JOURNAL of Horticulture, Forestry and Biotechnology
Volume 29(2), 2025, 414-418
https://jhfb.ro/index.php/jhfb
Print ISSN: 2066-1797
Online ISSN: 3045-1876

Analysis of the importance of strawberry (*Fragaria × ananassa*) cultivation in the European Union and Romania: economic, technological and pedoclimatic implications

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Manuscript received: 06 November 2025; revised: 03 December 2025; accepted: 04 December 2025

Abstract
Strawberry (*Fragaria x ananassa*) is one of the most valuable horticultural crops worldwide, due to its significant economic and nutritional contribution. This paper analyzes the importance of strawberry cultivation in the European Union and Romania, by evaluating the cultivated area, production, geographical distribution and socio-economic impact. The study combines statistical analysis of official data (Eurostat, 2023; INS, 2023) with a review of the specialized literature (Anttonen et al., 2006; Voca et al., 2008; Maltoni et al., 2009), targeting both the productive dimension and the quality of the fruit and technological adaptation.
The results show that the main producing countries in the EU are Poland, Spain, Italy and Germany, due to favorable climatic conditions and the use of modern cultivation technologies. In Romania, strawberry cultivation occupies an area of about 6,000 ha, concentrated in the counties of Argeș, Prahova and Dâmbovița, with a production of approximately 20,000 tons annually (Eurostat, 2022; INS, 2023). The average production, of 6,795 kg/ha, is below the European average, being influenced by pedoclimatic factors, lack of investment and deficient agricultural infrastructure.
The SWOT analysis highlighted strengths such as the diversity of varieties, local tradition and pedoclimatic potential, but also limitations related to climate volatility and the high costs of modern technologies. The conclusions highlight the need to adopt sustainable practices, modernize production infrastructure and strengthen short supply chains. Strawberry cultivation can become a strategic vector of rural economic development, with long-term benefits for the Romanian agricultural economy.

Keywords: strawberry (*Fragaria* × *ananassa*); production; European Union; Romania; technologies; pedoclimatic potential; sustainable development

Introduction

Strawberry (*Fragaria x ananassa*) is one of the most important horticultural crops worldwide, recognized for its high economic and nutritional value (Anttonen et al., 2006; Atkinson et al., 2006). Due to its rich content in vitamins, antioxidants and fiber, strawberry consumption contributes significantly to maintaining cardiovascular health and strengthening the immune system (Moshiur et al., 2015; Shamaila et al., 1992). At the same time, strawberry cultivation plays an essential economic role in the development of the European horticultural sector, due to the increased demand on domestic and foreign markets (Eurostat, 2022; European Commission, 2023). In Europe, strawberry is included in the summer fruit category, along with peaches and melons, contributing over 8 million tons to the total fruit and vegetable production of the European Union (Eurostat, 2023). Poland, Spain, Italy and Germany stand out for their high production, driven by favourable soil and climatic conditions and modern cultivation technologies (Voca et al., 2008). European strawberry production reached 1.2 million tonnes in 2022, generating significant economic value for the agricultural sector (Eurostat, 2024; Tridge, 2023). In Romania, strawberry cultivation has a long tradition, being concentrated especially in the counties of Argeș, Prahova, Dâmbovița and Brașov, where soil and climatic conditions favour early production (INS, 2023; Bacău Vegetable Research and Development Station, 2022). However, the

Print ISSN: 2066-1797
Online ISSN: 3045-1876

average productivity remains below the European level, standing at 6,795 kg/ha (Eurostat, 2025). The differences are explained by the low level of investment in agricultural infrastructure and the insufficient use of modern protection and irrigation technologies (Maltoni et al., 2009).

Strawberries (*Fragaria x ananassa*) are among the first fruits consumed in Romania throughout the year, being appreciated for their aroma and special nutritional qualities. The quality of strawberry fruits is defined by several characteristics and is influenced by genetic factors, pedoclimatic factors (Maltoni et al., 2009, Temocico et al., 2008) and cultivation technology (Anttonen et al., 2006).

