

## RISKS ANALYSES AND CHALLENGES IN CROP MANAGEMENT IN ROMANIA

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### **Abstract**

*Crop management in the Romanian agriculture faces many risks and challenges that directly influence the technical and economic performance of the farms and implicitly the sustainability of the agricultural sector. These challenges range from climate change to resource issues, from plant health problems to market and regulatory issues. It is therefore essential to understand these issues in detail to develop effective crop management strategies and support Romanian agriculture in the face of a complex and changing environment. Through methods of statistical analyses and bibliographic documentation, we will identify and analyze these risks and challenges in detail in order to obtain a more comprehensive picture of the agricultural landscape in Romania in order to develop some necessary measures to reduce and, as far as possible, eliminate these risks. Data were collected from public institutions, from the official National Institute of Statistics, NIS, website Tempo-Online. The aim of crop management in Romania, as in any other country, is to ensure efficient, sustainable and profitable agricultural production. By adopting these recommendations and proactively addressing risks and challenges, agriculture in Romania can become more resilient and sustainable, further ensuring the supply of high-quality food and contributing to the country's economic development.*

**Key words:** climate change, adaptation to new technologies, sustainability

### **INTRODUCTION**

Cereals are very important at the global level to sustain population and farm animals life, and also for biofuel [15].

Crop management in Romania faces a number of risks and challenges, many of which are common to other countries, but with certain particularities. Here are some of the most significant:

-Climate change has increased the frequency and intensity of extreme weather events such as droughts, floods and temperature fluctuations. These can significantly affect agricultural production and put pressure on the irrigation system [4].

-Drought is a significant problem in Romania and water resources can become limited in dry years. Farmers face challenges in securing access to water for irrigation and crop needs. Excessive use of pesticides and chemical fertilisers can lead to pollution of soil and

water resources, as well as pest resistance to pesticides. Farmers need to strike a balance between crop protection and sustainable chemical management.

-Diseases, pests and weeds can cause significant crop losses. The development of pesticide resistance and climate change can exacerbate these problems.

Sustainable soil management is a major challenge, as intensive farming can lead to soil degradation and reduced fertility. Soil conservation and the adoption of sustainable agricultural practices are becoming increasingly important.

- Today, more than ever, farmers face uncertainties related to crop prices, market demand and economic fluctuations which significantly affect the profitability and sustainability of agricultural businesses.

-Changes in agricultural policy and environmental regulations can have a significant impact on how farmers manage

their crops, as they have to adapt to new legislative requirements and changing environmental standards.

-Agriculture faces a shortage of skilled labor, especially for activities such as harvesting, leading to crop losses and increased production costs.

-Romanian agriculture must face international competition and the export of agricultural products can be influenced by global factors such as tariffs and quality standards.

-Farmers need to adapt to technological developments and implement digital solutions to improve their efficiency and productivity. Cereals business has come into a risky and uncertain situation concerning the production costs as a consequence of higher prices for farm inputs which started from 2021 fall and the situation was amplified by the conflict between Russia and Ukraine which increased fuel and energy prices with a negative effect on all the other prices in the economy [15,16]. Crop management in Romania therefore requires a strategic approach and adaptability to address these risks and challenges and to ensure sustainable and profitable agricultural production.

Cereals are raw materials of agricultural origin and are of particular importance in world agriculture, as they play an important role in human nutrition and are also a basic element in animal feed ration [3, 6, 7].

The aim of crop management in Romania, as in any other country, is to ensure efficient, sustainable and profitable agricultural production. However, there are many risks and challenges associated with crop management in the Romanian specific, and the aim of this approach is to identify them and propose solutions to manage them.

## MATERIALS AND METHODS

The data that contributed to the realization of this study were collected from public institutions, from various professional websites, and from various specialized articles, and the statistical data were taken from the official National Institute of Statistics, NIS, website Tempo-Online, with the following codes:

-AGR108A - Area under main crops;

-AGR109A - Crop production of main crops;

-AGR111A - Area under vines;

-AGR114A - Number of fruit trees;

-AGR210A - Volume of agricultural labor force.

The methods used were: documentation, comparative analyses and statistical interpretation of these data.

## RESULTS AND DISCUSSIONS

Risks and challenges in crop management in Romania include several issues that can affect agricultural production and the sustainability of the sector.

Here is a more detailed description of these risks and challenges:

**Climate change** - Romania has seen significant changes in climate patterns, with rising average temperatures and extreme weather events such as prolonged droughts and floods.

*-Drought and water management* - drought is a recurrent problem in Romania and water resources can become limited in dry years. Protection against pests and diseases - pests and diseases can cause significant damage to crops.

*-Inefficient use of fertilisers and pesticides* - uncontrolled use of chemical fertilisers and pesticides can lead to soil and water pollution and affect the quality of agricultural products.

*-Soil sustainability and conservation* - improper use of agricultural land can lead to soil degradation and decreased soil fertility.

