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THE EVOLUTION OF CEREAL CROPS IN IAȘI COUNTY WITHIN THE REGIONAL AND NATIONAL CONTEXT (2019-2023)

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Abstract. *This article analyzes the evolution of cereal crops in Iași County during the period 2019–2023, within both regional and national contexts. Using official statistical data provided by the National Institute of Statistics, the research offers a detailed perspective on the dynamics of cultivated areas and the productivity of cereal crops such as rye, wheat, barley, two row barley, oats, corn, and sorghum. The choice of Iași County is justified by its location in the Jijia Plain, a region with high agricultural potential due to favorable soil and climatic conditions. Additionally, Iași County's selection is also based on its significant role within the regional agricultural economy. The agricultural landscape of the county is further shaped by the integration of innovative practices and compliance with European Union standards. Despite these advantages, challenges such as land fragmentation and the low economic performance of many agricultural holdings persist. The study examines key trends in cereal production, focusing on factors such as climatic conditions, agricultural policies, technological advancements, and market demands. The results provide an overview of Iași County's contribution to national agriculture. The conclusions highlight the importance of adapting to the current agricultural context to ensure the sustainability and competitiveness of the cereal sector in Iași County.*

Keywords*: cereals, Iasi County, agricultural productivity, regional context, national context*

INTRODUCTION

The agricultural landscape of Iași County stands out due to its favorable conditions, which support a diverse range of crops and livestock farming. In some areas, this potential is further enhanced by the integration of innovative agricultural practices and adherence to European Union standards. On the other hand, challenges such as land fragmentation, the low economic performance of many farms, and resistance to change are preventing the county's agricultural potential from being fully realized.

Cereal crops play a crucial role in both human and animal nutrition, serving as a primary source of energy and essential nutrients. They are rich in carbohydrates, providing a significant source of energy, and contain proteins, with their quantity varying depending on the type of cereal (Tsekhomsky et al., 2024). Another key aspect of cereals is their enrichment with vitamins and minerals, which enhances their nutritional profile (Shahane & Shivay, 2024). Additionally, they contribute essential dietary fiber, which is vital for digestive health and can help prevent chronic diseases (Gari et al., 2024).

Cereal by-products are widely used as animal feed, supporting livestock production and contributing to the agricultural economy (Gari et al., 2024).

MATERIAL AND METHODS

The methodology employed in this article was designed to analyze the evolution of cereal crops in Iași County during the period 2019–2023, in comparison with the North-East Region and Romania.

Statistical data on cultivated areas, production output, and average yield per hectare were sourced from the National Institute of Statistics (INS). The analyzed crops included rye,

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wheat, barley, oats, corn, and sorghum. Annual data comparisons were conducted to identify variations over the analyzed period. The analysis involved calculating average values for cultivated areas, production output, and yield per hectare in Iași County, relative to regional and national averages.

To determine the causes of these variations, factors such as climatic conditions, agricultural policies, technological changes, and market demand fluctuations were examined.

The choice of this topic was motivated by the soil and climatic characteristics of Iași County and its role in the regional agricultural economy. Its location in the Jijia Plain, with favorable conditions for cereal crops, was a key criterion. Thus, the study aimed to highlight the recent evolution (2019–2023) of the cereal sector in this county.

RESULTS AND DISCUSSIONS

Iași County spans a total area of 547,588 hectares, ranking 23rd nationally and accounting for 2.3% of Romania's total territory. The agricultural area covers 381,256 hectares, placing the county 17th in the country, with a share of 2.6% of the national agricultural area. The arable land, measuring 256,098 hectares, also ranks the county 17th at the national level, contributing 2.7% to Romania's total arable land.

In addition to its extensive agricultural lands, Iași County benefits from fertile soils and a favorable climate, which, when properly utilized, should lead to high agricultural productivity (Bran et al., 2022). The level of mechanization in the region is on the rise, improving labor productivity and crop management (Drăguleasa et al., 2023).

