

AN OVERVIEW OF POTATO IMPORTS FROM ROMANIA

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ABSTRACT

Agriculture is an important area that contributes to food security at the national level, and at the EU level, Romania plays an important role in the market for agricultural products. Potatoes, the most consumed vegetable product in Romania, will show a decrease in both areas, by around 57% in 2021 compared to the reference year 2014, and total production by 60%. Calculating the Gini coefficient, it can be seen that in the case of imports, the degree of concentration is low, while in the case of exports, the degree of concentration is high. Applying the simple linear regression, potato imports are strongly influenced by the domestic consul.

KEYWORDS: *consumption, Gini, potato, Romania*

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1. INTRODUCTION

Romania is still recognized among the EU Member States as an important country in the agricultural sector, this is also reflected in the agricultural area of arable land and the yields obtained. In 2020 it ranked seventh in terms of the total contribution of the agricultural industry (Dumitru, 2021).

The potato crop is versatile, it is also an industrial crop that is easily processed into frozen products such as French fries, but also chips, flour, mash, alcohol, starch, and its various derivatives. Potatoes can be eaten fresh, and in addition to human consumption, tubers and leaves are used in animal feed (Dumitru, 2019; Iancu, 2022).

The high potential due to its nutritional content has easily become the most important food source in the world and represents the front line in the fight against hunger and poverty. Climate change as well as the sandy-clay soil may lead to a decrease in the areas cultivated with potatoes in Transylvania, Oltenia, Banat but also Bucharest-Ilfov (Dinu, 2015, Micu, 2022).

Several authors have highlighted the health benefits of potatoes, including antioxidant, anti-inflammatory, antihyperlipidemic, antihypertensive, anticancer, and antidiabetic effects. Also, many studies have shown that due to the natural agent PI-2 found in potatoes, it can have a satiating effect and considerable weight loss if consumed properly (Visvanathan, 2016).

In recent years, EU countries have significantly increased the percentage of fresh potatoes used in processed industries, even for human consumption. The top countries for industrial potato processing are the Netherlands with 67%, Denmark with 44.6%, and France with 40.8% respectively. In the case of Romania, from a total production of 3,038 thousand tonnes per year,

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only 1% goes to industrialization. The social and economic effects that Romania is facing affect the most important sector of the Romanian economy, namely agriculture (Preju, 2009; FAO).

At the EU level, in 2016, almost 1.5 million farms grew potatoes, of which 40.7% were in Romania, Poland 25.4%, Lithuania 5.3%, Spain 4.5%, and Portugal 2.8%; 90% of farms grew less than 1 hectare, with Poland growing on average 0.8 hectares and Romania 0.2 hectares. Among the countries that cultivated large areas were Denmark with 21.6 hectares and the Netherlands with 16.5 hectares (Chiru, 2010; Tudor, 2022).

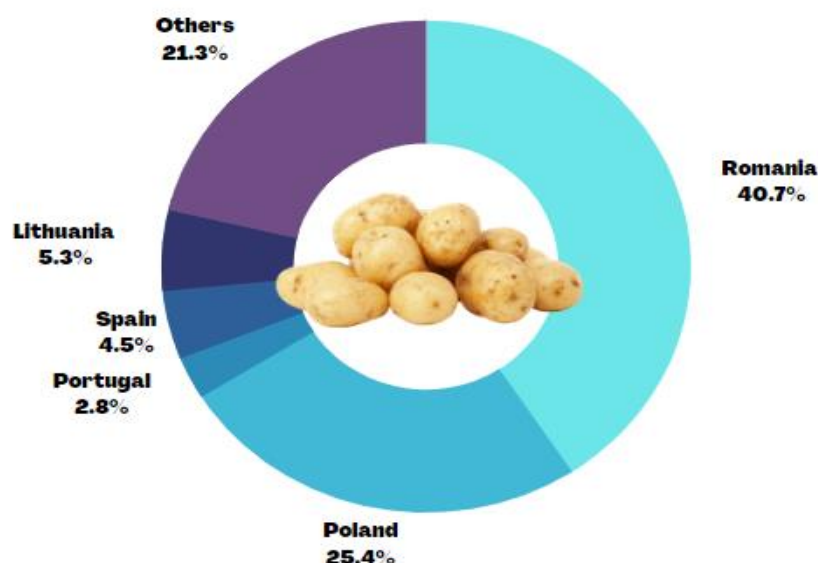


Figure 1. Farms growing potatoes in the EU

Source: FAO (Accessed on 10.09.2022)

The importance of small and family farms is due to the contribution they make to a sustainable economy and to food security. In addition to the benefits they bring to the rural environment by preserving traditions and rural life, these farms generate jobs and support the community, prevent an exodus from rural areas and contribute to poverty reduction. These are also European Union targets that are being pursued (Micu, 2022; Chiripuci, 2020).

