

**Biborka-Eszter Bíró<sup>18</sup> - Boróka-Júlia Bíró<sup>19</sup>**

***An attempt for analysing the agricultural performance and potential in Romania on NUTS3 county level***

*Present study proposes to give a snapshot view on the Romanian agriculture regarding its potential and performance. The analysis is made with recent datasets referring to the year 2020. County level (NUTS3) calculations have been made to give a more detailed view of the territorial diversity of the Romanian agriculture. A scoring model had been constructed in order to reflect the agricultural potential and performance level of each Romanian county.*

*Keywords: agricultural potential, agricultural performance, regional analysis*

*JEL Codes: Q10, Q15, Q18, R10, R14*

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## **INTRODUCTION**

Agriculture plays an essential role in the Romanian economy. This fundamental phenomenon justifies our choice to study the agricultural performance and potential of Romania's counties, since, beyond the uniform national data, there are significant differences between counties in this respect. We believe that the results of our research can be a useful starting point for policy makers when defining the measures of the Common Agricultural Policy: we cannot consider the country as a single entity when such significant differences exist in terms of crop production and livestock farming as well.

## **RESOURCES**

### ***Land use***

Land is a primary resource of agricultural production. Agricultural land is dedicated to various agricultural sectoral activities, involving the systematic and controlled use of various life forms, especially crop and livestock production, in order to produce food. Agricultural land dominates as the primary land use category in 2020 the EU (37.8%), and in Romania (61%) as a member state as well. (EUROSTAT, 2024)

### ***Machinery***

Advantages of Agricultural Machinery lie in the fact that utilizing agricultural equipment and machinery is essential for modern crop production as well as for livestock production. With more effective use of machinery, farmers can cultivate larger areas more efficiently, resulting in higher yields while placing less strain on natural resources.

Sustainable mechanization in agriculture can enhance land productivity by ensuring timely and quality cultivation, offer opportunities to alleviate labour shortages and help households better withstand shocks, minimize agriculture's environmental impact when paired with proper conservation practices, and reduce poverty while enhancing food security and people's livelihoods. (FAO, 2024)

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<sup>18</sup> Ph.D., University Lecturer, Sapientia Hungarian University of Transylvania, Faculty of Economics, Socio-Human Sciences and Engineering, Miercurea Ciuc, [birobiborka@uni.sapientia.ro](mailto:birobiborka@uni.sapientia.ro)

<sup>19</sup> Ph.D., University Lecturer, Sapientia Hungarian University of Transylvania, Faculty of Life Sciences and Sports, Sfântu Gheroghe, [biroboroka@uni.sapientia.ro](mailto:biroboroka@uni.sapientia.ro)

***Human Resources***

Agriculture is considered a big employer sector in the EU: those working in the fields of crop and animal production, hunting and related service activities had a share of 4.2% out of total employed. Among all member states, Romania is the one with the highest share of those employed in agriculture: in 2020 every fifth person (20.9%) working in the country is active in the agriculture sector. (EUROSTAT, 2022) However after joining the European Union in the year 2007, Romania faces a decreasing share of those employed in agriculture as compared to the total employed population. Back then, the share of agricultural employment was over 30%.

Wast majority of farmers activating in the EU only have practical experience. In 2020 seven farmers out of ten (72.3%) only had practical experience, almost two out of ten (17.5%) had basic agricultural training, and one in every ten (10.2%) of those managing a farm owned full agricultural training knowledge. Romania belongs to those member states where the share of fully trained farm managers is extremely low: 0.7%, while the share of those having only practical experience is the highest: 94.5%. (EUROSTAT, 2022)

**AGRICULTURAL ACTIVITY**

There are two basic branches of agricultural activity: crop production and livestock farming. Both crop production and livestock farming play a major role in the agricultural production. Crop and livestock production are complementary. They have a prominent status in the economy, with certain branches of the sector providing a steady source of income and regular employment of those involved in the sector throughout the year. (Benk, 2018)