Studies show that factors such as soil texture and fertility, humidity and thermal regime play a crucial role in determining the quality and quantity of production (Temocico et al., 2008; Wozniak et al., 1997). Recent research has shown that technological parameters – fertilization, drip irrigation, mulch type and variety selection – influence the content of bioactive compounds and the organoleptic quality of fruits (Anttonen et al., 2006; Atkinson et al., 2006; Shamaila et al., 1992).

In this context, a comparative analysis of the situation of strawberry cultivation in the European Union and Romania is necessary to highlight the development potential of this crop under current conditions of climate change and market demands. The present paper aims to evaluate the economic, pedoclimatic and technological importance of the *Fragaria* × *ananassa* crop, identifying current challenges and strategic directions for the sustainable growth of the Romanian horticultural sector.

Material and Method

2.1 Objective of the study

The main aim of this study is to analyse the importance of strawberry (*Fragaria* × *ananassa*) cultivation in the European Union and Romania, by assessing the cultivated areas, production and distribution, as well as the economic and nutritional impact. The study also aims to identify the main cultivation technologies used, as well as the challenges and opportunities associated with the development of this crop.

2.2 Study area

The research focused on two geographical levels:

The European Union, where the analysis was carried out based on European statistical data on the cultivated area, production and distribution of strawberries.

In Romania, the analysis focused on national and regional data, with an emphasis on Timiș and Arad counties to assess the specific situation of the crop at local level.

2.3 Research methodology

The study combined quantitative and qualitative methods, as follows:

2.3.1 Statistical data analysis

Official statistical data were collected on: cultivated area and total and average production per hectare; geographical distribution of crops; consumption and trade trends at European and national level.

The main sources included Eurostat, the National Institute of Statistics of Romania and specialized reports on strawberry cultivation (INS, 2023).

2.3.2 Case study

In order to understand the local context, case studies were carried out in Arad and Timiș counties. Data were collected through: direct visits to farms; semi-structured interviews with farmers; observations on irrigation technologies, plant protection, soil types and cultivated varieties.

2.3.3 SWOT analysis

To assess the potential and limitations of strawberry cultivation, a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) was conducted, identifying:

- the strengths of Romanian production;
- existing weaknesses and limitations;
- medium and long-term development opportunities;
- external threats, including climate change and competition on the European market.

Results and Discussion

3.1 Importance of strawberries in the European Union

Analysis of statistical data indicates that *Fragaria x ananassa* is a benchmark crop in the European horticultural sector. In 2023, fruit and vegetable production accounted for approximately 12.6% of total agricultural production in the European Union, generating an estimated value of around 68 billion euros (European Commission, 2023). Strawberries fall into the summer fruit category, along with peaches, nectarines, melons and watermelons, with a combined production of approximately 8.6 million tonnes in 2022, down 6.3% from the previous year (Eurostat, 2023) (Figure 1).

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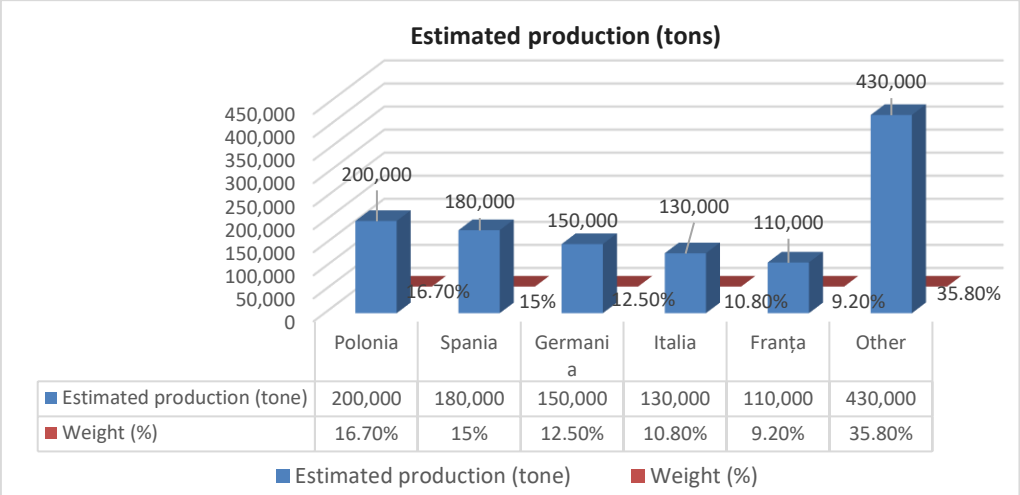