2. METHODOLOGY

The Gini coefficient was created by the statistician and sociologist Corrado Gini in 1912 as an index measuring the dispersion of statistical data in order to describe the disproportionality of income or wealth distribution. The percentage obtained, defined as the value ratio between 0 and 1, indicates perfect equality if it is 0 and perfect inequality if it is close to 1%.

$$G = \frac{\sum_i \sum_j |x_i - x_j|}{2 \sum_i \sum_j x_i} \quad (1)$$

The study presents the main technical-economic indicators for potato cultivation, data provided by the National Institute of Statistics and TradeMap. On this basis, the price for the import and export of potatoes from the main importing and exporting countries was calculated.

At the end of the study, a linear regression model was developed to show the influence between Romania's potato import and consumption. Linear regression involves identifying the dependent variable's influence on the independent variable and to what extent it is identified.

ANOVA is a statistical difference that divides a variable within a set into two factors: systematic and random, of which the systematic ones have an influence on the data set and the random ones do not.

The paper aims to identify the dispersion of potato exports and imports, identify the selling prices for potatoes, and the influence of consumption on potato imports.

Future research directions include a thorough analysis of potato cultivation at the European Union level, which will include multiple regression and forecasts of potato areas and yields.

3. RESULTS

In Romania, the area cultivated with potatoes in 2014 recorded 198.54 thousand hectares, representing the largest area in the period analyzed, reaching 2021 an area of 84.4 thousand hectares, showing a decrease of more than 57%.

The average production of potato crops also recorded decreases in the period 2014-2021. In 2021 (16.54 kg/ha) the average potato production decreased by 5.6% compared to the average production recorded in 2014 (17.3 kg/ha). Total potato production peaked in 2014 at 3.5 million tonnes, reaching approximately 1.4 million tonnes in 2021 (Table 1).

Table 1. Main technical indicators for potato crops

<i>Indicator</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>	<i>2018</i>	<i>2019</i>	<i>2020</i>	<i>2021</i>	<i>2021/2014</i>
Area (thousand ha)	198.54	191.77	182.24	167.42	169.30	170.06	98.5	84.40	-57.49
Average production (t/ha)	17.53	13.87	14.55	18.39	17.63	15.22	15.84	16.54	-5.63
Total production (thousand tonnes)	3,519.3	2,699.7	2,689.7	3,116.9	3,022.7	2,626.8	1,601.2	1,397.8	-60.28

Source: National Institute of Statistics (Accessed on 10.09.2022)

According to the National Institute of Statistics, potatoes are the most consumed vegetable in Romania, followed by tomatoes, onions, and carrots.

The average annual consumption of potatoes per inhabitant in 2014 was 39.77 kg/inhabitant, reaching 36.26 kg/inhabitant in 2021, showing a decrease of 8.8% (Figure 1).

Regarding the average price of potatoes in Romania, in 2014 a kilogram of potatoes was sold for 1.53 lei/kg, reaching 2021 for 1.63 lei/kg, showing an increase of 6.5% (Figure 1).

In 2014, Romania imported potatoes worth 16,940 thousand euros, reaching in 2021 to import potatoes worth 38,087 thousand euros, showing an increase of 124%. The main countries from which Romania imported potatoes in 2014-2021 were France, Germany, Greece, and the Netherlands.



Figure 2. Average annual potato consumption and price in Romania

Source: National Institute of Statistics (Accessed on 10.09.2022)

In the period 2014-2021, the highest import price of potatoes was recorded in 2019 (302.24 euros/tonne) the lowest in 2015 (127.02 euros/ton). In 2021, Romania imported potatoes worth 38.087 thousand euros, at an average price of 187.47 thousand euros/ton, where 29% of imports came from France (10.988 thousand euros), followed by Germany (7.501 thousand euros) with 19.69%, Greece (6.651 thousand euros) with 17.46% and the Netherlands (5.319 thousand euros) with 13.97%.