According to the data of the Romanian General Agricultural Census 2020<sup>20</sup>, there have been a total of 2887 thousand agricultural holdings in Romania using 12.8 million hectares of agricultural land. As compared to data from the year 2010, the number of agricultural holdings decreased by 972 thousand, meaning a 25.2% decrease and the utilized agricultural area decreased by 543 thousand ha that means 4.1% during the last decade. (General Agricultural Census in Romania, 2020) Concentration process of agricultural land is noticeable in Romania. The country however occupies an extreme position in the EU taking into account the average farm size. Luca, 2009 refers to Romania as „a country with two agricultures” identifying the large amount of subsistence and semi-subsistence farms having an extremely low average farm size on the one hand, and the very few extremely large size farms on the other hand.

In order to measure the economic size of farms and to classify them by type of farming we use the calculation of Standard Output (SO). Standard output can be calculated for each agricultural product, both for crops and for livestock. SO refers to the average value in monetary terms of the agricultural output (at farm-gate price) and it is expressed either in euro per hectare or in euro per head of livestock. There are regional SO coefficients defined for each crop and for each type of animals: calculated as averages for a reference period. The economic size of a farm thus can be expressed in monetary terms, calculated in euro by summing up all the SO per hectare for each crop and all the SO per head of livestock existing in that specific agricultural unit. (Eurostat Statistics Explained, 2024)

**PERFORMANCE*****Labour productivity***

Productivity is an important aspect in agricultural development strategies due to its impact on economic and social progress. Enhancing productivity generates the wealth needed to address

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<sup>20</sup> As the most recent Romanian Agricultural Census data is available for the year 2020, all other datasets used in within present study refer to year 2020 (even where there were already available more recent data) for consistency reasons.

current needs and invest in future improvements. In general, productivity measures the efficiency and effectiveness of resource use to produce the goods and services society requires over the long term. Labour, capital and natural resources represent basic resource inputs for agricultural activities. (Ukeje, 2000) Among these, we considered to highlight as one of the performance indicators the labour productivity. The value of labour productivity can be calculated as the average daily value generated by an individual working in the agriculture sector.

#### ***Average net monthly salary earnings***

Average net monthly salary earnings refers to all remuneration received after deduction of the employees contributions and taxes. Consequently, this reflects the average sum of money an agricultural worker earns as a disposable income each month. When analysing the sectoral performance of agriculture it is highly important to have a look at the monthly wages realised in the sector.

#### ***Agricultural enterprises***

Enterprises play an essential role in sectoral performance. When analysing the agricultural sector, it is important to have a look at the number of firms operating in this sector. The calculation of agricultural enterprises per 1000 inhabitants in each county (NUTS3 level) reflect the predominancy of the agricultural sector on subregional level.

In our study we considered a total of ten indicators that cover, by theme: resources used in agriculture, agricultural activity and agricultural performance. Within these, the following have been quantified on county level:

Table 1: Indicators

	<b>Land use</b>	<b>RESOURCES</b>
M1	Average farm size (ha), 2020	
M2	Share of agricultural land in total land fund (%), 2014	
	<b>Machinery availability</b>	
M3	Number of tractors per 100 ha of arable land (tractor/100 ha), 2020	
	<b>Human resources</b>	<b>AGRICULTURAL ACTIVITY</b>
M4	Share of farm managers under 35 years with full agricultural training (%), 2020	
M5	Share of those employed in agriculture (%), 2020	
	<b>Crop production</b>	
M6	SO value of crop production (EUR), 2020	
	<b>Livestock farming</b>	<b>PERFORMANCE</b>
M7	SO value of livestock (EUR), 2020	
M8	Labour productivity in agriculture: value produced (RON/working day/person), 2020	
M9	Average net monthly salary earnings in the agricultural sector (RON), 2020	
M10	Number of active agricultural enterprises per thousand inhabitants (number/1000 inhabitants), 2020	

Source: Authors' own edition

## **PERFORMANCE**

M8: Labour productivity in agriculture: value produced (RON/working day/person), 2020