	Polonia	Spania	Germania	Italia	Franța	Other
Estimated production (tone)	200,000	180,000	150,000	130,000	110,000	430,000
Weight (%)	16.70%	15%	12.50%	10.80%	9.20%	35.80%

Figure 1. Share of strawberry producing countries in the EU

Poland is the leading producer of strawberries in Europe, contributing 16.7% of the total EU production, followed by Spain, Germany and Italy. This hierarchy is due to favorable climatic conditions and the use of advanced cultivation technologies, which allow for higher yields and high-quality fruits. The largest areas cultivated with strawberries are found in Spain (28,500 ha), Poland (20,000 ha) and Germany (12,000 ha). In Romania, the areas cultivated with this species are only about 3,272 ha (Figure 2).

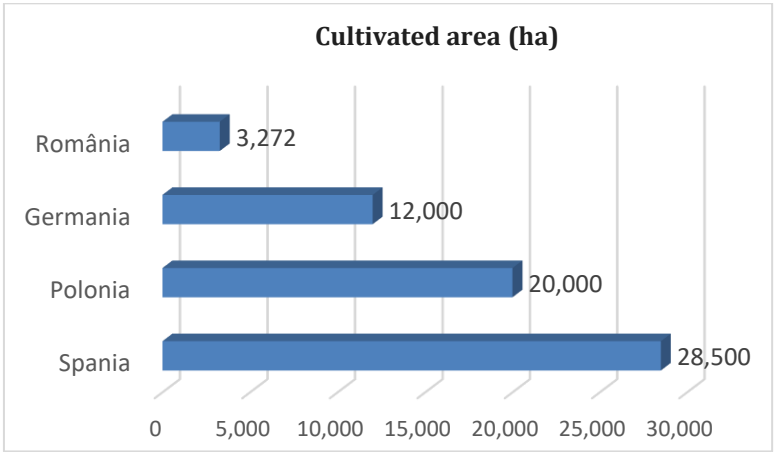

Figure 2. Cultivated area with strawberries in Romania and the EU

The largest productions are obtained in Spain (500,000 t), Poland (300,000 t), followed by Germany (180,000 t). Romania produces only 20,640 t annually (Figure 3).

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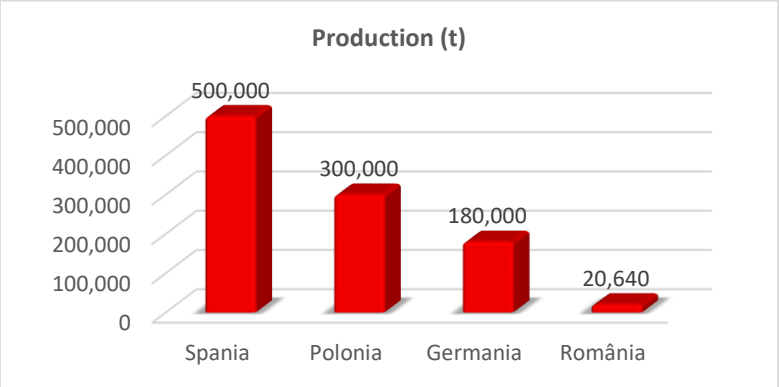

Figure 3. Strawberry production in the main producing countries

3.2 Importance of strawberries in Romania

In Romania, strawberries play a significant economic and nutritional role, being cultivated mainly in the counties of Argeș, Prahova and Dâmbovița. Historical data suggest a constant production, but influenced by factors such as limited agricultural infrastructure and variable climatic conditions. Despite these constraints, there are regional initiatives that support the development of the crop, including training programs for farmers and access to modern technologies.