The evolution of cultivated area

The table below (Table 1) presents the evolution of cultivated areas for various types of cereals between 2019 and 2023, highlighting both annual changes and overall trends throughout the period. During this time, the total area cultivated with cereals increased slightly, from 143,469 hectares in 2019 to 144,976 hectares in 2023, reflecting a variation of only +1.1%. However, this apparent stability conceals significant differences among individual crops.

Table 1

Cultivated area (ha). Source: elaborated by the author.

Nr. crt.	Cereals	2019	2020		2021		2022		2023		
		ha	ha	% 2019-2020	ha	% 2020-2021	ha	% 2021-2022	ha	% 2022-2023	% 2019-2023
1	Rye	97	99	2%	205	107,1	89	-56,6	90	1,1	-7,2
2	Wheat	36018	39990	11%	48361	20,9	42019	-13,1	48897	16,4	35,8
3	Barley and two row barley	4787	4391	-8%	5733	30,6	4298	-25	5458	27	14
4	Oats	4480	1502	-66%	1794	19,4	1303	-27,4	1668	28	-62,8
5	Grain maize	97584	97726	0%	106779	9,3	107075	0,3	88780	-17,1	-9
6	Sorghum	503	307	-39%	170	-44,6	131	-22,9	83	-36,6	-83,5
7	Total	143469	144015	0%	163042	13,2	154915	-5	144976	-6,4	1,1

Wheat experienced a significant growth, increasing from 36,018 hectares in 2019 to 48,897 hectares in 2023, marking a total rise of 35.8%. The peak year was 2021, with an increase of 20.9% compared to the previous year. However, this expansion was followed by a moderate decline of 13.1% in 2022, which was subsequently recovered in 2023 (+16.4%). In contrast, sorghum recorded the largest percentage decrease among all crops, shrinking from 503 hectares in 2019 to just 83 hectares in 2023, a reduction of 83.5%. This sharp decline was consistent year over year.

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Grain maize, the most extensively cultivated crop in 2019 (97,584 hectares), showed relatively stable growth until 2022, when the area reached 107,075 hectares. However, 2023 brought a significant reduction of 17.1%, dropping to 88,780 hectares. Overall, the cultivated area for maize decreased by 9% between 2019 and 2023. As for oats, the cultivated area plummeted by 66% in 2020 (from 4,480 hectares to 1,502 hectares) and remained at low levels until 2023, when it saw a slight increase of 28%, reaching 1,668 hectares.

Barley and two-row barley exhibited significant fluctuations over the analyzed period. From 4,787 hectares in 2019, the area decreased to 4,391 hectares in 2020 (-8%) but rose again to 5,733 hectares in 2021 (+30.6%). This was followed by declines in 2022 (-25%), but 2023 marked a notable recovery (+27%), reaching 5,458 hectares. Rye, while experiencing a 2% growth in 2020 (from 97 hectares to 99 hectares), underwent substantial declines in 2022 (-56.6%) and a marginal recovery in 2023 (+1.1%), ending at 90 hectares. Overall, rye lost 7.2% of its initial area.

These figures highlight a general trend of declining cultivated areas for certain cereals, such as maize and sorghum, while wheat has seen considerable growth.

The graph below (Figure 1) shows the average of the areas cultivated with different types of cereals in the period 2019-2023.