M9: Average net monthly salary earnings in the agricultural sector (RON), 2020

M10: Number of active agricultural enterprises per thousand inhabitants (number/1000 inhabitants), 2020

The data used in the analysis refer to the year 2020, with the exception of the agricultural area as a percentage of total area (%), where the most up-to-date county series were available for the year 2014. The data on which our calculations are based were extracted from publications of the Romanian National Statistical Office (INS) and from its online database. We further used the county data series of the General Agricultural Census 2020 (Recensământul General Agricol) published in December 2022 and the INS TEMPO database tables. The results of the calculation of the ten indicators at county level were displayed on maps, and the Excel module of the Microsoft Office was used for data visualisation.

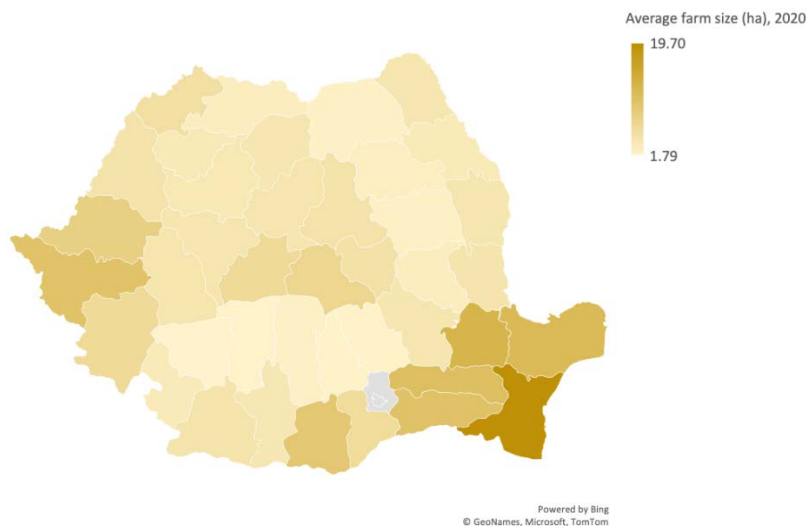
The aggregated results of a ranking on ten indicators were used for the analysis. Each indicator was calculated for each county. We deliberately excluded Bucharest and Ilfov from the county ranking, as the urban character of this region would bias our results for the agricultural performance potential study.

## Results

### *M1: Average farm size (ha), 2020*

Average of the utilised agricultural area (UAA) shows the average value of a farm. On country level, in Romania, most recent data referring to the year 2020 (RGA, 2020) shows an average farm size value of 4.42 ha. This value is considered extremely low on European level: average mean size of an agricultural holding in the EU was 17.4 ha in 2020. Romania is the Member State with the highest number of farms in the Union. The evolution of farms and farmland between 2005 and 2020 shows that largest reductions among all member states were recorded in Romania: a minus of 1.4 million farms, that equals a decline of 32 %. (Eurostat, 2022)

