

ASPECTS REGARDING SUNFLOWERSEED CROPS IN BRAILA COUNTY, ROMANIA

A.D. DINCĂ¹, S. STANCIU², Cristina STOICA (DINCĂ)²

¹"University of Agronomic Sciences and Veterinary Medicine of Bucharest", București, Romania

²"Dunărea de Jos" University of Galați, Romania,

Corresponding author: sstanciu@ugal.ro

Abstract. The sunflower is one of the most important agricultural crops grown worldwide, being grown mainly for its nutrient- and oil-rich seeds. The study focuses on the impact of stress factors on the sunflower crop in the Northern Bărăganului Plain, in Braila County, Romania, considering the importance of this crop for agriculture in this region. The Northern Bărăganu Plain is an important area for sunflower production, and stress factors can have a significant impact on yield and crop quality. In the farms of Brăila County an increase in the amounts of fertilizers in the last three years can be observed, as well as in the amounts of pesticides used, especially herbicides and fungicides, used due to mechanization and intensive cultivation and the reduction of labor in agriculture. Understanding how stressors affect crops can provide valuable information for farmers and develop effective strategies to reduce negative impacts. In conclusion, stress factors such as drought, high temperatures, disease and pest attack or nutrient deficiency can negatively influence the sunflower crop in the Northern Bărăganului Plain. In this regard, it is important that farmers adopt appropriate agricultural practices and take protective measures to minimize the impact of these factors on yield and crop quality.

Keywords: sunflower, agriculture, Bărăgan Area, Romania

INTRODUCTION

In Romania, agricultural land represents 61.4% of the country's total surface, according to the data provided by the National Institute of Statistics, agriculture being the most important activity in the countryside both economically and socially. (STOICA, ET. AL.2018) The diversity of climatic, pedological, ecological and economic conditions existing on the territory of the country requires a differentiated territorial distribution of agricultural production. Ever since the formation of the Romanian school of agrarian economy, Ion Ionescu from Brad, noticed the zonal character of agricultural production, making some recommendations regarding the place where different crops can be developed more profitably. (BACANU, ET.AL. 2018) In Romania, the sunflower is the third agricultural plant in terms of cultivated area, assuring domestic producers the first position in terms of area and total production at the European level in recent years. But the Romanian agricultural sector owns approximately 30% of all European farms, but contributes only 3% to the EU's total agricultural production (FLOREA ET AL, 2019). The sunflower culture extends mainly in the countries of southern and eastern Europe, such as Romania, Bulgaria, Turkey or France (EUROSTAT, 2024) (Fig. no. 1).

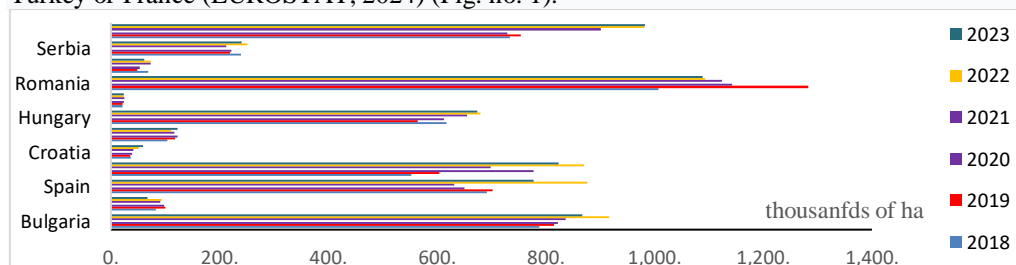


Figure 1. The area cultivated with sunflowers in Europe. Source Authors based on (EUROSTAT, 2024)

This plant is valued for its various uses, the most widespread of which is the production of vegetable oil. Sunflower oil is used in the food, pharmaceutical and cosmetic industries, and the seeds are eaten as a snack or used in the pastry and confectionery industry. Sunflower culture also has an impact on the environment, being a honeydew plant that attracts numerous pollinators and promotes biodiversity in agricultural areas. Although the culture has special requirements related to the temperature and humidity regime, which can decisively affect the level of production obtained, the vegetation factors are important regardless of the quantitative ratio in which each intervenes in the process of plant growth and development, and the neglect of these aspects can have negative consequences on the production obtained (PANDREA,2012).