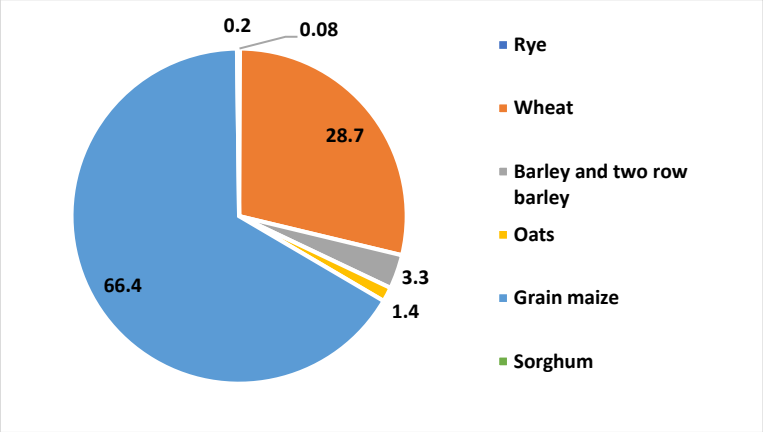

Figure 1. Structure of areas cultivated with cereals – period average (%)
Source: elaborated by the author

Grain maize dominates with an average of 66.4% of the total cultivated area, reaffirming its primary role in agriculture despite annual fluctuations. Wheat accounts for 28.7% of the area, showing a sustained growth trend (+35.8% during the analyzed period), which highlights its economic significance and farmers' preference for this crop. Barley and two-row barley contribute 3.3%, reflecting a modest but stable presence. Oats (1.4%), rye (0.2%), and sorghum (0.08%) hold very small shares, suggesting limited economic relevance.

The evolution of cereal production

From the table presented below (Table 2), you can see the evolution of production for several types of cereals, expressed in tons, in the period 2019–2023.

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Table 2

Total production (tons). Source: elaborated by the author.

Nr. Crt.	Cereals	2019	2020		2021		2022		2023		
		Tons	Tons	% 2019-2020	Tons	%2020-2021	Tons	% 2021-2022	Tons	% 2022-2023	% 2019-2023
1	Rye	367	221	-39,8	793	258,8	283	-64,3	195	-31,1	-46,9
2	Wheat	146955	121669	-17,2	225452	85,3	107631	-52,3	189866	76,4	29,2
3	Barley and two row barley	16881	11725	-30,5	21828	86,2	11684	-46,5	23228	98,8	37,6
4	Oats	8626	3395	-60,6	5715	68,3	2449	-57,1	4823	96,9	-44,1
5	Grain maize	535020	225986	-57,8	633817	180,5	172735	-72,7	256037	48,2	-52,1
6	Sorghum	2090	638	-69,5	1269	98,9	46	-96,4	256	456,5	-87,8
7	Total	709939	363634	-48,8	888874	144,4	294828	-66,8	474405	60,9	-33,2

Between 2019 and 2023, cereal production experienced a general decline, marked by sharp fluctuations. Total output dropped from 709,939 tons in 2019 to 363,634 tons in 2020 (-48.8%), rebounded in 2021 to 888,874 tons (+144.4%), then fell again in 2022 (-66.8%), ending at 474,405 tons in 2023 (a 33.2% decrease compared to 2019).

Wheat, the main crop, showed relative resilience, decreasing to 121,669 tons in 2020 (-17.2%), then increasing to 225,452 tons in 2021, falling to 107,631 tons in 2022, and recovering to 189,866 tons in 2023 (29.2% higher than in 2019). Barley and two-row barley also grew overall, from 16,881 tons in 2019 to 23,228 tons in 2023 (+37.6%).

In contrast, maize suffered a steep decline, from 535,020 tons in 2019 to 256,037 tons in 2023 (-52.1%). Oats and rye also dropped significantly, by 44.1% and 46.9% respectively. Sorghum was the most affected crop, with an 87.8% drop by 2023.

These declines reflect broader challenges in agriculture, particularly recurring droughts. Severe water shortages had a major impact on yields, especially in Iași County, which lacks a modern irrigation system (Zaharia & Pătrălageanu, 2019). "Ziarul de Iași" reported that by mid-July 2024, over 4,500 hectares of crops were affected by drought.

