800	2100	2127
Georgia	1740	1460	920	1430	1400
Switzerland	1112	979	834	893	992
Bulgaria	1084	918	823	749	756
Turkey	754	725	695	622	747
Uruguay	745	585	622	609	91

Source: OIV, https://www.oiv.int/what-we-do/global-report?oiv

Wine production in the European Union is 161.1 mhl in 2022 which represents an increase of 4% compared to the previous year and is in line with its latest five-year average. Italy (49.8 mhl), France (45.6 mhl) and Spain (35.7 mhl) together account for 51% of world wine production in 2022.

Of these three major wine producers, Italy is relatively stable in in terms of wine production, by (-1%) compared to the year 2021 and +2% compared to its last five-year average. On the other hand, France is seeing an increase in wine production not only compared to the low volume of 2021 (+21%), but also compared to its last five-year average (+7%). Due to drought and limited access to water in many regions, in Spain 2022 wine production stabilizes at +1% compared to the previous year, but is 5% below its last five-year average.

Germany is the only country to see an increase in wine production in 2022 recording 8.9 mhl being 6% higher than the previous year, thanks to drought and heat in the growing season, which were beneficial to its vineyards. with regard to production levels from 2022, the other EU wine-producing countries recorded negative variations: 6.8 mhl in Portugal (-8% / 2021), 3.9 mhl in Romania (-19% /2021), 2, 9 mhl in Hungary (-6% / 2021), 2.3 mhl in Austria (-5% / 2021) and 2.1 mhl in Greece (-14% /2021).

As for non-EU countries, Russia (4.7 mhl) increases its wine production from 2022 by 4% compared to 2021. This volume is due to favorable weather conditions, which lead to a large amount of grapes, with higher yields and a government subsidy program that pushed production to record levels. Wine production in Moldova is estimated at 1.4 mhl. This level is 2%. lower than wine production in 2021. Switzerland records a production of 1.0 mhl, which is not only a 63% increase over 2021 production, but also 15% higher than the average seen over the past five years. The heatwaves across Europe have been beneficial for Swiss vineyards, which are located at relatively high altitudes.

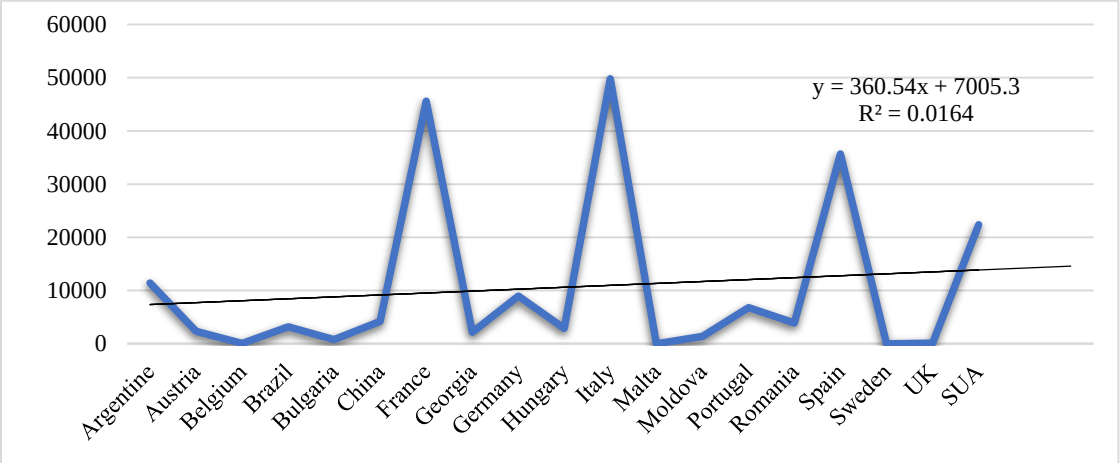
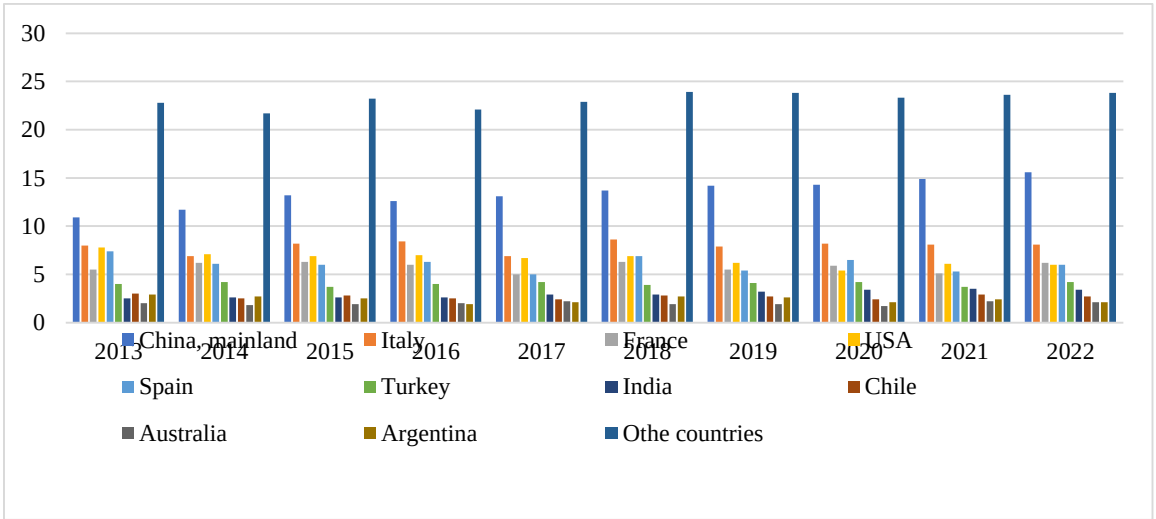