*-Price and demand fluctuations* - farmers face risks related to fluctuating crop prices and variable market demand.

*-Agricultural policies and regulations* - changes in agricultural policy and environmental regulations can have a significant impact on how crops are managed.

*-Lack of skilled labor* - agriculture faces a shortage of skilled labor.

The goal of crop management in Romania is to address these risks and challenges by developing sustainable production strategies, optimizing resource use, adopting advanced technologies, adapting to climate and

legislative changes, and ensuring food security and profitability of the agricultural sector.

It is important that farmers, government authorities and other stakeholders work together to effectively manage these challenges and promote the sustainable development of agriculture in Romania.

### Cultivated area with selected agricultural crops

The dynamics of the cultivated area with cereals for grains: common wheat, barley, grain corn and also with rape is shown for the period 2018-2022 in Table 1, based on the data collected from NIS Tempo-online.

Table 1. Areas cultivated with the main crops (total Romania) (ha)

Unit of measure: Hectare						
Crops	Forms of ownership	2018	2019	2020	2021	2022
Cereals for grains	Overall	5,257,168	5,569,090	5,338,067	5,351,547	5,183,820
	Private sector	5,237,554	5,547,499	5,313,017	5,312,011	5,144,991
	Individual farms	3,285,879	3,262,296	3,133,764	2,807,933	2,778,807
Common wheat	Overall	2,110,520	2,162,645	2,150,987	2,167,716	2,162,096
	Private sector	2,098,657	2,152,078	2,137,421	2,146,655	2,142,379
	Individual farms	1,039,689	1,022,767	1,045,415	943,076	923,894
Barley	Overall	250,797	285,065	292,079	333,007	322,730
	Private sector	249,305	283,199	289,862	330,599	320,211
	Individual farms	98,012	95,624	83,619	89,956	86,761
Grain corn	Overall	2,439,842	2,678,504	2,537,104	2,549,281	2,431,106
	Private sector	2,435,500	2,671,704	2,530,079	2,536,239	2,417,475
	Individual farms	1,779,675	1,788,167	1,720,213	1,569,108	1,579,805
Rapeseed	Overall	632,679	352,622	362,865	445,918	468,870
	Private sector	629,462	351,046	361,001	441,105	464,613
	Individual farms	145,155	120,033	97,775	105,536	90,614

Source: NIS, <http://statistici.insse.ro> [12].

The area under main crops is the area sown or planted in the main field in the reference agricultural year or in previous years (biennial, triennial or perennial crops) with a main crop occupying the land for most of the year.

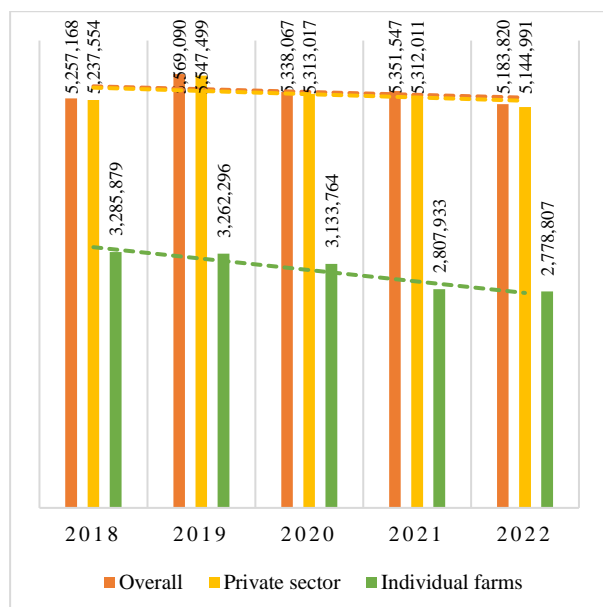


Fig. 1. Dynamics of the area with cereals for grains in Romania, 2018-2022 (ha)

Source: Own design based on the data from NIS, <http://statistici.insse.ro> [12].

Otherwise, we can say that grain crops are on a downward scale (especially individual crops), with percentages of -1.4% for the total number, -1.77% for the private sector and -15.43% for individual crops (between reference years 2018 - 2022) (Table 1, Fig.1). Regarding the common wheat crop, data is presented, the scale is upward for total and private numbers, but downward for individual numbers. Expressed in percentages, these would be 2.39% for total number, 2.04% for private and -11.14% for individual (between the reference years 2018 - 2022). (Table 1, Fig. 2).

Regarding the barley culture in Romania, the total area is on an ascending scale, it is 22.29%. In the case of the private ones there is an increase, it is 22.14% and -11.48% in the case of the individual ones (between the reference years 2018 - 2022), (Table 1, Fig.3). In grain maize crops, the total number is in a slight decrease of -0.36%, as well as in the case of private crops, the percentage is -0.74% and in the case of individual crops the percentages are in a much larger decrease of -11.23% (between the reference years 2018 - 2022), (Table 1, Fig.4).