Map 1: Average farm size (ha), 2020



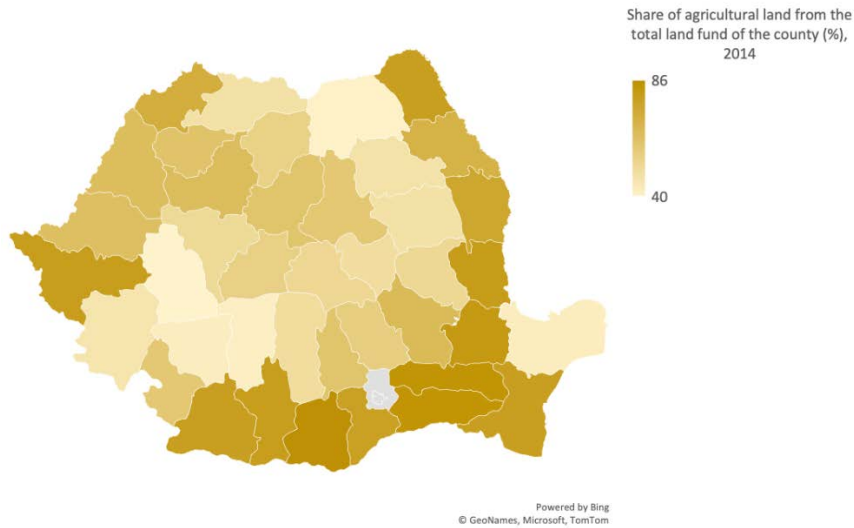
Source: Authors' own edition

Large differences on county level are noticeable in Romania regarding the average physical size of farms. Counties of the South-Muntenia and South East region as well as those of the West region have higher average physical farm sizes than the rest of the country. Highest value can be observed in Constanța county: 19.70 ha / farm, while lowest value in Gorj county: 1.79 ha / farm. (Map 1.)

**M2: Share of agricultural land in the total land fund of the county (%), 2014**

In terms of the share of agricultural land in the total area per county the Romanian national average is 61%. This value highlights the importance of the agriculture sector on country level. Southern and Eastern counties located along the border have higher shares of agricultural land than other counties. Teleorman is the county with the highest share of agricultural land: 86%, while Hunedoara is the one with the lowest share of the agricultural land: 40%.

Map 2: Share of agricultural land in the total land fund of the county (%), 2014



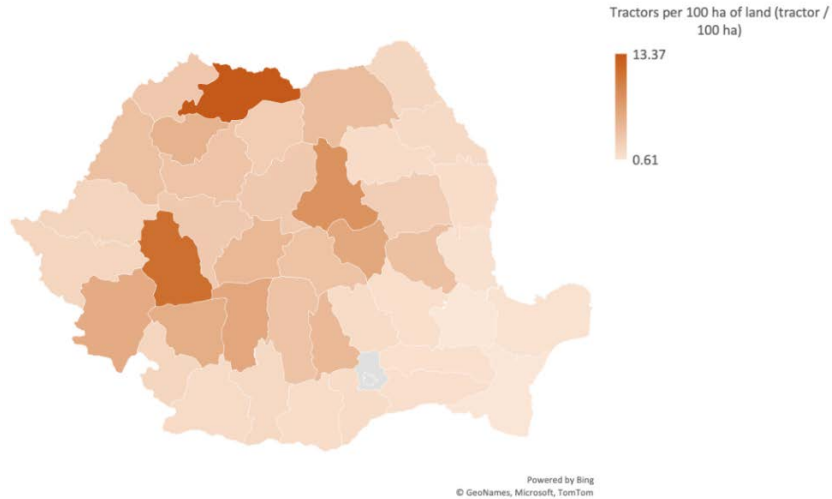
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When speaking about regional and cultural identity in the European Union, agricultural output, food supply as well as gastronomic traditions play a crucial role. The wide variety of agricultural products is provided by the various farming techniques as well as by various landscapes and climate conditions. In the territory of the whole Union, there have been 9.1 million farms in 2020, operating on a total area of 1.55 million km<sup>2</sup>. This means that on EU level, 37.8% of the total land fund is used as agricultural area. (Eurostat, 2024)

**M3: Number of tractors per 100 ha of arable land (tractor/100 ha), 2020**

As an indicator of the degree of mechanisation, the number of tractors per 100 ha of arable land had been calculated in Romania, on county level. Here the statistics do not allow us to distinguish between smaller and larger machines. The level of tractor stock in Romania in 2020 clearly shows the positive results of the EU support system, i.e. the access of funds available through the Common Agricultural Policy's Rural Development pillar that were implemented in the country after its accession to the Union, since 2007. Moreover, both quantitative and qualitative increase of mechanical resources in the Romanian agriculture were noticeable even in the pre-accession period, due to the accession by farmers of pre-accession funds. (Constantin and Ciobanu, 2011)