The law of the ranking of vegetation factors limiting production and the priority of intervention in case of restriction of some of the vegetation factors, represents a new concept related to the conditions of intensive agriculture. (DAVIDESCU ET.AL.1992).

When culture technology does not provide a plant community with the requirements related to the environmental factors written in the genetic code (water supply, food, air, carbon dioxide, light, heat, density, nutrition space), then the plants sense the conditions that they have them at their disposal through natural factors or through applied culture technology, and self-regulate staged growth, development, photosynthesis, transpiration, leaf index, harvest, to existing conditions so as to ensure the perpetuation of the species, even if it produces a single grain. In the situation of restrictions applied to some vegetation factors (water, food, light, temperature, etc.), a certain ranking of their importance for the growth and development of plants is created, corresponding to the phylogenetic evolution and the environmental conditions. According to the Code of Good Agricultural Practices developed by the National Meteorological Administration of Romania (ANM), the changes in the climate regime fall within the global context, but with the particularities of the geographical region in which our country is located. (ANM, 2023).

It could be noted that in Romania the drought is the limiting factor that manifests itself on the largest agricultural area, especially in the Romanian.

Plain, in the South-East of Moldova and in Dobrogea. In normal years, when the climatic factors are favorable, with precipitation within normal limits, sunflower hybrids have the ability to achieve maximum production. Even in the presence of some stress factors, it has the ability to react, through different biochemical mechanisms, and generate important productions, so that there are no important losses at the level of the harvests obtained. Sunflower crops can also be affected by a number of pathogens, which have emerged and spread with the plants. In general, cultivated plants are more sensitive than wild ones, having to develop in conditions that differ from the natural ones, in the areas of origin. The exchange of plant products favored the spread of pathogens from one geographical area to another (ION, 2010).

MATERIAL AND METHODS

The methods used to develop the paper were analysis, synthesis and comparison. The data regarding the agricultural areas cultivated with sunflowers and the production obtained were selected from the data of the National Institute of Statistics NIS and from the Statistical Yearbook of Romania (2024), Eurostat, General Directorate of Research Services of the European Parliament. Where necessary, data were selected and used from specialized scientific articles or from the specialized journals of Romanian agricultural associations, with a corresponding citation. The collected information was analyzed, processed statistically and represented graphically. When interpreting the results, the conclusions were correlated, where appropriate, with relevant research from the specialized literature.

RESULTS AND DISCUSSIONS

At the level of the European Union, Romania ranks first in the area cultivated with sunflowers, holding in 2023 almost 23% of a total of 4.6 million hectares registered by the Member States (EUROSTAT, 2024). (Fig.no. 2).

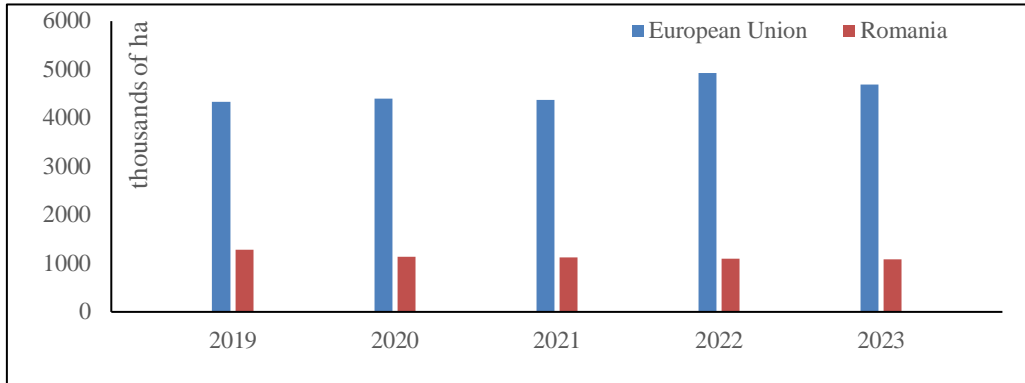


Figure 2. Area cultivated with sunflowerseed in EU and Romania 2019-2023
Source Authors based on EUROSTAT (2024)