Additionally, local farmers faced growing competition from Ukrainian grain imports sold at much lower prices. Following the war in Ukraine, international efforts redirected exports, resulting in 1.7 million tons of Ukrainian grain entering Romania within the first seven months of the conflict (Puiuleț, 2023). After the Black Sea Grain Initiative expired in July 2023, Ukraine adapted by using land routes through Romania, Poland, and Hungary (Sîrbu, 2024). Deliveries continued into 2024, with road exports rising 14% in late September, reaching 20,300 tons (Mat, 2023). This influx of low-cost imports has driven down prices for Romanian produce, discouraging farmers from investing or cultivating large areas due to fears of sustained foreign competition.

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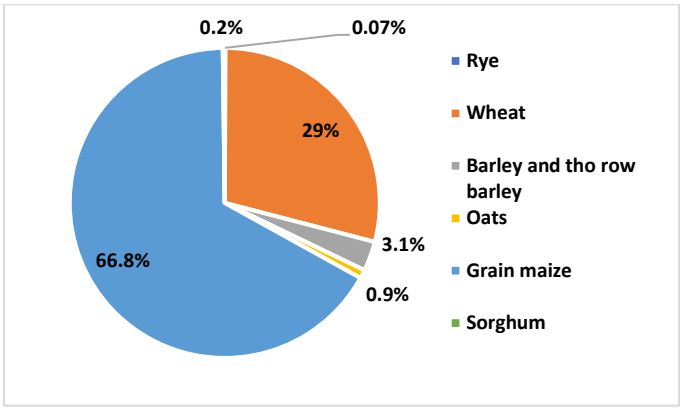

Figure 2. Structure of total grain production – period average (%)
Source: elaborated by the author

The chart above (Figure 2) shows that the average cereal production from 2019 to 2023 is dominated by maize (66.8%) and wheat (29%), which together account for nearly the entire production (95.8%). Maize stands out for its large cultivated areas and high yields, while wheat, although grown on smaller areas, makes a significant contribution due to its productivity. Barley and two-row barley hold a modest share of 3.1%, while oats (0.9%), rye (0.2%), and sorghum (0.07%) have marginal contributions, reflecting their limited cultivation areas and lower yields.

Average production per hectare

Over the past five years, the average yield per hectare for cereals in Iași County has shown significant fluctuations compared to the average for the North-East Region and the national average (Figure 3). In 2019, Iași recorded a yield of 4,942 kg/ha, below the national average (5,458 kg/ha) but close to the regional average (5,055 kg/ha).

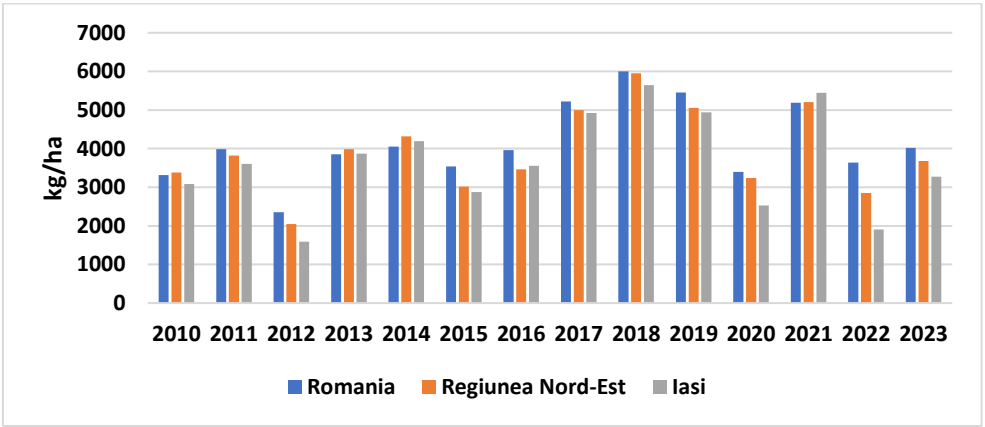

Figure 3. The yield per hectare (Iași, Norh-East Region, Romania)
Source: elaborated by the author