Fig. 2. Dynamics of the area with common wheat in Romania, 2018-2022 (ha)  
 Source: Own design based on the data from NIS, <http://statistici.insse.ro> [12].

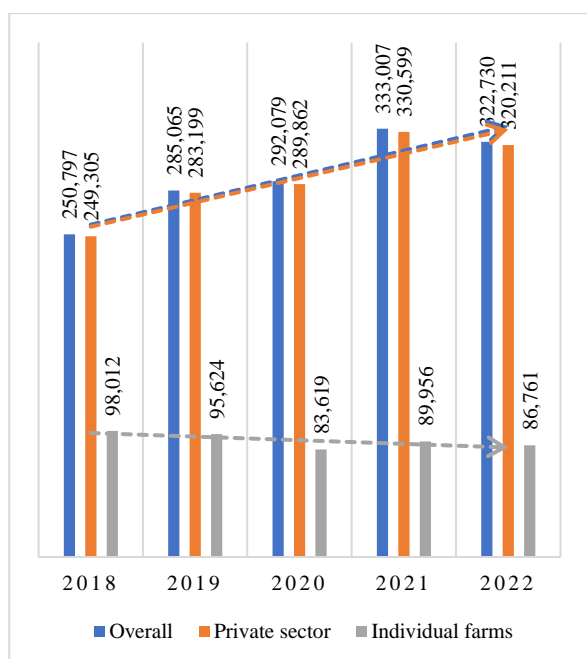


Fig. 3. Dynamics of the area with barley culture in Romania, 2018-2022 (ha)  
 Source: Own design based on the data from NIS, <http://statistici.insse.ro> [12].

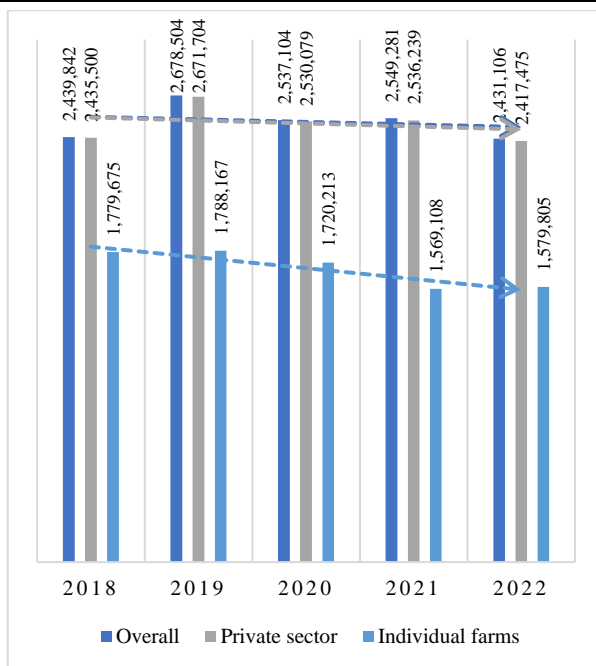


Fig. 4. Dynamics of the area with grain corn in Romania, 2018-2022 (ha)  
 Source: Own design based on the data from NIS, <http://statistici.insse.ro> [12].

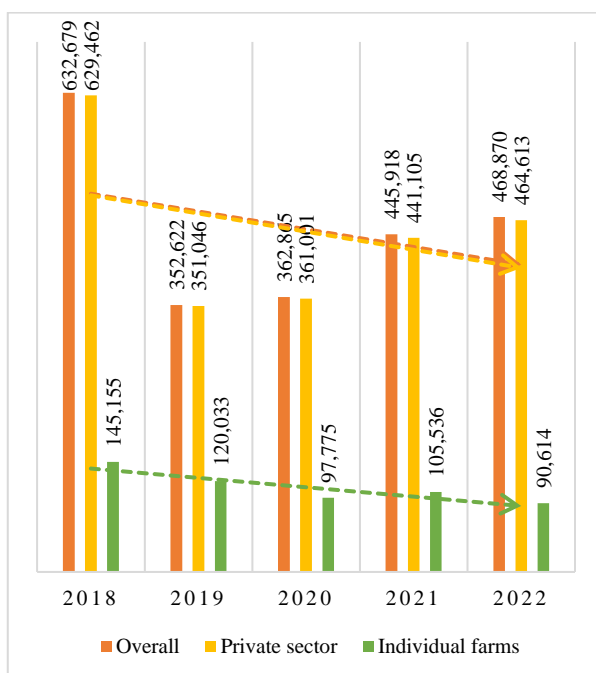


Fig. 5. Dynamics of rapeseed culture in Romania, 2018-2022 (ha)  
 Source: Own design based on the data from NIS, <http://statistici.insse.ro> [12].