Romania annually produces approximately 17% of the sunflower production in Europe by companies specialized in the cultivation of plants, whose turnover, according to according to KeysFin data, it recorded the second highest nominal annual growth in the last 10 years of over 8 billion lei, reaching the historical maximum of 68 billion lei in 2022, being 48% higher than in 2018 (EUROSTAT, 2024) (Fig. no. 3)

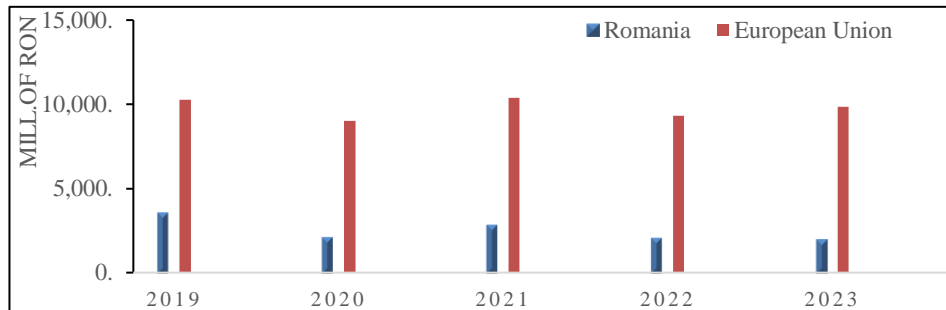


Figure 3. Sunflower production 2019-2023. Source Authors based on EUROSTAT (2024)

In Romania, sunflower can be cultivated with good results in all agricultural regions where it meets favorable climate and soil conditions. The areas with the largest areas cultivated with sunflowers are in the South-East region, where in 2023 277,994 ha were cultivated, representing 21% of a total of 1,077,867 ha cultivated nationally (INS, 2024) (Fig. no. 4).

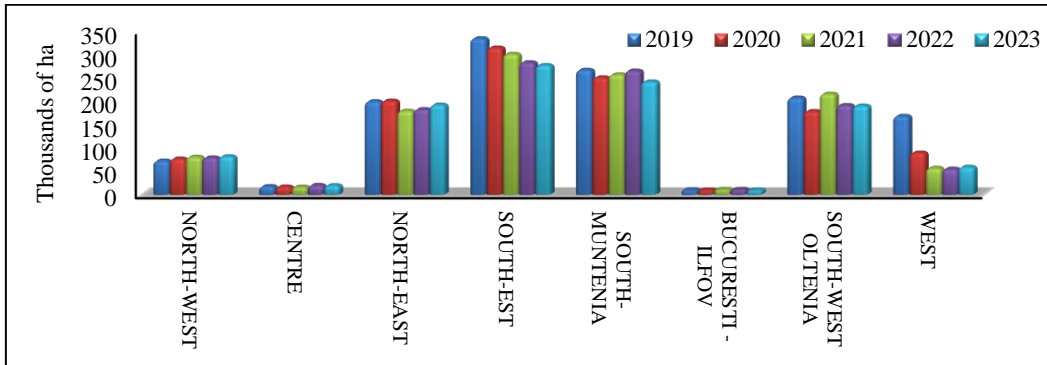


Figure 4. Area cultivated with sunflower by region 2019-2023
Source Authors based on NATIONAL INSTITUTE OF STATISTICS (2024)

Within the South-East region, the largest area is cultivated in Constanta county, followed in 2019-2020 by Braila county, but in the last three years, areas in Galati and Tulcea counties have increased.(INS, 2024) (Fig. no. 5)