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The year 2020 saw a sharp decline to 2,525 kg/ha, marking the lowest value in the analyzed period, below both the North-East Region average (3,243 kg/ha) and the national average (3,400 kg/ha). In 2021, Iași experienced a significant recovery, reaching 5,448 kg/ha, surpassing both the regional average (5,203 kg/ha) and the national average (5,188 kg/ha). However, in 2022, production plummeted dramatically to 1,910 kg/ha, far below the regional average (2,855 kg/ha) and the national average (3,635 kg/ha). In 2023, a partial recovery was noted, with production rising to 3,272 kg/ha, though it remained below the North-East Region average (3,679 kg/ha) and the national average (4,021 kg/ha).
Between 2019 and 2023, the yield of major cereal crops in Iași County experienced significant fluctuations, driven by climatic, geopolitical, and technological factors. Overall yield decreased by 33.9% in 2023 compared to 2019, though certain crops demonstrated better adaptability.

Table 3

The yelds per hectare by cereal types (kg/ha). Source: elaborated by the author.

Nr. crt.	Cereals	2019	2020		2021		2022		2023		
		kg/ha	kg/ha	% 2019-2020	kg/ha	% 2020-2021	kg/ha	% 2021-2022	kg/ha	% 2022-2023	% 2019-2023
1	Rye	3,784	2,232	-41,0	3,868	73,3	3,180	-17,8	2,167	-31,9	-42,7
2	Wheat	4,080	3,042	-25,4	4,662	53,2	2,561	-45,1	3,883	51,6	-4,8
3	Barley and two row barley	3,526	2,670	-24,3	3,807	42,6	2,718	-28,6	4,256	56,6	20,7
4	Oats	1,925	2,260	17,4	3,186	40,9	1,880	-41,0	2,891	53,8	50,2
5	Grain maize	5,483	2,312	-57,8	5,936	156,7	1,613	-72,8	2,884	78,8	-47,4
6	Sorghum	4,155	2,078	-50,0	7,465	259,2	0,351	-95,3	3,084	778,4	-25,8
7	Total	4,948	2,525	-49,0	5,452	115,9	1,903	-65,1	3,272	71,9	-33,9

Oats, barley, and two-row barley showed the best performance, with long-term increases of 50.2% and 20.7%, respectively, due to their greater adaptability. Wheat demonstrated relative stability, ending 2023 only 4.8% below its 2019 level. On the other hand, corn and rye experienced the largest declines, with decreases of 47.4% and 42.7%, highlighting significant vulnerabilities. Sorghum was the crop with the most variability, showing a remarkable recovery in 2023 but still falling short of its 2019 level. This trend emphasizes the need for investments in sustainable and adaptive agricultural technologies to stabilize and increase production under variable conditions.

Between 2019 and 2023, the analysis of the average cultivated areas (Figure 4) and average yields (Figure 5) of the main cereal crops in Iași County reveals an interesting correlation between the proportion of land dedicated to specific crops and their contribution to regional and national production.

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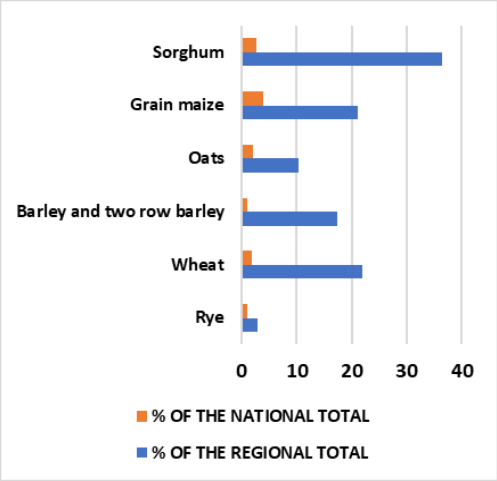

Figure 4. Cultivated area, county contribution at national and regional level - percentage average of the analyzed period
Source: elaborated by the author