The area occupied with the rape crop is founding on a descending scale, the total number being -25.89%, private -26.19% and individual -37.57% (between reference years 2018 - 2022) (Table 1, Fig.5).

Rapeseed has several advantages and benefits for both farmers and consumers. Here are some of these advantages:

- Quality oil production;
- Profitability for farmers;
- Resistance to varying climatic conditions;
- Improved crop rotation;
- Multiple uses;
- Reduced environmental impact;

-Consumer health.

It is important to note that proper management of the oilseed rape crop, including fertilization, pests and diseases, is necessary to achieve these benefits.

### Agricultural crop production

The agricultural crop production in Romania by forms of ownership in 2018-2022 are shown in Table 2.

Table 2. Romania's agricultural crop production by forms of ownership (t)

Unit of measure: Tonnes						
Crops	Forms of ownership	2018	2019	2020	2021	2022
Cereals for grains	Overall	31,553,279	30,412,426	18,153,714	27,791,258	18,860,679
	Private sector	31,468,941	30,317,523	18,059,942	27,598,059	18,736,494
	Individual farms	18,801,066	16,625,966	10,476,648	12,976,951	8,952,099
Common wheat	Overall	10,122,912	10,280,578	6,381,692	10,404,076	8,661,220
	Private sector	10,074,939	10,236,235	6,333,574	10,305,391	8,589,250
	Individual farms	4,963,030	4,707,867	3,072,876	3,966,037	3,317,229
Barley	Overall	1,276,620	1,340,389	847,241	1,593,802	1,406,689
	Private sector	1,270,816	1,332,476	839,411	1,582,274	1,396,900
	Individual farms	455,169	417,640	230,594	293,735	294,228
Grain corn	Overall	18,663,939	17,432,223	10,096,689	14,820,693	8,037,134
	Private sector	18,639,932	17,397,712	10,064,743	14,748,285	8,003,334
	Individual farms	12,250,618	10,482,121	6,562,783	8,135,374	4,866,304
Rapeseed	Overall	1,610,907	798,215	780,155	1,375,067	1,229,532
	Private sector	1,605,334	794,883	776,402	1,363,116	1,220,328
	Individual farms	356,904	241,787	199,947	302,786	244,663

Source: NIS, <http://statistici.insse.ro> [12].

Total agricultural crop production is the physical (gross) production obtained in each period, expressed in physical units of measurement (kg, tonnes) according to the nature of the products and product groups.

Analyzing the evolution of these cultures regarding vegetable agricultural production, the expressions being in percentages, between the reference years 2018 – 2022, we observe the following:

*Grain cereals* = overall -40.23 %, private - 40.46 %, individual -52.39.

*Common wheat* = overall -14.44 %, private - 14.75 %, individual -33.16 %.

*Barley* = overall 9.25 %, private 9.03 %, individual -36.36 %.

*Grain corn* = overall -56.94 %, private -57.06 %, individual -60.28 %.

*Rapeseed* = overall -23.67 %, private -23.98 %, individual -31.45 %.

### Labour force in the Romanian agriculture

The volume of labor force in Romanian agriculture, using the list of variables between 2018-2022 are shown in Table 3.

Table 3. Romania's agricultural labor force (AWU)

Unit of measurement: 1,000 annual work units (AWU)					
List of labor force variables	2018	2019	2020	2021	2022
Overall	1,474	1,402	1,090	1,055	1,015
Unpaid	1,314	1,243	919	879	845
Salaried	160	159	171	176	170

Source: NIS, <http://statistici.insse.ro> [18].

The volume of the labor force in agriculture represents the ratio of the total number of days worked by employees and self-employed persons in the agricultural industry in a year to the annual work unit expressed in days.

The annual work unit is the work done by a person in full-time equivalent in agriculture in a year (245 working days of 8 hours per day).

We observe that the total number of employees and non-employees are on a downward scale (-31.14% total, -35.69% non-employees) and the number of employees on a slight increase (5.88% employees) between the reference years 2018 - 2019.

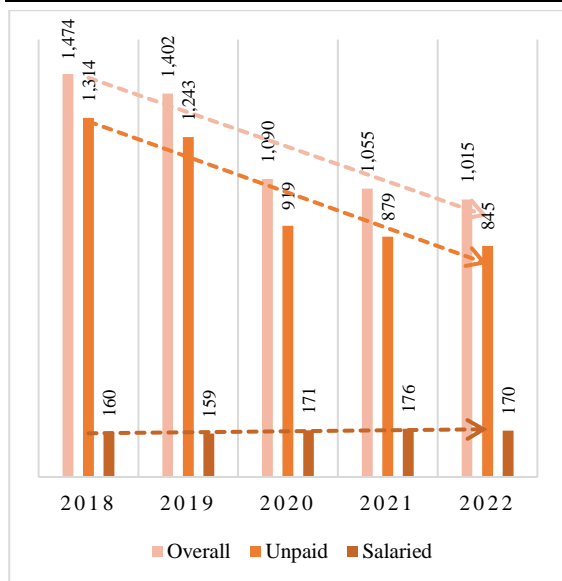


Fig. 6. Labor force dynamics in Romanian agriculture., 2018-2022 (AWU)

Source: Own design based on the data from NIS, <http://statistici.insse.ro> [12].