Map 3: Number of tractors per 100 ha of arable land (tractor/100 ha), 2020



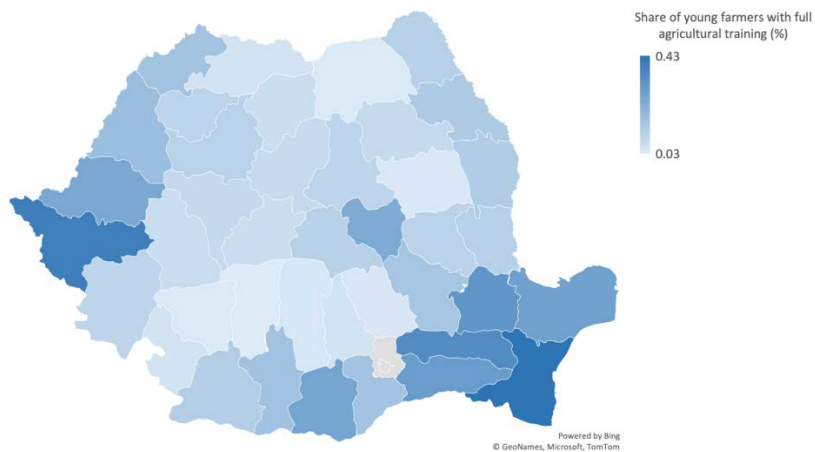
Source: Authors' own edition

On average, in Romania, in 2020 there were 2.48 tractors available for each 100 ha of arable land. No additional technical information was available regarding the capacity of these tractors. Maramureș was the county with the highest average value: 13.37 tractors / 100 ha of arable land, while Brăila was the one with the lowest level: 0.61 tractors / 100 ha of arable land.

***M4: Share of farm managers under 35 years with full agricultural training (%), 2020***

When analysing the human resource potential in agriculture, we considered the share of young and fully trained farmers in the year 2020 as a forward looking indicator. Romanian county values show extremely low levels in this respect. National average is as low as: 0.12%. Highest value belongs to Constanța county: 0.43%, while lowest value belongs to Vâlcea: 0.03% of young farm managers are fully trained in agricultural studies.

Map 4: Share of farm managers under 35 years with full agricultural training (%), 2020

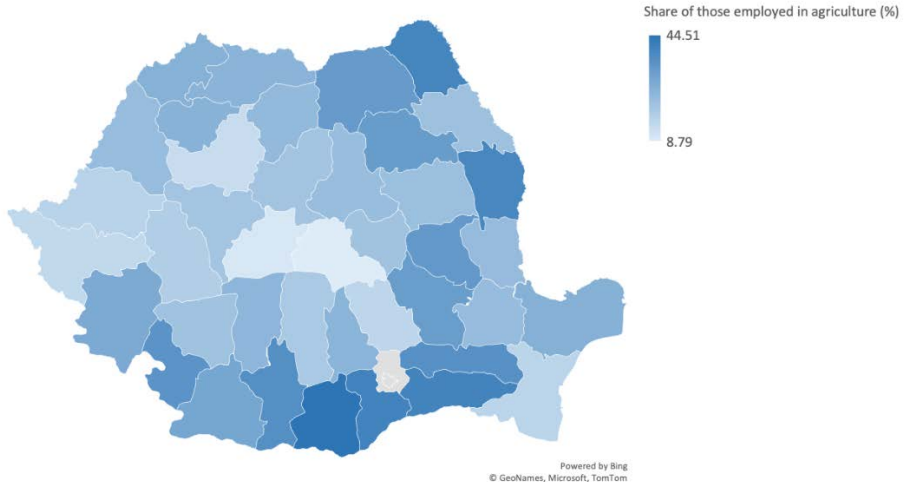


Source: Authors' own edition

**M5: Share of those employed in agriculture (%), 2020**

Agricultural sectoral employment has been traditionally high in Romania, and still is, however with a decreasing trend in the last decades. In 2020 the share of those employed in the agricultural sector was 19.92%. Large differences are noticeable when we take a closer look on the country, as on county level the share of agricultural employment is 44.51% in Teleorman county on the one hand, and is 8.79% in Braşov county on the other hand. Geographical factors as well as the predominance of other sectors contribute to very diverse levels of agricultural employment in Romania. Southern and Eastern development regions of the country have generally higher values of agricultural employment than other ones.