In Germany, the export price of potatoes in 2014 was 1720.76 euros/ton reaching 159.2 euros/tonne in 2021, showing a decrease of approximately 8% (Table 2).

Table 2. Potato import value and selling price

Specification		2014	2015	2016	2017	2018	2019	2020	2021	% from 2021
Import value	World	16,940	13,155	30,355	25,747	25,250	59,058	40,251	38,087	100
	France	5,374	2,368	4,920	1,651	3,343	12,147	9,641	10,988	28.85
	Germany	2,282	2,086	5,157	2,705	3,264	7,329	5,751	7,501	19.69
	Greece	1,108	1,081	5,470	5,733	4,982	11,628	7,432	6,651	17.46
	Netherlands	2,686	1,044	2,747	919	1,744	8,459	7,827	5,319	13.97
Gini coefficient		0.36	0.28	0.35	0.36	0.36	0.34	0.35	0.38	2021/2014
Selling price	World	152.24	127.02	190.85	199.21	180.73	302.24	214.20	187.47	23.14
	France	107.95	71.99	213.57	168.66	119.69	268.14	196.13	161.53	49.64
	Germany	172.76	115.15	206.48	211.28	166.49	262.89	169.26	159.20	-7.85
	Greece	235.59	217.33	376.88	312.27	335.53	410.22	245.01	271.26	15.14
	Netherlands	209.88	207.84	180.52	429.64	224.22	305.51	240.42	263.38	25.49

Source: Own processing based on TradeMap data

In terms of potato exports, the lowest value was recorded in 2015, i.e. 206 thousand euros, while the highest value was recorded in 2021 at 3,725 thousand euros. Romania exported potatoes in 2021 worth 3,725 thousand euros at an average price of 151.49 euros/tons. Moldova bought 40.43% of Romania's total exports of potatoes at a price of 137.41 euro/tonne, followed by Poland with a percentage of potato imports of 15.57% at an average price of 280.06 euro/tonne, Greece and Hungary with over 6% with an average price of 136.17 euro/tonne and 243.44 euro/tonne respectively. A significant increase in the export price of potatoes can be observed in Hungary where in 2014 a tonne of potatoes was bought for 104.52 euro/tonne, reaching in 2021 to be bought for 243.44 euro/tonne, showing an increase of more than 132% (Table 3).

Table 3. Potato export value and selling price

Specification		2014	2015	2016	2017	2018	2019	2020	2021	% from 2021
Export value	World	1,016	206	571	2,427	1,816	1,580	3,541	3,725	100.00
	Republic of Moldova	305	114	92	1,814	756	503	1,615	1,506	40.43
	Poland	206	4	357	392	309	875	721	580	15.57
	Greece	52	10	48	106	129	125	8	233	6.26
	Hungary	37	7	2	16	25	7	78	232	6.23
Gini coefficient		0.37	0.59	0.62	0.75	0.41	0.62	0.51	0.47	2021/2014
Selling price	World	139.93	127.79	245.7	119.69	154.37	285.66	147.76	151.49	8.27
	Republic of Moldova	113.93	106.84	204.44	104.5	116.04	250.25	133.73	137.41	20.6
	Poland	181.02	190.48	309.9	212.93	237.15	347.22	267.43	280.06	54.71
	Greece	179.31	169.49	195.12	243.12	232.85	179.08	150.94	163.17	-9
	Hungary	104.52	50.72	54.05	148.15	219.3	205.88	195	243.44	132.91

Source: Own processing based on TradeMap data.

Comparing the Gini coefficient for potato import and export, we observe that for potato import, the degree of concentration ranged from 0.28 in 2015 to 0.38 in 2021 indicating a low degree of concentration, while for potato export, the degree of concentration ranged from 0.37 in 2014 to 0.75 in 2017 indicating a high degree of concentration. (Table 3).