This fluctuation occurs for several reasons:

**Seasonality** - agriculture is often characterized by seasonality, with intensive farming activities at certain times of the year, such as planting and harvesting. Many agricultural workers are employed only during the agricultural season and leave the sector during the rest of the year.

**Demographic trends** - population migration to cities and other sectors of the economy may reduce the number of people interested in

working in agriculture, especially in rural areas.

**Crop demand and prices** - fluctuations in prices and demand for agricultural crops can influence employment levels. Low prices may lead farmers to reduce labor costs. **Subsidies and government policies** - agricultural subsidies and government policies can influence the number of people employed in agriculture.

**Education and skills of the workforce** - the availability of skilled agricultural workers may vary depending on their level of education and training. If there is a limited supply of skilled labor, this may affect the number of employees.

**Unforeseen events** - unforeseen situations such as pandemics or conflicts can have a significant impact on employment in agriculture [19].

Fluctuations may vary from one region to another and may be influenced by multiple pedoclimatic, economic, social, technological, geopolitical, etc, factors.

Among other factors, work force is an important capital of which depends the performance in agriculture and agribusiness [9].

**The areas under vines in Romania** by form of ownership between 2018-2022 are shown in Table 4.

Table 4. The areas under vines in Romania (ha)

Unit of measurement: Hectare						
Categories of vineyards	Forms of ownership	2018	2019	2020	2021	2022
<b>Total - live on fruit</b>	Overall	177,497	178,230	167,346	165,553	161,045
	Private sector	175,662	177,023	165,489	163,914	159,872
	Individual farms	149,025	153,656	141,919	138,782	136,491
<b>Grafted vines on fruit</b>	Overall	92,160	91,799	90,420	88,725	87,056
	Private sector	90,650	90,595	89,244	87,087	85,959
	Individual farms	65,259	69,765	67,467	64,552	64,247
<b>Hybrid vines in fruit</b>	Overall	85,336	86,431	76,926	76,827	73,990
	Private sector	85,011	86,428	76,245	76,827	73,913
	Individual farms	83,766	83,891	74,452	74,230	72,244
<b>Table grapes</b>	Overall	6,335	6,284	6,165	6,270	6,203
	Private sector	6,296	6,244	6,134	6,228	6,147
	Individual farms	5,515	5,520	5,521	5,433	5,434
<b>Wine grapes</b>	Overall	171,162	171,947	161,181	159,283	154,842
	Private sector	169,366	170,778	159,355	157,685	153,725
	Individual farms	143,510	148,136	136,398	133,349	131,057

Source: NIS, <http://statistici.insse.ro> [12].

The area planted with vines, under vines is the area planted with grafted and hybrid vines, under vines [13].

**Vines in bearing** - vine plantations that come into bearing after 3 years from planting; these include grafted (noble) vines with wine grape varieties and table grape varieties and vine



plantations with direct producer hybrids (domestic or imported varieties grown on own roots), including those from family gardens. The number of hectares between the reference years 2018 - 2022, expressed in percentages, are the following:

*Total - live in fruit* = overall -9.27%, private - 8.99%, individual -8.41%.

*Grafted vines in bearing* = overall -5.54 %, private -5.17 %, -1.55 % individual.

*Hybrid grafted vines* = overall -13.3 %, private -13.05 %, -13.75 % individual.

*Table grapes* = overall -2.08 %, private -2.37 %, individual -1.47 %.

*Wine grapes* = overall -9.53 %, private -9.24 %, individual -8.68 %.

**The number of fruit trees** by form of ownership between 2018-2022 are shown in Table 5.

Table 5. The number of fruit trees in Romania (count)