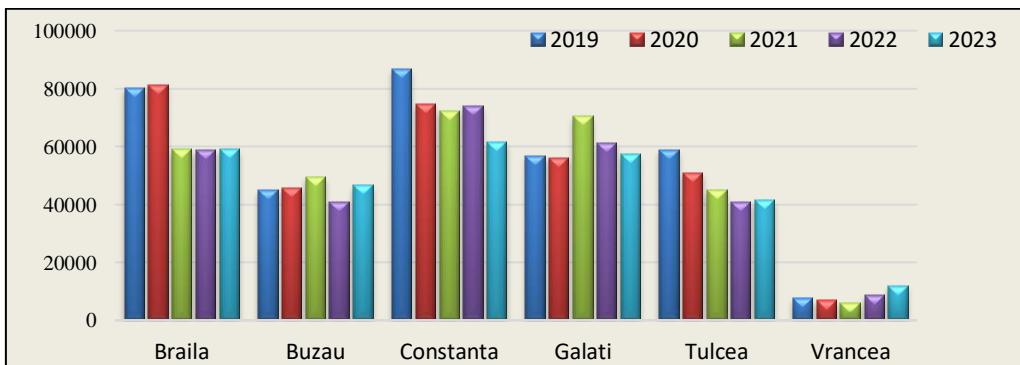


Figure 5. Area cultivated with sunflower in South - East Region 2019-2023
Source: Authors based on NATIONAL INSTITUTE OF STATISTICS (2024)

In 2021, there was a sudden decrease in the areas cultivated with sunflowers at the level of Braila County from 81454 ha in 2020 to 58946 in 2021, areas that have remained at this level for three years. Regarding the production obtained, in 2019 in Braila County an average production of 2781 kg/ha was achieved, in the following years this is continuously decreasing, in 2023 an average production of only 1838 kg/ha was achieved (INS, 2024) (Fig. no. 6).

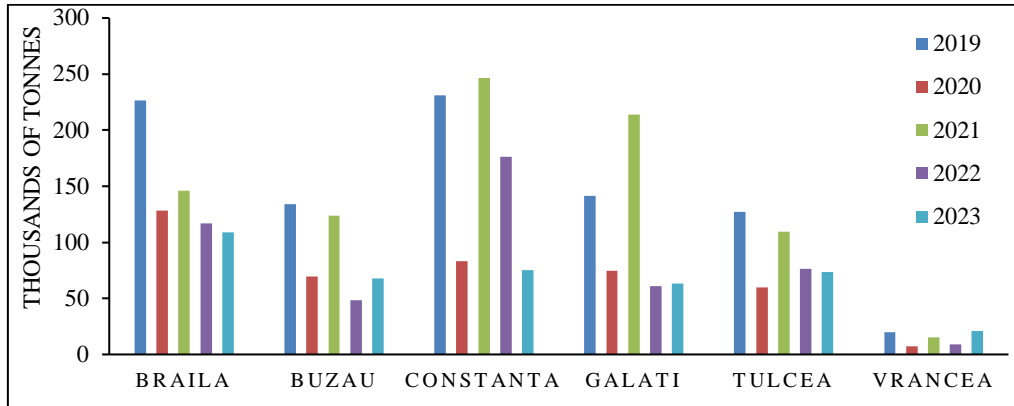


Figure 6. Sunflowerseed production in Southeast Region 2019-2023
 Source Authors based on NATIONAL INSTITUTE OF STATISTICS (2024)

According to the researchers from INCDA, the sunflower is one of the drought-resistant plants due to its highly developed root system (being able to use water from deep layers up to 150 cm deep), the porosity of the plants, the storage of certain amounts of water in the core of the stem and especially due to the fact that plants endure temporary tissue dehydration (withering of leaves caused by drought). However, long-term drought (in the soil, associated with dry air) causes important changes in the growth and development of plants (INCDA FUNDULEA,).

Romania's National Strategy on Climate Change for the period 2013-2020 specifies that the areas affected by frequent drought at the national level have expanded in recent decades, reaching 7.1 million ha in recent years (GUVERNUL ROMANIEI, 2023).

The South and South-East of Romania are the agricultural areas considered the most vulnerable to pedological drought (Fig. no. 7).