Chart 2. Evolution of world wine production, thousand hl,
Source: OIV data processing, https://www.oiv.int/what-we-do/global-report?oiv



Graph no. 3. Top 10 producers (mt)
Source: OIV, FAO, National Statistical Offices

Wine consumption

World wine consumption in 2022 is estimated at 232 mhl, marking a decrease of (-1%) 2 mhl compared to 2021. Since 2018, world wine consumption has had a downward trend, increasing in 2020 by the Covid-19 pandemic, which has had a depressing effect on many large wine markets, but also due to the war in Ukraine and the associated energy crisis, together with global supply and global production chain disruptions, leading to an increase sudden rise in production and distribution costs. This has led to significant increases in wine prices for consumers. In such a context, wine consumption behaviors at the national level were quite heterogeneous between geographical regions.

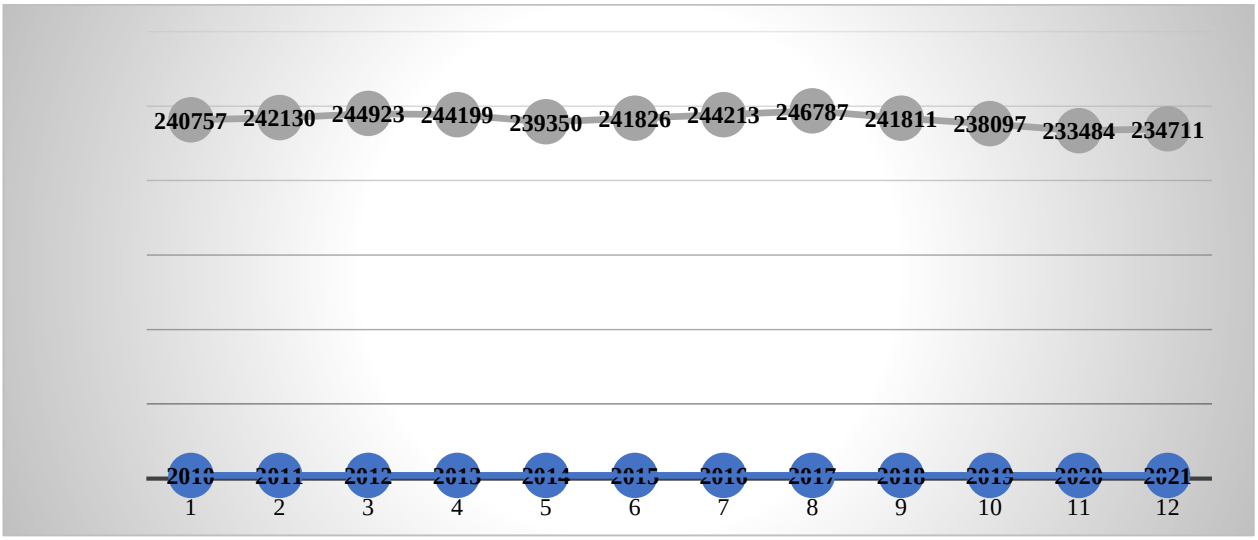


Chart .4. Evolution of world wine consumption in the period 2010-2021 (mhl)