3.3 Cultivation technologies and challenges

The adoption of modern technologies, such as drip irrigation, the use of substrates and crop protection in tunnels or solariums, has proven effective in increasing fruit production and quality. However, the implementation of these technologies requires considerable financial investments and advanced technical knowledge, which may limit their wide adoption.

The main challenges identified include climate change, which can generate drought or late frosts, and competitive pressure on external markets, which can influence prices and profitability. In this context, cooperation between farmers, research institutions and authorities become essential for the development of solutions adapted to local specificities and for increasing the competitiveness of Romanian strawberry production.

3.4 Interpretation of results

The results indicate that Romania has significant growth potential in the strawberry sector, but achieving this objective depends on investments in modern technologies, the promotion of varieties adapted to local conditions and the implementation of effective market strategies. Also, current consumption trends in Europe, focused on local, organic and high-quality products, offer development opportunities for Romanian producers.

Conclusions

The analysis carried out highlights the fact that *Fragaria x ananassa* represents a horticultural crop of strategic importance both at the level of the European Union and in Romania. In the European context, the strawberry contributes substantially to the total value of fruit and vegetable production, ensuring significant income and jobs in the agricultural sector. Romania, although it is below the level of European leaders in terms of cultivated area and yield, has considerable development potential, due to favourable pedoclimatic conditions and local agricultural tradition.

From a nutritional perspective, the strawberry is distinguished by its high content of vitamin C, antioxidants and dietary fibre, constituting an important element of a balanced and healthy diet. Its social impact is reflected in employment opportunities in rural areas and in the stimulation of the local economy, by involving small and medium-sized farmers in production and marketing.

Modern cultivation technologies, including drip irrigation, the use of substrates and crop protection through tunnels and solariums, have been shown to increase production efficiency and fruit quality. However, their implementation requires significant investments and adequate technical knowledge, which currently limits their widespread adoption in Romania.

The main challenges identified include climate instability, which negatively influences product yield and quality, and competition on external markets, which can affect prices and profitability of the crop. In this context, the sustainable development of strawberry cultivation requires integrated strategies, combining

applied research, investments in modern technologies, diversification of varieties and promotion of local products on both the domestic and external markets.

Finally, in order to fully exploit the potential of this crop, Romania needs to adopt coherent agricultural policies, support investments in infrastructure and technologies and promote sustainable agricultural practices, which will ensure long-term competitiveness and strengthen its position on the European fruit market.

References

[1] Anttonen, M.J., Hoppula, K.I., Nestby, R., Verheul, M.J., Karjalainen, R.O. (2006), *Influence of fertilization, mulch color, early forcing, fruit order, planting date, shading, growing environment, and genotype on the contents of selected phenolics in strawberry (Fragaria × ananassa Duch.) fruits*. J. Agric. Food Chem., 54(7), 2614–2620. https://doi.org/10.1021/jf0529955

[2] Atkinson, C.J., Dodds, P.A.A., Ford, Y.Y., Le Miere, J., Taylor, J.M., Blake, P.S., Paul, N. (2006), *Effects of cultivar, fruit number and reflected photosynthetically active radiation on Fragaria × ananassa productivity and fruit ellagic acid and ascorbic acid concentrations*. Ann. Bot., 97(3), 429–441. https://doi.org/10.1093/aob/mcj043