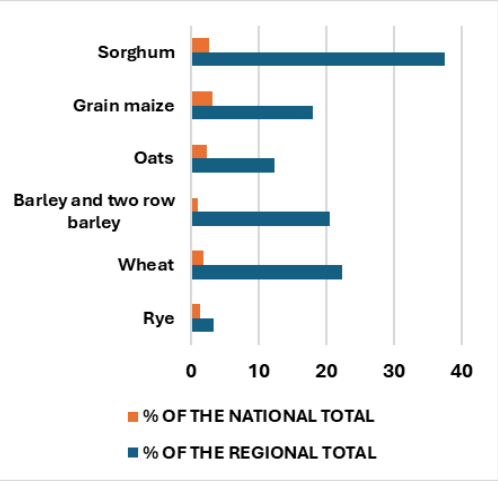

Figure 5. The production obtained, the contribution of the county at national and regional level - percentage average of the analyzed period
Source: elaborated by the author

Sorghum stands out as the predominant crop in Iași County, covering 36.4% of the cultivated land regionally and 2.6% at the national level. This share is reflected in production as well, where the county contributes 37.5% to the regional production average, yet only 2.6% at the national level. This suggests that sorghum is a representative crop for the county, with a productive efficiency proportional to the cultivated area, though with a relatively smaller impact on the national agricultural context.

Focusing on sorghum cultivation could be a highly effective strategy for farmers in Iași County, as sorghum is a valuable crop known for its adaptability and resilience. It is extremely drought-resistant due to its deep roots and ability to slow its growth when water is scarce (Bălteanu and Birnaure, 1989; Jardim et al., 2020). For this reason, sorghum can perform exceptionally well in Iași County and the rest of eastern Romania, where average annual rainfall is lower (around 450 mm) compared to the western part of the country.

Sorghum is also an excellent choice for crop rotation. It prepares the soil well for subsequent crops such as sunflower and corn (Zamfirescu, 1964). Additionally, it provides high yields of green mass and dry matter and is resistant to drought, diseases, and pests (Heitman et al., 2018). Another advantage is its low input requirements. Sorghum can thrive on low-quality soils, saving on seeds, water, and fertilizers (Bejiga & Dasa, 2024; Velmurugan et al., 2020). It also has a short growing season, allowing farmers to harvest two crops per year and secure feed for livestock.

Another significant crop in Iași County is wheat, which occupies 21.9% of the cultivated land regionally and 2% nationally. Regarding production, the county accounts for 22.2% of the output within the North-East Region but only 1.7% nationally. The discrepancy between the land allocated and the production obtained at the national level may indicate relatively lower productivity in Iași County compared to other regions in the country.

Corn holds a significant role in the agricultural structure of the county, accounting for 21.1% of the regional cultivated area and 4% of the national total. This area translates into a

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contribution of 17.9% to regional production and 3.1% to national production. The data suggest that, while corn is an important crop for the county, its productive efficiency could be optimized to enhance its contribution at the national level.

Other crops have a modest presence in both cultivated area and resulting production. For instance, rye represents only 2.9% of the regional cultivated area and 1% nationally, contributing 3.3% to regional production and 1.2% to national output. Similarly, barley occupies small proportions: 20.4% of the regional cultivated area but just 1% nationally. Oats, covering 12.3% of the regional area, make a modest contribution of 2.3% to national production.

The correlation between cultivated areas and resulting production highlights that Iași County has a significant agricultural specialization within the North-East Region, particularly in crops such as sorghum, wheat, and corn. However, its contributions at the national level remain less pronounced.