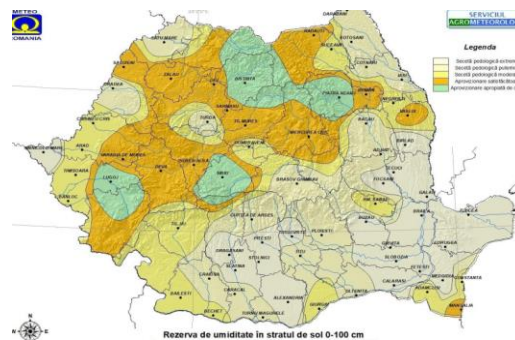


Figure 7. Agricultural areas affected by drought in Romania
 Source: <https://www.meteoromania.ro/>, 2024

According to the European Environment Agency (EEA), the precipitation regime is changing, with generally increasing precipitation in wet regions and decreasing precipitation in arid regions. Forecasts show that southern and southeastern Europe will be climate change hotspots, with the largest number of negative impacts expected here. This region is already experiencing significant increases in extreme positive temperatures, but also decreases in

precipitation and river flows, which have increased the risk of more severe droughts, lower crop productivity, and loss of biodiversity (EEA,2024)

The phenomenon of global warming in recent years manifests itself even in the short term, with an increase in average monthly temperatures being highlighted in recent years. The year 2023 ranks first in the list of the warmest years in Romania, a list made based on data from 129 meteorological stations with a complete line between 1961 and 2023 (ANM, 2024). The first limiting factor of production in intensive agriculture (DAVIDESCU and DAVIDESCU, 1992) is water, when temperature and light intensity are disregarded. In case of water shortage, the other vegetation factors, which may be optimal, do not act either. At the level of Braila county, the water deficit has been reported often in recent years, and the distribution of precipitation by month has undergone changes, having long periods without precipitation followed by abundant precipitation in a short period of time (STOICA et.al.,2018) (Fig. no. 8).

This fact caused the irrigation systems to expand in this area, covering more and more important agricultural areas (ANIF,2024). Irrigation infrastructure is a vital component for modern and competitive agriculture. According to the INS, in 2023, 514,737 hectares were irrigated in Romania, of which 235,832 ha were in Brăila county. If in 2019 the surface on which at least one irrigation was applied in Braila County was 140,615 ha, in 2023 it increased to 235,832 ha (INS, 2024).

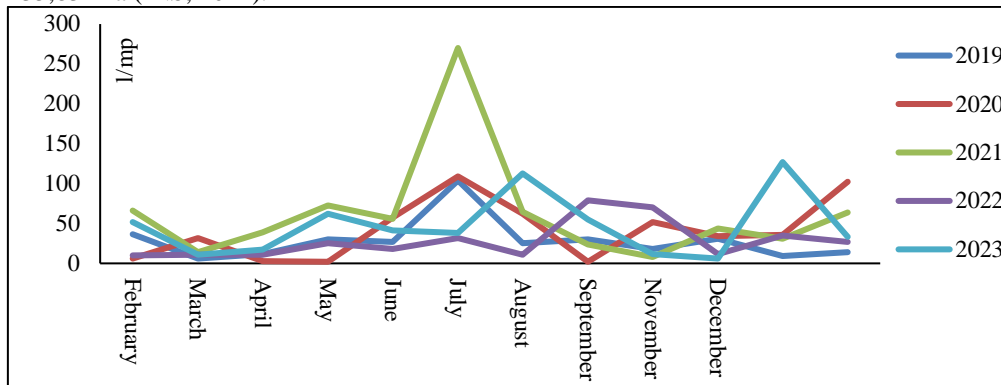


Figure 8. Average rainfall in Unirea, Braila county
Source Authors, based on data from own station (2024)

But the irrigated area at the county level is 377,077 ha. This shows the fact that there are still large areas in this area that are dependent on natural precipitation and the productions are unfortunately quite limited (Fig. no. 9).