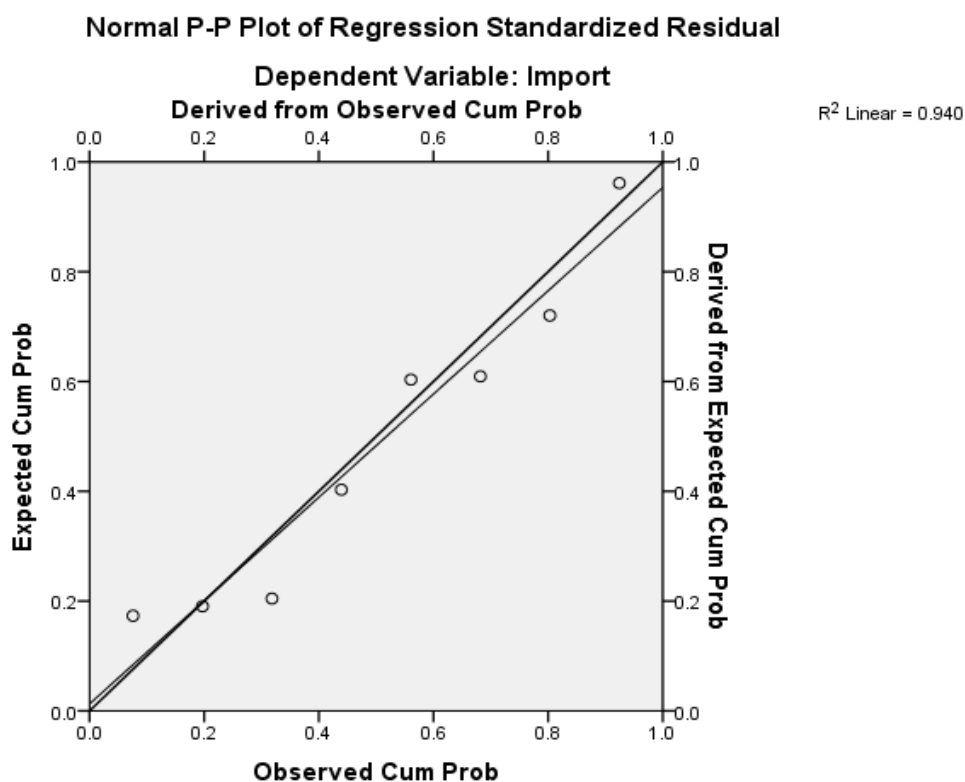


Figure 3. Determination of the regression between potato import and potato consumption

Source: SPSS's own representation

Analyzing the relationship between the dependent variable, "import" and the independent variable "consumption" resulted in the coefficient of determination of 0.940, our dependent variable is 94% explained by the independent variable (Figure 3).

Table 4. Determination of the ANOVA model between potato import and potato consumption

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7104418480.467	1	7104418480.467	12.581	.012 ^b
	Residual	3388063409.408	6	564677234.901		
	Total	10492481889.875	7			
a. Dependent Variable: Import						
b. Predictors: (Constant), Potato Consumption						

Source: SPSS' own representation

Analyzing the influence of potato consumption on potato imports, the table shows the linear regression model between the two variables. It is observed that the F-parameter has a value of 12.581 and the value of the critical F-parameter is 0.012, which does not exceed the critical value of 0.05 (5%), thus the F-parameter does not exceed the value of the critical parameter, resulting in 88% model validation (Table 4).

CONCLUSION

Considered "the second bread for people" due to its properties, the potato is an important crop for Romanian agriculture (Dumbrava, 2004).

In Romania, the area cultivated with potatoes decreases in the period 2014-2021, the largest area was recorded in 2014 (198.54 thousand hectares) and the smallest area in 2021 (84.4 thousand hectares), showing a decrease of more than 57%. In addition, in the case of total production, there was a decrease of 60% in 2021 (1,397.8 thousand tons), compared to the potato production recorded in 2014 (3,519.3 thousand tons). These decreases can be attributed not only to climatic conditions and lack of irrigation but also to the cost of plant protection products.

In terms of imports, the largest quantity in 2021 we imported from France (10,988 thousand tonnes), followed by Germany (7,501 thousand tonnes), Greece (6,651 thousand tonnes), and the Netherlands (5,319 thousand tonnes), while Romania exported the largest quantities of potatoes to countries such as the Republic of Moldova (1,506 thousand tonnes), Poland (580 thousand tonnes), Greece (233 thousand tonnes), Hungary (232 thousand tonnes).

According to linear regression, potato consumption influences potato import by 94%, and the Gini coefficient analysis shows that the degree of concentration is low for import, while for export, the degree of concentration is high.