Map 5: Share of those employed in agriculture (%), 2020

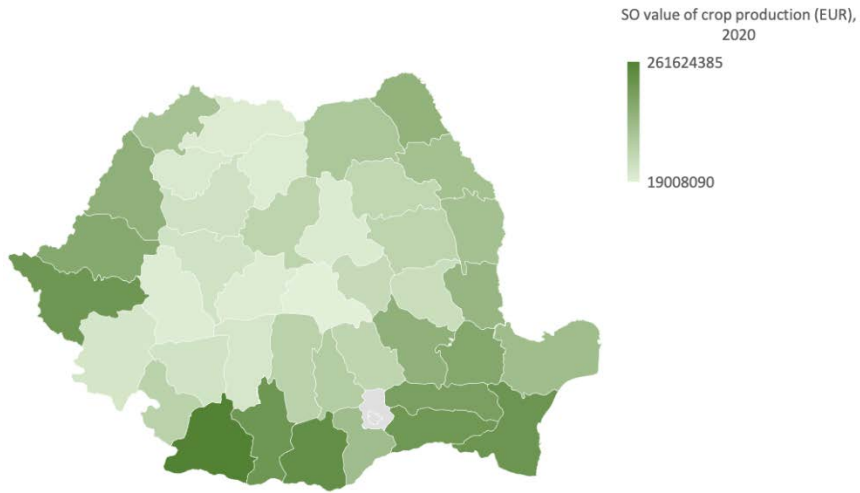


Source: Authors' own edition

**M6: SO value of crop production (EUR), 2020**

We considered important to calculate the size of crop production in Romania in economic terms. For this, we have chosen the following crops: wheat, maize, sunflower, rapeseed, potato. These are the predominant crops, that occupied more than 70% of arable land countrywide, in 2020. We calculated an average wighted SO value of crop production for the above mentioned five types of crops and for each county. Our results show a national total crop output value of 4.46 billion EUR in terms of Standard Output in Romania. The county with the highest crop production value was Dolj: 0.26 billion EUR, while the county with the lowest level of crop production was: Braşov with 0.02 billion EUR.

Map 6: SO value of crop production (EUR), 2020



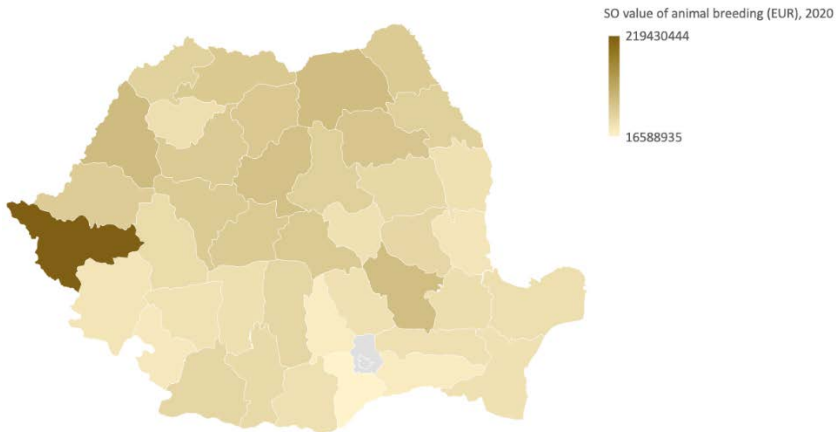
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Source: Authors' own edition

***M7: SO value of livestock (EUR), 2020***

We also considered essential to calculate the economic size of livestock production in Romania. For this, we took into account the following livestock units: cattle, sheep, goat and pig, calculating their values using SO coefficients for each category. These animals are predominant in the Romanian agriculture. Their total value countrywide means in terms of SO 2.40 billion EUR. Timiș county is the one with the highest value of livestock SO in Romania: 0.22 billion EUR in 2020, while Giurgiu is the county with the lowest value, that of: 0.017 billion EUR.