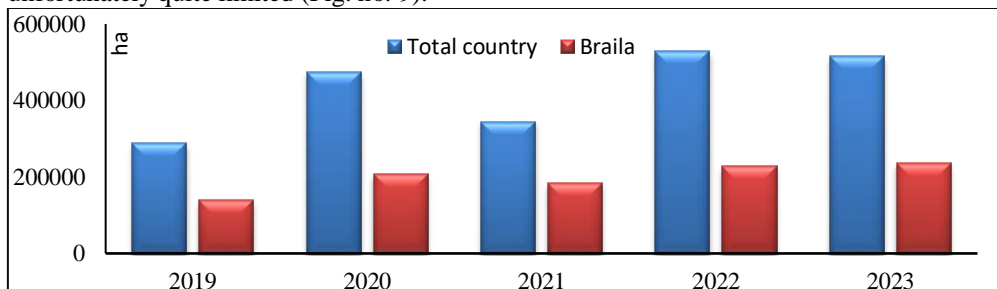


Figure 9. Area irrigated area in the Northern Baragan Plain (Braila)
Source: Authors based on INSTITUTE OF STATISTICS (2024)

Another limiting factor of production is the nutrients that the plant takes from the soil or from the administered chemical fertilizers (DAVIDESCU D., DAVIDESCU V., 1992). If the plant is provided with sufficient amounts of water, but does not have the necessary nutritional resources, then it adapts, without to reach the genetic production potential. In order to cover the needs of agricultural crops for nutrients, at the level of Brăila county, an increase in the amounts of fertilizers administered to agricultural crops can be observed in recent years (Fig.no. 10).

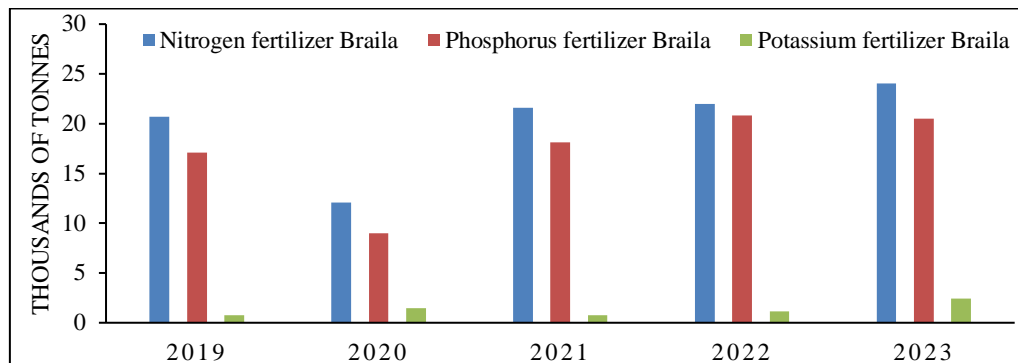


Figure 10. Chemical fertilizers applied in the North Bărăganului Plain (tonnes s.a./ha)
Source: Authors based on INSTITUTE OF STATISTICS (2024)

A third factor considered restrictive for the optimization of sunflower production is the physical and hydro physical properties of the soil (DAVIDESCU AND DAVIDESCU, 1992).

The monitoring of soil quality in Romania has revealed a series of problems regarding the use of land in Romania as a result of the manifestation of one or more limiting factors, such as: moisture deficit, salinization and alkalinization, soil erosion, water agglomeration, low content of organic matter, soil acidity, compaction, pollution, reduced soil volume, etc (MIHALACHE, ET.AL., 2015).

A heavy, non-aerated soil cannot properly exploit the other factors and the results are not satisfactory. In the area of Bărăganu, the soils are fertile, having a predominantly rich composition in chernozem, with a high humus content (STOICA ET.AL., 2018) (Fig. no. 11).

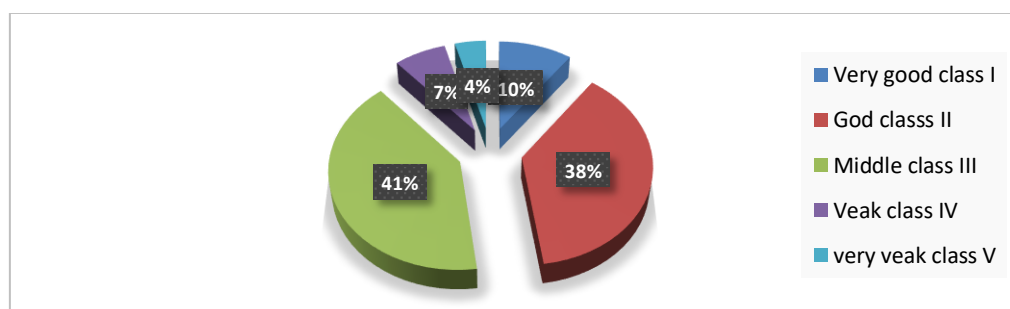


Figure 11. The production potential of the land
Source: Authors, by using Pro Braila