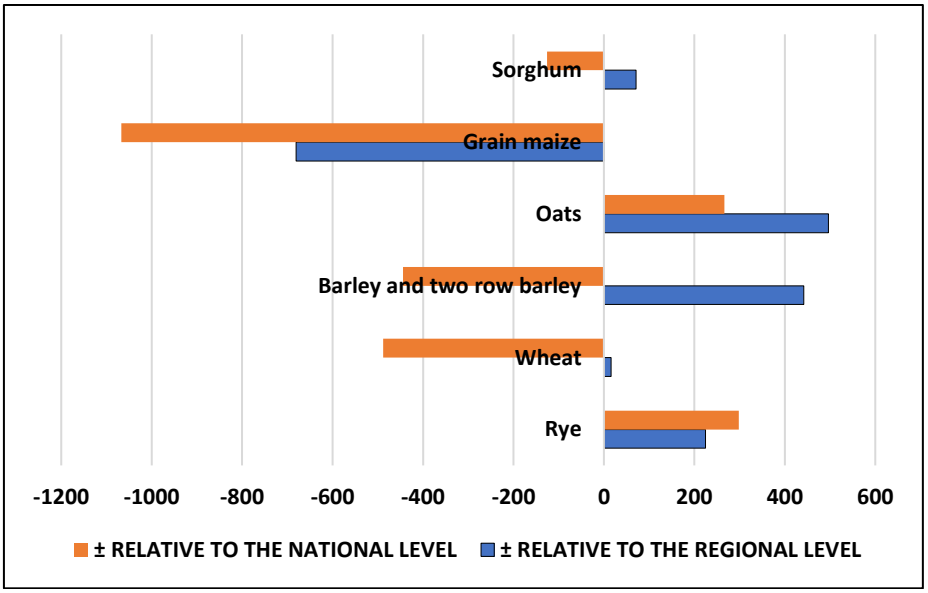

Figure 6. Average production per hectare, the county's contribution at the national and regional levels – percentage average of the analyzed period. Source: elaborated by the author

The average yield per hectare in Iași county, compared to regional and national averages for the 2019-2023 period, highlights strong performance for rye and oats, which significantly exceed both benchmarks. In the case of wheat, production is close to the regional average but below the national average, indicating room for improvement. For barley and two row barley, yields are higher than the regional average but fall short of the national one. Corn for grain shows the largest deficits, performing well below both averages, suggesting specific local challenges.

In conclusion, measures are needed to sustain the high performance of rye and oats, while a detailed analysis is required to enhance the productivity of wheat and corn.

CONCLUSIONS

The evolution of cereal crops in Iași County between 2019 and 2023 reveals both opportunities and challenges. The cultivated area has remained relatively stable (+1.1%), but significant variations were observed across crop types. Wheat saw a substantial increase (+35.8%), while sorghum experienced a dramatic decline (-83.5%). Total cereal production was impacted by drought, a lack of irrigation systems, and competition from imported Ukrainian cereals, resulting in a 33.2% decrease in 2023 compared to 2019.

Crop performance has varied, with wheat and barley demonstrating resilience, while corn experienced significant declines. Although oats and sorghum hold a smaller share, they could become strategic options for diversification. The lack of investment in modern technologies, land fragmentation, and market uncertainty limit the competitiveness of local farmers.

To address these challenges, it is essential to invest in irrigation systems, crop diversification, and sustainable technologies. Developing supply chains and increasing collaboration with research institutions can boost productivity. Leveraging favorable soil and climate conditions, along with local agricultural policies that support small farmers, is crucial to transforming Iași County into a model of sustainable and competitive agriculture.