Map 7: SO value of crop production (EUR), 2020



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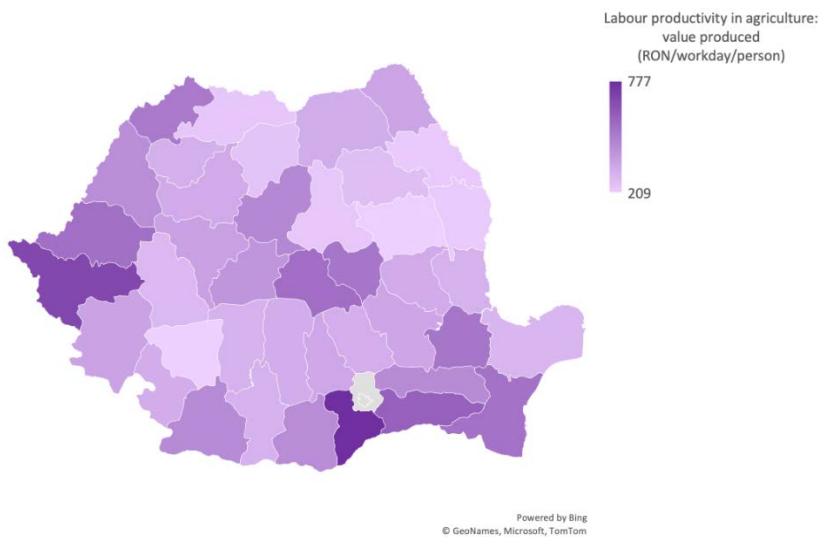


When analysing the evolution of livestock units during Romania's post-accession period, we notice between 2007 and 2020: a general decreasing trend of cattle with 33%, a general decreasing trend of pigs with 43% and an oscillating trend of sheep and goats with an increase of 27%. (INS, 2023)

**M8: Labour productivity in agriculture: value produced (RON/working day/person), 2020**

In the performance indicator group, we first looked at the value produced by a person working in agriculture sector on an average working day. This was measured in monetary terms. Compared to the national average in the year 2020, which was 368 RON, in Bacău county this value was only 209 RON, while in Giurgiu county it has been 777 RON. It is noticeable that there are large territorial differences regarding the daily value produced in the agriculture sector in Romanian counties.

Map 8: Labour productivity in agriculture: value produced (RON/working day/person), 2020

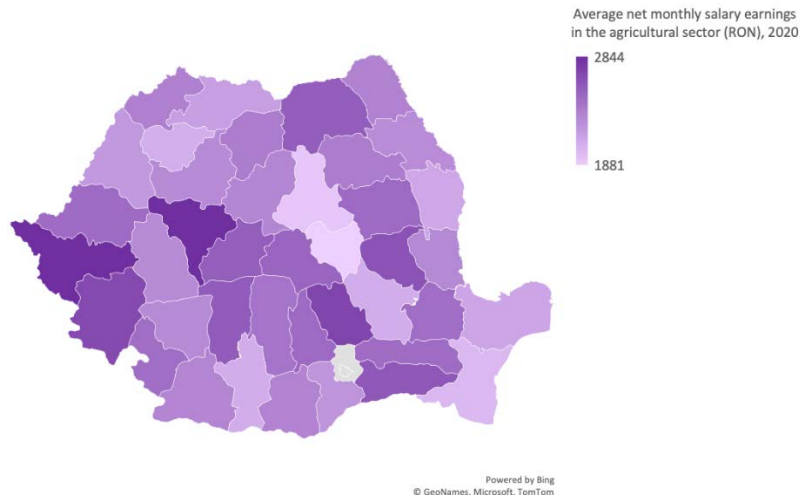


Source: Authors' own edition

**M9: Average net monthly salary earnings in the agricultural sector (RON), 2020**

Our second performance indicator is the average net monthly salary earnings in the agriculture sector in Romania on county level. In terms of average gross monthly wages those realised in the agricultural sector are considerably lower than the country average considering all sectors. Sectoral data of the Romanian Statistical Yearbook 2020 shows that the average gross monthly salary earning was 4853 RON, with a value of 3773 RON in the Agriculture, forestry and fishing sector. In the same year average gross monthly earnings in Romania in the Information and communication sector was: 9012 RON, in the Financial intermediation and insurance sector 8269 RON, while in the Public administration and defence sector was 8234 RON. (Statistical Yearbook, 2020)