The fourth restrictive factor are the production potential of the variety, respectively the ability of the hybrid/variety to give high yields (DAVIDESCU ET.AL.,1992). Among the essential

factors that contribute to the increase of agricultural production, the most effective is the use of a quality seed, free from diseases and pests (STANCIU ET. AL. 2007)

The stability of a hybrid, which is the most important technological link, means its ability to adapt in different crop areas, high tolerance to various stress factors (climatic, biological, anthropic, etc.), the possibility to adapt the yield different biochemical processes to achieve performance (BACANU, ET.AL. 2018).

This means that in normal years, without major problems related to environmental factors, hybrids are capable of high productions, but above all they have the ability to react through biochemical mechanisms in the presence of stress factors and to be able to generate important productions, thus so that there are no very high fluctuations in productivity. (DUMITRIU, ET.AL. 2018) Multinational companies produce seed in Romania to ensure a seed base adapted to the national pedoclimatic conditions and to ensure the need for seed with high biological and cultural value for agricultural producers (MADR, INCS,2024).

In the year 2019-2023, the area established in Romania with sunflower hybridization lots was between 6640 ha and 5005 ha, annually, with an average production of 1543 kg/ha (INCS,2024) (Fig. no.12).

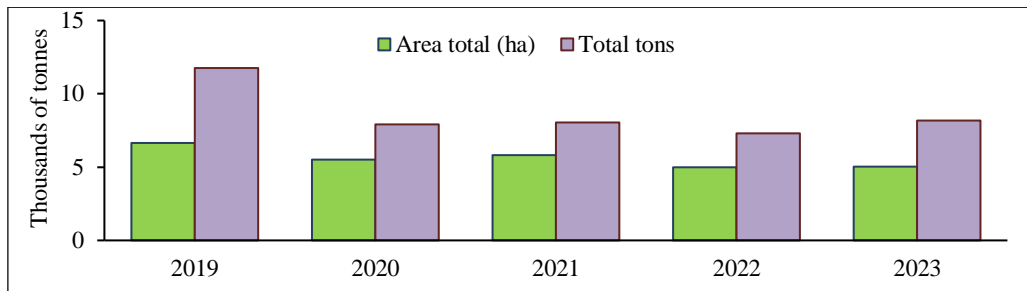


Figure 12. The production of sunflower hybrid seeds in Romania
Source: Authors based on INCS (2024)

At the Brăila County, in 2019, sunflower seed was produced on an area of 423 ha, from which a quantity of 630 tons was obtained, with an average production of 1489 kg/ha. In 2020 the average production was 1263 kg/ha, in 2021 it was 1941 kg/ha, in 2022 the average production was 2350 kg/ha and in 2023 it was 1641 kg/ha (INCS,2024). Fig.no. 13)

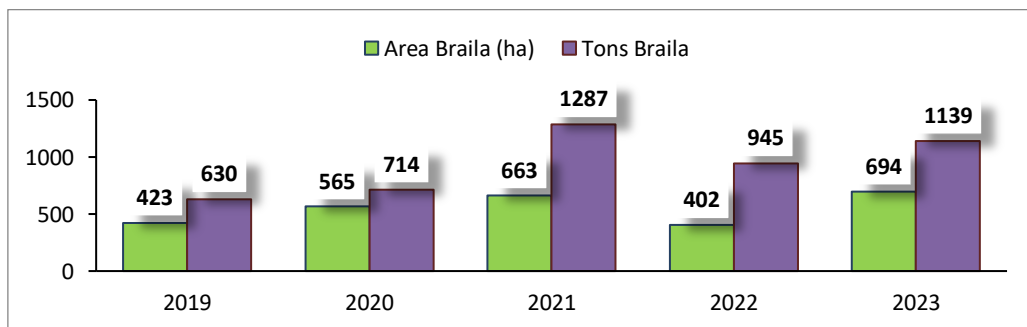


Figure 13. Sunflower hybrid seed produced in Brăila county. Source: Authors based on INCS (2024)

The fifth limiting factor for sunflower cultivation is the fight against weeds, diseases and pests (DAVIDESCU, 1992). Drought conditions greatly accentuate the favorable factors for the development of some harmful insects specific to the arid zone.