Source: data processed according to OIV

In the European Union in 2022, a 48% share of wine consumption in the total world consumption was estimated, 2% lower than the level estimated in 2021 and compared to the year 2000, the relative share was estimated at 59%. France is the largest consuming country, is achieved with an estimate of 25.3 mhl in 2022. being the second consecutive year of positive growth, after the drop in consumption caused by the Covid19 health crisis. Italy, the third country worldwide, has an estimated amount of wine consumption of 23.0 mhl in 2022, down 5% from 2021, but maintaining its average of the last five years.

On the fourth level is Germany, which registers a consumption volume of 19.4 mhl in 2022 (-3% / 2021); Spain remains stable at 10.3 mhl in 2022 (-0.1% /2021) and Portugal shows an increase in its wine consumption level by 6.0 mhl in 2022 with an increase of 14% compared to the previous year, and of the last five-year average by +19%.

Romania registers a consumption of 3.7 mhl, with a share of -0.2% in 2021 and the Netherlands registers a negative trend compared to 2021 of -3%, respectively 3.6 mhl. Austria records a consumption of 2.4 mhl, being -0.4% compared to 2021. Similarly, the Czech Republic (2.2 mhl, +0.3% /2021) remains stable compared to 2021, but in up 6% from the five-year average. Belgium (2.0 mhl, -15% / 2021) and Sweden (2.0 mhl, -6% /2021) are decreasing in terms of wine consumption in 2022, both year-on-year and their averages over the last five years.

The fifth largest wine-consuming country in the world, Great Britain records a slight decrease in wine consumption being estimated at 12.8 mhl and a share of -2% compared to the previous year. In Switzerland the USA and the share of wine consumption is 3%.

In Asian markets, wine consumption in 2022 in China is estimated at 8.8 mhl, and in Japan at 3.4 mhl with a share between 2-3% compared to the previous year.

In South America, the largest consuming country is Argentina, with 8.3 mhl, followed by Brazil with a consumption of 3.6 mhl but with negative differences compared to 2021, respectively 1.3% and 12.9%.

International wine trade

World wine trade refers to the import/export of sparkling and bulk wine is estimated to decrease by -5% in 2022 compared to 2021.

Regarding the global export, the value is estimated at 37.8 billion euros. In terms of volume, the top three exporters are Italy (22 million), Spain (21 million) and France (14 million), and the top three importers are the USA (14 million), Germany (14 million), Great Britain (13 million).

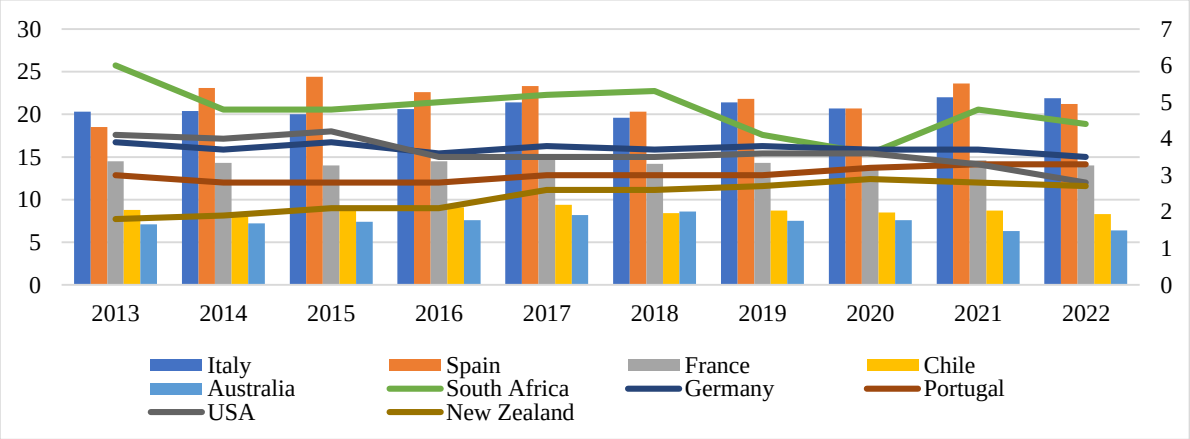


Chart 5. Top 10 exporters (mhl)