Map 9: Average net monthly salary earnings in the agricultural sector (RON), 2020



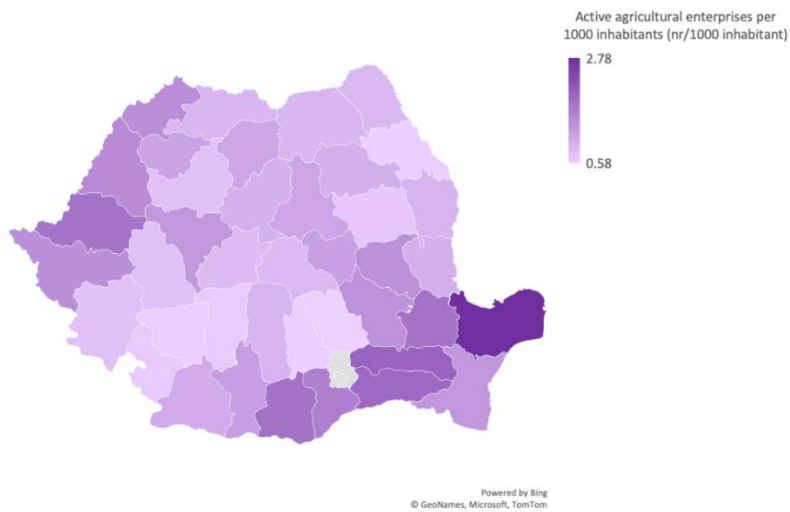
Source: Authors' own edition

Taking into account gross net monthly salary earnings in the Agriculture, forestry and fishing sector in Romania, the average national value in year 2020 was 2412 RON. Territorial differences are noticeable in terms of the farmers net monthly earnings: highest value in Alba county: 2844 RON, while lowest value in Covasna county: 1881 RON.

***M10: Number of active agricultural enterprises per thousand inhabitants (number/1000 inhabitants), 2020***

The number of active agricultural enterprises per thousand inhabitants is generally low in Romania: 1.03 enterprises/1000 inhabitants. We detected highest value in Tulcea county: 2.78 agricultural enterprises/1000 inhabitants, lowest value in Prahova county: 0.58 enterprises/1000 inhabitants.

Map 10: Number of active agricultural enterprises per thousand inhabitants (number/1000 inhabitants), 2020



Source: Authors' own edition

## RESULTS AND CONCLUSION

We have calculated the county rankings for all ten indicators. The best performing county received 40 points and the worst performing county received 1 point for each indicator. The scores for each indicator were summed up in order to give a final score for each county, which gives us an indication regarding the agricultural performance and potential.

Territorial differences on subregional level are noticeable regarding the agricultural performance and potential of the Romanian counties. This diversity should be reflected in the measures of the National Rural Development Programme. Common Agricultural Policy funds should also target specific needs of different counties regarding their agricultural performance and potential. One national strategic agricultural policy would not fit the specific needs of the development regions. It is questionable whether LEADER Funds within the CAP are enough to meet these specific subregional level agricultural and rural development needs in Romania or more funds should be allocated for these purposes. Further research should be made in order to analyse the evolution in time of the agricultural performance and potential of the Romanian counties. The analysis of the absorption of CAP funds should also be analysed in time within the framework of further research in order to detect whether the gap between low potential regions and high potential regions is shrinking or enlarging. To study whether agriculturally rich regions become richer, and poor regions become poorer as time goes by.

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