The weevil *Tanymecus dilaticollis* is a polyphagous insect, affecting more than 30 species of cultivated and spontaneous plants. In the event of a massive appearance of pests, the areas cultivated with sunflowers are significantly affected, and if timely measures are not taken to combat them, the crops are completely destroyed and their re-sowing is required. Sunflower crops show a strong and diversified infestation with annual and perennial mono- and dicotyledonous weeds.

Analyzing the consumption of pesticides over a period of 3 years at the level of Brăila County, a slight decrease in the consumption of these agricultural treatments can be noted, especially for herbicides and fungicides (INS, 2024). These fluctuations are due, on the one hand, to the mechanization of farm work and, on the other hand, to the reduction/lack of labor employed in agriculture (BACANU ET.AL 2018) (Fig. no. 14).

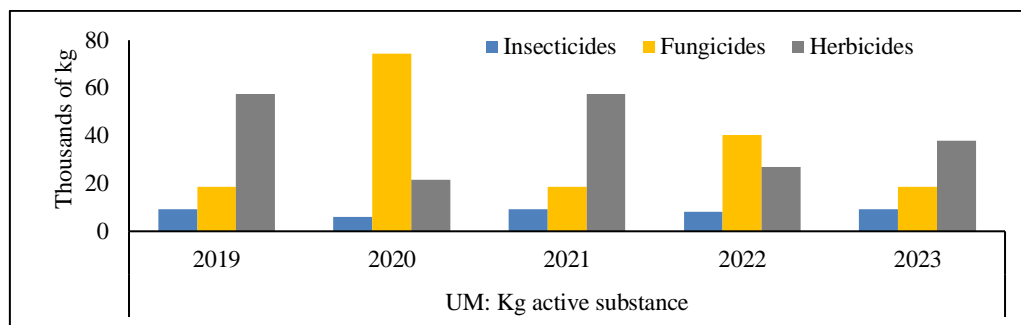


Figure 14. The consumption of pesticides at the level of Brăila county
Source: Authors based on INSTITUTE OF STATISTICS (2024)

CONCLUSIONS

The study carried out aimed at an analysis of the surfaces and the production capacity of the specialized agricultural areas in the Northern Bărăganului Plain, as well as the factors that influence its production and quality. Cultivated agricultural areas, the influence of some climatic and pedological factors on agricultural yields were evaluated. Following the research carried out, the authors highlighted the presence of a high agricultural potential in the North of the Bărăganu Plain and the existence of specialized producers, but the local production capacity is limited by the action of some restrictive factors, especially in the field of climate changes, by the absence of an efficient irrigation system, the fragmentation of agricultural land and the insufficiency of specialized labor. The results of the research are useful to farmers in Brăila County, the academic environment and officials and can form the basis for the development of local and national strategies in the agricultural sector. In order to ensure adequate and sufficient production, the vegetation factors must contribute equally, regardless of the quantitative ratio with which each one contributes to the process of plant growth and development, and the neglect of one of them can have negative consequences on the culture, as well as on final harvests.

Culture technology must equally ensure other factors such as light, water, heat, etc. Nutrient provision can be done more easily compared to other vegetation factor, but this does not mean that proper nutrition can be sufficient for plant growth and development. In the farms of Brăila County an increase in the amounts of fertilizers in the last three years can be observed, as well as in the amounts of pesticides used, especially herbicides and fungicides, used due to mechanization

and intensive cultivation and the reduction of labor in agriculture. In the North Bărăganului Plain there are extensive areas where, due to the lack of irrigation systems, the drought phenomenon cannot be controlled, and this is one of the cultural factors that can compromise the entire harvest.

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