

The Economic Profitability of Garlic Cultivation through the Application of the "De Minimis" Aid Scheme, Estimates for the Year 2024 in Romania

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Abstract. *The culture of Romanian garlic has a high potential from an economic point of view, being in great demand on the market, Romanians preferring its taste and aroma. However, ..garlic cultivation does not have an easy technology and the Romanian seed is hard to find, so many of the producers are discouraged and prefer to cultivate other, safer crops. Massive imports of garlic led to measures from the state. Underscoring the importance of garlic cultivation for the Romanian economy, the state met agricultural producers with a "de minimis" support to support garlic production. The present paper, in order to contribute to making the necessary decisions for the future production cycle as well as to support farmers who want to cultivate this crop, analyzes the economic efficiency with the help of profitability indicators (profit, profitability rates, breakeven point, etc.), for two possible situations: with financial support granted through the Garlic Production Support Program and without taking into account this "de minimis" support. In this context, it is aimed to evaluate the economic viability in terms of the use of the production framework technology of garlic culture and the rational use of both the raw materials used and the human and financial resources to produce garlic of high quality but at low costs. Agricultural activities are always determined by the profitability of the crop. The findings of the study can have a positive impact on farmers, allowing them to adjust their material resources and current farm capacities for higher productivity, while highlighting the importance of implementing the garlic crop support program.*

Keywords: economic efficiency, breakeven point, support program, agricultural subsidies, garlic production.

Introduction

Garlic has been known since ancient civilizations, both for its special taste, being a spice very often used in food, but also for its health benefits, due to its rich content of vitamins and minerals. Nicknamed "Russian penicillin" (Jones and Goebel, 2001), garlic contains vitamin B6, B1, vitamin C and minerals such as: calcium, potassium, iron, manganese and in addition contains germanium and selenium giving it antibacterial properties, but also other components such as inulin, adenosine and allicin (Mikali P and col, 2013).

Garlic began to be used on a large scale only after science demonstrated its energetic, nutritional and medicinal values, so that with the increase in demand for garlic, the areas cultivated with this crop also increased (Ibrahim Totić, Stevan Čanak, 2014).

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After joining the European Union in 2007, the Payments and Interventions Agency for Agriculture (APIA) applied a series of support measures for producers in the vegetable sector, namely: funds allocated from the European Agricultural Guarantee Fund (EGF), the European Agricultural Fund for Rural Development (FEADR) and from the National Budget.

In accordance with the objectives of the European Commission, the National Strategic Plan 2023-2027 (PNS) of Romania presents significant changes in its financing strategies. Its allocation was intended to increase the performance of farms, which must ensure the safety of the environment and the climate.

For the period 2023-2027, Romania will grant a subsidy decoupled from production, per eligible hectare declared by active farmers to maintain the economic viability of its farms, as follows: BISS (basic income support for the purpose of sustainability) will replace SAPS (scheme of single payment per area), CRISS (complementary redistributive support for income for the purpose of sustainability) is another type of subsidy intended for farms between 1 hectare and 50 hectares, farmers aged up to 40, with agricultural qualifications, will could access complementary income support for young farmers and the greening payment turns into echoschema PD-04: Environmentally beneficial practices applicable to arable land.

For the 2024 agricultural year, according to the plans made in the National Strategic Plan 2023-2027 (PNS) of Romania, the amount per hectare for APIA subsidies amounts to 264.45 euro, of which BISS – 97.85 euro, CRISS – 51, 42 euro, echo scheme PD-04 – 56.28 euro, payment for young farmers – 47 euro and Transitional National Aid ANT1- 11.92 euro. In addition to the APIA subsidies, the Ministry of Agriculture and Rural Development adopted the Draft Normative Act on the “de minimis” aid scheme to support garlic production, which was also implemented in 2023. By extending this “de minimis” aid scheme also in 2024, agricultural producers in the vegetable sector, especially garlic growers in regions with a tradition in this culture will be more interested in maintaining and growing garlic for the next period. This can lead to a decrease in imports and an increase in the consumption of Romanian garlic, which will contribute to the satisfaction of consumers in terms of consumption of local products.