Unit of measure: Count						
Fruit tree categories	Forms of ownership	2018	2019	2020	2021	2022
Entire	Overall	78,929,084	73,866,869	73,586,476	74,914,434	76,278,474
	Private sector	78,408,286	73,340,212	73,115,452	74,237,894	75,524,215
	Individual farms	67,394,992	67,366,224	67,430,798	66,872,533	68,022,003
Plums trees	Overall	34,534,473	34,459,654	34,214,693	34,195,891	34,210,196
	Private sector	34,487,609	34,374,102	34,144,962	34,101,969	34,157,188
	Individual farms	33,379,279	33,349,797	33,129,307	32,940,859	33,218,798
Apple trees	Overall	28,689,430	23,655,918	24,014,734	24,950,006	24,931,036
	Private sector	28,370,412	23,369,784	23,712,983	24,609,762	24,484,981
	Individual farms	20,714,257	20,690,368	20,949,972	20,832,169	21,515,429
Pear trees	Overall	3,192,913	3,147,062	3,313,645	3,331,620	3,247,171
	Private sector	3,187,765	3,143,750	3,309,028	3,323,803	3,238,024
	Individual farms	3,022,360	3,013,041	3,001,308	2,993,501	2,982,987
Peach trees	Overall	1,135,512	1,184,277	1,095,561	1,142,911	1,094,746
	Private sector	1,046,788	1,093,852	1,042,530	1,045,315	995,919
	Individual farms	782,107	783,072	783,070	773,730	772,757
Nectarine trees	Overall	28,797	39,944	52,855	55,586	31,797
	Private sector	28,757	37,817	52,406	52,812	31,723
	Individual farms	24,721	24,551	24,347	20,213	21,506
Cheery tree and Sour cheery tree	Overall	5,323,535	5,333,720	5,404,675	5,354,406	5,500,738
	Private sector	5,288,979	5,300,079	5,388,690	5,300,582	5,465,439
	Individual farms	4,735,419	4,742,193	4,821,091	4,631,025	4,697,349
Apricot tree and Wild apricot tree	Overall	2,076,955	2,098,513	2,080,913	2,094,294	2,177,181
	Private sector	2,060,142	2,083,409	2,067,445	2,067,411	2,149,413
	Individual farms	1,702,641	1,706,332	1,704,191	1,677,205	1,675,462
Walnuts trees	Overall	1,918,156	1,936,247	2,006,104	2,088,057	2,351,612
	Private sector	1,913,967	1,932,968	2,000,718	2,067,217	2,342,651
	Individual farms	1,767,097	1,844,230	1,784,246	1,777,583	1,879,724

Source: NIS, <http://statistici.insse.ro> [12].

Orchards have an important role in Romania's horticulture and food safety providing fruit for the population, and processing industry, nectar for bee families which help the pollination and income for tree growers [2].

The number of fruit trees is the total number of fruit trees in orchards and orchard trees in the cultivated area including home gardens, expressed in number of trees.

Analyzing the number of fruit trees by category, between the reference years 2018 – 2022, we observe the following:

*Entire* = overall -3.36 %, private -3.68 %, individual 0.92 %.

*Plums trees* = overall -0.94 %, private -0.96 %, individual -0.48 %.

*Apples* = overall -13.1 %, private -13.7 %, individual 3.72 %.

*Pear trees* = overall 1.67 %, private 1.55 %, individual -1.3 %.

*Peaches trees* = overall -3.59 %, private -4.86 %, individual -1.2 %.

*Nectarine trees* = overall 9.43 %, private 9.35 %, -13.01 % individual -13.01 %.

*Cheery tree and Sour cheery tree* = overall 3.22 %, private 3.23 %, individual -0.8 %.

*Apricot tree and wild apricot tree* = overall 4.6%, private 4.15%, individual -1.6%.

*Walnuts trees* = overall 18.43 %, private 18.3 %, individual 5.99 %.

### Solutions to these risks and challenges

Farmers have to decide on what surfaces these crops could be cultivated and what new technologies could be implemented and estimate yields and production costs [17]. Biodiversity should be extended and improved to help the farmers to increase efficiency in cereals production [11,15].

To address the risks and challenges of crop management in Romania, farmers and policy makers can implement a number of solutions and strategies. Here are some of these solutions:

*-Precision farming* - the use of precision farming technologies such as GPS systems, drones and sensors can help farmers monitor and manage crops more efficiently, reducing inefficient use of resources such as water and fertilizers [5].

Conservative agriculture could be an option for crop farming assuring increased yields, with low costs, labor savings, carbon sequestration, healthier soils, improved biodiversity, sustainability [14, 18, 8].

*-Efficient irrigation* - modern irrigation systems can help manage water resources efficiently, ensuring that each crop receives the right amount of water for its needs.

*-Hybrids and varieties resistant to extreme weather conditions* - choosing hybrids and varieties resistant to drought, extreme temperatures and disease can help minimize losses in adverse climatic conditions.

*How are natural ecosystems supplied with nitrogen* when they sometimes function in extremely difficult soil conditions.

Nitrogen is the basic element of life construction, and it is found in amino acids, peptides, proteins, including nucleic acids, that make life and its reproduction available [1].

*-Pest and disease monitoring and management* - implementing a pest and disease monitoring program and using biological control methods can reduce the negative impact of these threats.

*-Use fertilizers and pesticides responsibly* - farmers can follow fertilizer and pesticide application recommendations and follow integrated pest management practices to reduce negative environmental impacts.

*-Sustainable farming practices* - adopting sustainable farming practices such as conservation tillage, crop rotation and mulching can help maintain soil fertility and conserve natural resources.

*-Crop diversification* - growing more than one type of crop on a farm can reduce the risk associated with price and demand fluctuations for a single crop.