[3] ***Eurostat. (2022–2025), T*he fruit and vegetable sector in the EU – a statistical overview; Agricultural production – crops; Fresh vegetables and strawberries by area*. https://ec.europa.eu/eurostat/

[4] ***Eurostat. (2022), *The fruit and vegetable sector in the EU - a statistical overview.* https://ec.europa.eu/eurostat/statistics-explained/index.php/The_fruit_and_vegetable_sector_in_the_EU_-_a_statistical_overview

[5] ***Eurostat. (2023), *The fruit and vegetable sector in the EU - a statistical overview*. https://ec.europa.eu/eurostat/statistics-explained/index.php/The_fruit_and_vegetable_sector_in_the_EU_-_a_statistical_overview

[6] ***Eurostat. (2023), *Production of summer related fruits down -6.3% in 2022*. https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20230720-2

[7] ***Eurostat. (2023), *Fresh vegetables and strawberries by area*. https://ec.europa.eu/eurostat/databrowser/view/tag00115/default/table?lang=en

[8] ***Eurostat. (2023), *Agricultural production - crops*. https://ec.europa.eu/eurostat/statistics-explained/index.php/Agricultural_production_-_crops

[9] ***Eurostat. (2023), *Production of summer related fruits down -6.3% in 2022*. https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20230720-2

[10] ***Institutul Național de Statistică al României. (2023), *Crop production for major crops in 2023*. https://insse.ro/cms/sites/default/files/field/publicatii/productia_vegetala_la_principalele_culturi_in_anul_2023_0.pdf

[11] ***Institutul Național de Statistică al României. (2023), *Crop production for major crops in 2023*. https://insse.ro/

[12] Maltoni, M.L., Faedi, W., et al. (2009), *Quality and sensory evaluation of strawberry cultivars grown under different environments*. Acta Horticulturae, 842, 667–672. https://doi.org/10.17660/ActaHortic.2009.842.146

[13] Moshiur, R., Rahman, M.M., Hossain, M.M., Mian, M.A.K., Khaliq, Q.A. (2015), *Field performance and fruit quality of strawberry genotypes under subtropical climate*. Bangladesh J. Agril. Res., 40(1), 137–151. https://doi.org/10.3329/bjar.v40i1.23773

[14] Shamaila, M., Baumann, T.E., Eaton, G.W., Powrie, W.D., Skura, B.J. (1992), *Quality attributes of strawberry cultivars grown in British Columbia*. J. Food Sci., 57(3), 696–699. https://doi.org/10.1111/j.1365-2621.1992.tb08067.x

[15] ***Stațiunea de Cercetare-Dezvoltare pentru Legumicultură Bacău. (2022), *Modern technologies in strawberry cultivation*. https://www.scdlb.ro/tehnologii-moderne-in-cultura-capsunului

[16] Temocico, G., Duma, M., Popescu, D. (2008), *Research on the influence of pedoclimatic conditions on strawberry production in Romania*. Scientific Papers USAMV Iași, 51, 312–317.

[17] Tridge. (2023), *Strawberry production in Romania – how much is produced, where it is exported.* https://agrobiznes.ro/57242-productia-de-capsune-in-romania-cum-a-evoluat-piata

[18] Voca, S., Dobricevic, N., Dragovic-Uzelac, V., Duralija, B., Druzic, J., Cmelik, Z., Babojelic, M.S. (2008),. *Fruit quality of new early ripening strawberry cultivars in Croatia*. Food Technol. Biotechnol., 46(3), 292–298. https://hrcak.srce.hr/26479

[19] Wozniak, W., Radajewska, B., Reszelska-Sieciechowicz, A., Dejwor, I. (1997), *Sugars and acid content influence organoleptic evaluation of fruits of six strawberry cultivars from controlled cultivation*. Acta Hortic., 439, 333–336. https://doi.org/10.17660/ActaHortic.1997.439.52