BIBLIOGRAPHY

1.BĂLTEANU, G., BIRNAURE, V. (1989) Fitotehnică (Fitotehnie), Editura Ceres, București, 256-268.
2.BEJIGA, T., & DASA, E. W. (2024). Comprehensive Review of the Potential of Sorghum in Malt and Beer Production. Journal of Advances in Food Science & Technology, 11(2), 10–21. https://doi.org/10.56557/jafsat/2024/v11i28621
3.BRAN, M., DOBRE, I., & BRAN, S. D. (2022). Sustainable Development Through Field Vegetal Exploitation in Romania. In I. Management Association (Ed.), Research Anthology on Ecosystem Conservation and Preserving Biodiversity (pp. 347-374). IGI Global Scientific Publishing. https://doi.org/10.4018/978-1-6684-5678-1.ch018
4.DRĂGULEASA, I. -A., NIȚĂ, A., MAZILU, M., & CURCAN, G. (2023). Spatio-Temporal Distribution and Trends of Major Agricultural Crops in Romania Using Interactive Geographic Information System Mapping. Sustainability, 15(20), 14793. https://doi.org/10.3390/su152014793
5.GARI, M.T., ASFAW, B.T., ABO, L.D., JAYAKUMAR, M., KEFALEW, G. (2024). Effective Utilization of Agricultural Cereal Grains in Value-Added Products: A Global Perspective. In: Cherian, E., Gurunathan, B. (eds) Value Added Products From Food Waste. Springer, Cham. https://doi.org/10.1007/978-3-031-48143-7_3
6.HEITMAN., ADAM, J., MIGUEL, S., CASTILLO., T., J., SMYTH., CARL, R., CROZIER. (2018). 2. Stem, Leaf, and Panicle Yield and Nutrient Content of Biomass and Sweet Sorghum. Agronomy Journal, doi: 10.2134/AGRONJ2018.03.0178
7.JARDIM, A.M.D.R.F.; DA SILVA, G.I.N.; BIESDORF, E.M.; PINHEIRO, A.G.; DA SILVA, M.V.; DO NASCIMENTO ARAÚJO JÚNIOR, G.; DOS SANTOS, A.; ALVES, H.K.M.N.; DE SÁSOUZA, M.; DE MORAIS, J.E.F.; et al. Production potential of Sorghum bicolor (L.) Moench crop in the Brazilian semiarid: Review. Pubvet 2020,14, 141.
8.MAT, V. (2024, 27 september). Grain exports from Ukraine to Romania are increasing. Ferma Magazine. Available at: https://revista-ferma.ro/exporturile-de-cereale-din-ucraina-spre-romania-sunt-in-crestere/
9.PUIULEȚ, R. (2023). Black cereals from Ukraine. RISE Project. Available at: https://www.riseproject.ro/investigations/investigatii/cerealele-negre-din-ucraina/
10.SHAHANE, A., & SHIVAY, Y. S. (2024). Cereal crops: A valid option for bio-fortification and development of nutrient-dense food in developing and developed countries in Asia and Africa. Advances in Agronomy. https://doi.org/10.1016/bs.agron.2024.02.010

11.SÎRBU, G. (2024). Ukraine exported a record volume of grain last month. HotNews.ro. Available at: https://hotnews.ro/ucraina-a-exportat-luna-trecuta-un-volum-record-de-cereale-909857

12.TSEKHOMSKY, A., V., NEFEDOV, P., V., NEFEDOVA, L., V. (2024). 4. The role of cereals in providing the diet with macro and micronutrients in the diet. doi: 10.33920/med-08-2401-07

13.VELMURUGAN B, MADHURI N, DARSHAN R & DATTA M (2020). Sweet sorghum: a potential resource for bioenergy production. 10.1016/B978-0-12-818996-2.00010-7.

14.ZAHARIA, A., PATARLAGEANU, S. R. (2019). 5. Determinants of Agricultural Production in Romania: A Panel Data Approach. doi: 10.4018/978-1-5225-5739-5.CH001

15.ZAMFIRESCU, N., VELICAN, V., SAULESCU, N. (1964) Phytotechnics (Fitotehnica), vol.I, edition a 2-a, Editura Agro-Silvica, 434-446.

16.*** Ziarul de Iași. (2024, 5 december). Drought wreaked havoc in Iași: corn and sunflower crops almost ruined. Over 4,500 hectares of crops affected. https://www.ziaruldeiasi.ro/stiri/seceta-a-facut-prapad-la-iasi-porumbul-si-floarea-soarelui-aproape-compromise-peste-4-500-ha-de-culturi-afectate--1658861.html

17.*** Tempo database of the National Institute of Statistics, Agriculture series. Available at: http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table