At the global level, climate, food, and energy issues need to be addressed in a way that does not neglect agriculture and that finds solutions to ensure food security for the coming years. A major problem for Romania is the export of non-value-added products and the import of value-added products for both vegetable and cereal crops.

The difficulties encountered by potato and other vegetable crops are represented by the low level of mechanization present on small farms. Although the quality of small-scale production is higher, accessibility in markets and supermarkets is difficult to achieve, so cooperation between farmers is recommended in order to increase the level of negotiation and create direct cooperative shops. There is also a need for suitable varieties in areas where the soil is not suitable for potatoes.

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REFERENCES

- Chiripuci, B. C., Constantin, M., Popescu, M. F., Scriciu, A. (2020). The Socioeconomic Impact of Migration on the Labor Market in the Romanian Danube Region. *Sustainability* 2020, 12(20), 8654. <https://doi.org/10.3390/su12208654>.
- Chiru, S. C., Olteanu, G., Chiru, N., Rusu, S. (2010). *Limits and new approach to improve seed potato production in Romania*. Retrieved 24-25 November, 2010, from http://potato.ro/_publicatii_files/SesiuniAnula/Prezentari%20sesiunea%20stiintifica%202010/9.30.pdf
- Dinu, M., Sore, R. (2015). Research on the sweet potato (*Ipomea batatas* L.) behavior under the soil and climatic conditions of the South-West of Romania, *Journal of Horticulture, Forestry, and Biotechnology*, 19(1), 79-84
- Dumbrava, M. (2004). Crop technology, *Didactical and pedagogical Publishing House*, Bucharest, p.215- 216
- Dumitru, E. A., Ursu, A., Tudor, V. C., Micu, M. M. (2021). Sustainable Development of the Rural Areas from Romania: Development of a Digital Tool to Generate Adapted Solutions at Local Level, *Sustainability* 2021, 13, 11921, <https://doi.org/10.3390/su132111921>
- Dumitru, E. A., Micu, M. M., Tudor, V. C., (2019). Conceptual Approaches Regarding The Romanian Rural Area. *Scientific Papers. Series "Management, Economic Engineering In agriculture and Rural Development"*, Vol. 19(2), 121-128.
- Dumitru, E. A., Roxana, F. (2017). Study on the potato market at the level of Romania in the period 2012-2017, *Agrarian Economy and Rural Development-Realities and Perspectives for Romania. International Symposium*, 10th Edition. Bucharest.
- Marius, M. M., Toma, A. D., Gina, F., Valentina, C. T., Elena, S., Eduard, A. D., Paula, S., Adina, I. (2022). Climate Change—Between “Myth and Truth” in Romanian Farmers’ Perception. *Sustainability* 2022; 14 (14):8689.
- Micu, M. M., Dumitru, E. A., Vintu, C. R., Tudor, V. C., Fintineru, G. (2022). Models Underlying the Success Development of Family Farms in Romania, *Sustainability* 2022, 14, 2443, <https://doi.org/10.3390/su14042443>
- Perju, N., Chiran, A., Ungureanu, G. (2009). The economic aspects of potato production in Romania in the context of European integration and globalization. *Revista Lucări. Științifice Seria Agronomie*, 52(2), 538-545
- Tiberiu, I., Petre, L. P., Tudor, V. C., Marius, M. M., Ursu, A., Teodorescu F. R., Dumitru., E. A. (2022). A Difficult Pattern to Change in Romania, the Perspective of Socio-Economic Development. *Sustainability* 2022; 14(4):2350.
- Tudor, V. C., Dinu, T. A., Vladu, M., Smedescu, D., Vlad, I. M., Dumitru, E. A., Sterie, C. M., Costuleanu, C. L. 2022. Labour Implications on Agricultural Production in Romania, *Sustainability* 2022, 14: 8549. <https://doi.org/10.3390/su14148549>
- Visvanathan, R., Jayathilake, C., Chaminda Jayawardana, B., Liyanage, R. (2016). Health- beneficial properties of potato and compounds of interest. *Journal of the Science of Food and Agriculture*, 96(15), 4850-4860
- Food and Agriculture Organization of the United Nations. (n.d). Retrieved September, 9, 2022, from <https://www.fao.org/home/enTradeMap.org>
- The International Trade Centre (n.d). Retrieved September 9, 2022, from <https://intracen.org/>
- National Institute of Statistics (n.d). Retrieved September 9, 2022, from <https://insse.ro/cms/>