Source: OIV, FAO, GTA, ITC, National Statistical Offices

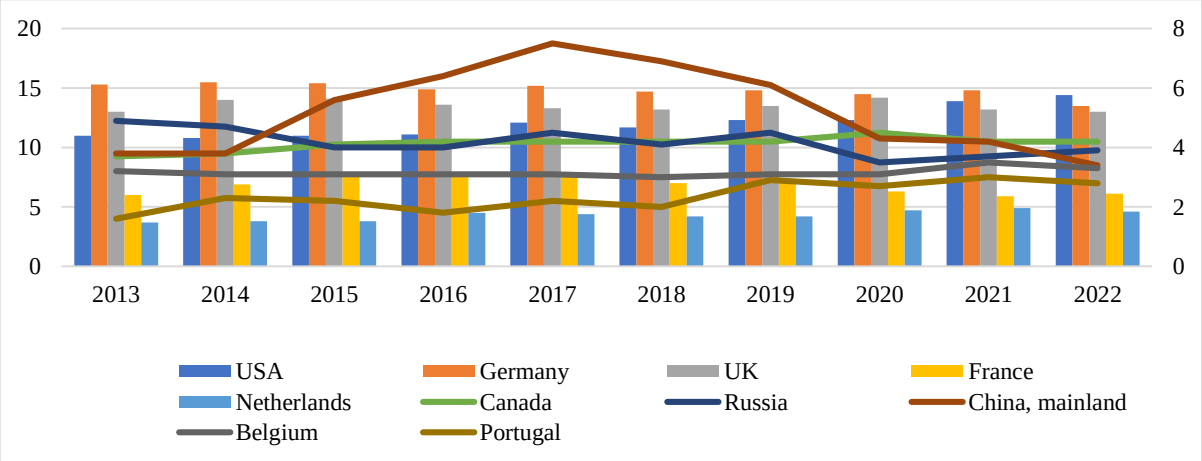


Chart 6. Top 10 importers (mhl)

Source: OIV, FAO, GTA, ITC, National Statistical Offices

Disruptive events such as the pandemic and the war in Ukraine led to strong inflationary pressure and the year 2022 was marked by global supply chain disruptions that led to a significant slowdown in shipping and more.

This combination of events resulted in a generally lower volume of wine exported at a much higher average price (+15% compared to 2021), with the value of global wine exports estimated at

€37.6 billion, the highest figure ever recorded. However, it should be noted that this sharp rise in prices is mainly driven by higher costs borne by manufacturers, importers, distributors and retailers.

CONCLUSIONS

Generally dry and hot conditions observed in various regions of the world led to early harvests and average volumes. The year 2022 was marked by high inflation, the energy crisis caused by the conflict in Ukraine and disruptions to the global supply chain. In this context, many markets have seen significant increases in wine prices, leading to a slight decrease in the volumes consumed worldwide (OIV, 2022).

In recent decades, the world wine sector has seen an overall positive trend in the production and consumption of white and rosé wines, while red wines have declined. This structural change can be attributed mainly to general changes in consumer preferences. A report prepared by the Statistics Department of the International Organization of Vine and Wine (OIV) aims to better understand this phenomenon, providing an overview of the evolution of world wine production and consumption according to color (broken down by red, white and pink) period 2000-2021.

Over the years, strategies in the wine sector have focused mainly on improving quality, as demonstrated by the recognition of a national or Community brand of origin. The 2020-2024 strategic plan and its key objectives are guided by the various challenges faced by the international wine sector, but also by the desire to integrate the 2030 perspectives of the Sustainable Development Goals (SDGs), developed under the auspices of the United Nations, into the Organization's activity (OIV strategic plan 2020-2024)

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