*-Strategic water resource planning* - developing strategies for efficient water storage and use can help manage droughts and water scarcity.

*-Investment in agricultural education and training* - to effectively manage new technologies and farming practices, farmers can benefit from agricultural training and continuing education.

*-Access to agricultural insurance* - agricultural insurance can help farmers cope with losses due to adverse weather or other risks, providing a financial safety net.

*-Agricultural cooperation and partnerships* - farmers can join together and cooperate to benefit from economies of scale, gain access to more efficient technology and resources and strengthen their market position.

*-Upgrading agricultural infrastructure* - upgrading agricultural infrastructure, including irrigation networks, roads and storage, can help improve efficiency and access to markets.

The unitary and/or combined approach of these solutions can help Romanian agriculture to successfully face risks and challenges, ensuring sustainable and efficient agricultural production.

#### **Solutions to attract labor force**

Attracting and retaining labor in agriculture in Romania can be challenging due to various factors such as intense physical labor, seasonality and competition with other sectors for skilled workers [10]. However, there are several solutions that can help attract and retain labor in agriculture:

*-Competitive wages and benefits* - offering competitive wages and benefits can attract workers interested in the agricultural sector. Farmers can offer competitive wages,



seasonal bonuses and benefits such as health and medical insurance.

*-Training and professional development courses* - providing training and professional development courses can increase the skills of the workforce and make farming more attractive to those who want to learn new skills.

*-Adequate housing and living conditions* - farms can provide adequate housing and living conditions for seasonal workers, which can reduce some of their housing concerns and improve their comfort.

*-Flexible working hours* - offering flexible working hours can be an advantage, especially for workers who want more autonomy in managing their time.

*-Opportunities for advancement* - farmers can offer advancement opportunities for workers eager to develop their careers in agriculture. This may include promotion to supervisory or management positions.

*-Partnerships with educational institutions* - farmers can develop partnerships with schools or agricultural education institutes to attract graduates and offer jobs to young people interested in starting their careers in agriculture.

*-Social networking and online recruitment* - using online recruitment platforms and social media to reach out to potential workers can be effective, particularly in attracting young people and those interested in technology.

*-Promoting working in agriculture as a viable career* - farmers and agricultural organizations can work together to promote agriculture as a viable and rewarding career through awareness campaigns and career guidance events.

*-Working with employment agencies* - farmers can work with employment agencies to identify and recruit suitable candidates for available positions.

*-Positive organizational climate* - creating a positive and supportive work environment where workers feel valued and engaged can contribute to long-term workforce retention.

Attracting and retaining a workforce in agriculture requires a comprehensive approach that addresses competitive wages,

living and working conditions, and career development opportunities. Agriculture can offer satisfying and stable jobs for those willing to work in the sector, and so these solutions can help make it more attractive.

### **Strategies applicable to crops established on large and small areas in Romania**

For crops established on large areas, as well as for those established on small areas in Romania, there are strategies that can contribute to agricultural success and maximize yields. Here are some key strategies for both categories of farmers:

#### **For crops established on large areas:**

*Detailed farm planning* - large growers need to develop detailed farm plans that include crop rotation, water management, fertilizer and pesticide use and precision farming technologies.

*Investment in technology* - the use of state-of-the-art technologies such as modern tractors, GPS systems and farm sensors can increase efficiency and productivity.

*Efficient management of water resources* - the development of efficient irrigation systems and careful monitoring of water resources can help manage drought and water scarcity.

*Sustainability and environmental protection* - large farmers should adopt sustainable farming practices and protect the environment through responsible resource management and pollution reduction.

*Diversification of farming activities* - diversification can include growing more than one crop or even expanding into related sectors such as livestock farming to minimize risks.

*Cost saving and financial management* - large farmers should implement effective cost saving practices and have good financial management to maximize profitability.

The circular economy is a concept that can no longer be considered a novelty, but which is beginning to gain more and more visibility in the context of the pressure that climate change issues have on the political and economic environment, but also on the planet's inhabitants who are increasingly concerned about the effects that uncontrolled

consumption, unsustainable practices and irresponsibility have on the environment [5].

**For crops established on small areas:**

*Farm cooperation and partnerships* - smallholders can benefit from collaborating and partnering with other farmers to achieve economies of scale and gain access to more efficient resources and technology.

*Crop diversification* - growing more than one type of crop can reduce the risk of loss in the event of crop failure and ensure a steady stream of income.

*Selling direct to consumers* - selling direct at fairs, markets or through a delivery system can increase profitability and build loyal relationships with customers.

*Organic farming and quality products* - small farmers can invest in organic farming and the production of high-quality products, which can bring better prices and attract consumers interested in healthy food.

*Education and training* - small farmers can benefit from education and training to learn new farming techniques and skills to increase their efficiency.

*Access to resources and funding* - small farmers can seek funding and resources to grow their business, including government support programs or agricultural grant funding. Regardless of farm size, a sustainable approach, innovation and adaptability to environmental and market changes are key to success in farming in Romania.

**S.W.O.T. Analysis**

The S.W.O.T. analysis of risks and challenges in crop management in Romania can provide a clearer picture of the situation and how policy makers can address these issues. In Table 6 is presented a S.W.O.T. analysis of the risks and challenges in Romanian agriculture.

Table 6. SWOT Analysis of the risks and challenges in Romanian agriculture

<b>Strengths</b>	<b>Weaknesses</b>
<p><i>Rich natural resources</i> - Romania has fertile land and water resources, which offer potential for rich agricultural production.</p> <p><i>Traditional farming experience</i> - Romanian farmers have a rich farming tradition and knowledge passed down from generation to generation.</p> <p><i>Predominance of commercial societies</i> in working the land- On about 54% of the arable land there are applied modern technologies.</p> <p><i>High potential production</i> - Romania among the top EU producers of wheat, maize and sunflower seeds.</p>	<p><i>Un corresponding farm structure</i>- average farm size 4.4 ha and economic size Euro 4,029/farm standard output, the smallest in the EU. 94% farms have below 5 ha.</p> <p><i>The dominance of family subsistence and semi-subsistence farms</i> lacked of capital.</p> <p><i>Aging of the agriculturists</i> and young work force migration to cities or abroad</p> <p><i>Low training level of the agriculturists</i></p> <p><i>Lack of infrastructure in terms of irrigation systems</i></p> <p><i>Vulnerability to climate change</i> - Romanian agriculture is vulnerable to climate change, such as droughts, floods and extreme temperatures.</p> <p><i>Water resource management</i> - water resource management in agriculture is sometimes inefficient, with risks related to drought and depletion of water resources.</p> <p><i>Excessive use of pesticides and fertilizers</i> - uncontrolled use of pesticides and chemical fertilizers can have a negative impact on the environment.</p>
<b>Opportunities</b>	<b>Threats</b>
<p><i>Modernization opportunities</i> - there are significant opportunities for upgrading agricultural infrastructure such as irrigation systems and storage.</p> <p><i>Precision farming and innovative technologies</i> - Implementing precision farming technologies such as IoT sensors and monitoring systems can increase efficiency and productivity.</p> <p><i>EU common market and other beneficiaries on the international market</i> - exporting Romanian agricultural products to the EU countries and other beneficiaries all over the world is an opportunity to increase revenue.</p> <p><i>Sustainability and organic farming</i> - pursuing a sustainable approach to agriculture can bring long-term benefits, such as increased demand for organic products.</p>	<p><i>Climate change</i> - climate change may worsen the risks of drought, floods and extreme temperatures, putting additional pressure on agriculture.</p> <p><i>Price and demand fluctuations</i> - Fluctuating crop prices and volatile demand can affect farmers' incomes.</p> <p><i>Agricultural regulations and policies</i> - Changes in agricultural policies and environmental regulations can have a significant impact on Romanian agriculture.</p> <p><i>Lack of skilled labor</i> - lack of skilled labor can affect productivity and production costs.</p> <p><i>Globalization and competition</i> - Romanian agriculture faces global competition, which can affect prices and access to markets.</p>

Source: Own conception.

S.W.O.T. analysis can help farmers and policy makers in Romanian agriculture to develop effective strategies to exploit potential opportunities, minimize weaknesses and cope with external threats.

## CONCLUSIONS

In conclusion, crop management in Romania faces multiple risks and challenges that can affect agricultural production and the sustainability of the sector.

Climate change, drought, pests and diseases, inefficient use of fertilizers and pesticides, and fluctuations in prices and demand are just some of the threats facing farmers.

To address these challenges and manage the risks, the following recommendations are needed:

*Precision farming and technology* - farmers should invest in precision farming technologies, such as sensors and monitoring systems, to manage resources more efficiently and monitor crop health.

*Water resource management* - developing efficient irrigation systems and managing water resources properly can reduce the risk of drought and help maintain production.

*Promoting sustainability* - farmers should adopt sustainable farming practices, such as conservation agriculture and crop rotation, to protect the environment and maintain soil fertility.

*Crop diversification* - growing more than one type of crop can reduce the risk associated with price and demand fluctuations.

*Education and training* - investing in agricultural education and continuous training can help farmers manage technological change and adopt best practices.

*Agricultural insurance* - agricultural insurance can provide a financial safety net in case of losses due to risk factors.

*Promoting agriculture as an attractive career* - It is important to promote agriculture as a viable and rewarding career to attract new talent to the sector.

*Collaboration and innovation* - farmers should collaborate with each other and with research institutions to develop and

implement innovative risk management solutions.

By adopting these recommendations and proactively addressing risks and challenges, agriculture in Romania can become more resilient and sustainable, further ensuring the supply of high-quality food and contributing to the country's economic development.

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