The scheme of “De minimis” aid for the application of the garlic production support program" is a multi-year government program that has been implemented since 2019. This “de minimis” aid scheme for garlic growers is applied according to the provisions of Regulation (EU) no. 1408/2013. Initially scheduled to take place over a period of 3 years (year 2019 – HG 108/2019, year 2020 – HG 202/2020, year 2021 – HG 436/2021) this program continued in the following years (year 2022 – HG 147 /2022 and 2023 – HG 393/2023). In 2019, the “de minimis” aid, representing the subsidy granted for the domestic production of garlic, had the value of 1000 euro. This value proved to be insufficient to support the expenses related to the technology applied to obtain garlic, a fact that determined the increase of this value to 3000 euro per hectare cultivated with garlic, starting from the year 2020.

The main reasons behind issuing the Government Program to Support Garlic Production were:

- The massive imports of garlic from outside the country have negatively influenced the valorization of auththon garlic on the domestic market. The existence of insufficient premises for the proper conditioning and storage of garlic led to difficulties in its marketing. This caused the import of garlic to increase.

- The high costs of production, the lack of seeds from indigenous varieties, the absence of machines and equipment necessary for the application of technology but also the weak association of agricultural producers led to a deficit of production for the garlic crop.

Literature review

Although the tradition of garlic cultivation in Romania has roots stretching back to the pre-Roman period, information about it only began to appear in the 19th century. The demand for garlic increased with the development of cities, due to its traditional status in the diet of the population (Drăghici & Lagunovschi-Luchian, 2015). These developments sparked an increased interest from farmers in the cultivation of garlic, and the area dedicated to this crop expanded, especially in regions that offered favorable environmental conditions and where traditions and previous experiences supported the development of this crop (Munteanu, I., 2018).

In Romania, initially, garlic culture had a slow expansion, starting to be cultivated in family gardens, and currently it is not as widespread as it was in the 1990s. Cultivated areas vary between 50-100 hectares per village and 0, 5 and 15/20 in the rest of the country. Compared to worldwide production, Romania presented a yield of 18 tons/hectare, while China and Egypt presented yields of 20 tons/hectare (Munteanu, I., 2018).

One of the challenges of garlic production in Romania in the last decade is of an economic nature, derived from the relatively modest production per surface unit and the intense competition generated by the significant volume of imported garlic. The main purpose desired by the economic agents that import garlic is to satisfy the market demand and obtain a significant profit (Munteanu, I., 2018).

Garlic (*Allium sativum* L.) is a crop that is part of the Amaryllidaceae family and is one of the oldest medicinal plants, used for more than 5,000 years. According to Sapáková & Horký (2015), the earliest references were found on Sumerian clay tablets from 2600 to 2100 BC. Due to its notoriety, garlic is one of the most consumed vegetables globally. In terms of garlic production, Asian countries are recognized as the main producers (Velarde-Mendivil et al, 2021).

Given that garlic is a resource-intensive crop sensitive to weather conditions as well as soil composition, soil testing is necessary. They are carried out by planting a variety of garlic varieties over a longer period of time (several years) before starting the actual cultivation of this crop and have the role of identifying the best variety for the field and the most efficient garlic cultivation technology (Muska & Saksone, 2019).

Using an appropriate technology, garlic cultivation can be profitable, despite the fact that Romanian producers have to compete with large quantities of garlic from import (Alina Mitran, 2020). The Romanian market is flooded with large quantities of garlic from China at low prices but of questionable quality (Prato-Sarmiento AI, 2016).

One of the most recent problems related to the production of garlic in Romania is an economic one, determined by the relatively small productions/ha and the competition caused by the import of garlic. By importing garlic, the trade aimed to ensure the market's requirements, against the reduced supply of local production, and to achieve a profitable business, from a commercial point of view (Munteanu N., 2018).

It is good to know that garlic is a crop whose production does not endanger the agrosystem and the ecosystem, representing a particular importance in the production of ecological food (Ibrahim Totić, Stevan Čanak, 2014).

Among the main problems faced by garlic producers in Latvia are: lack of significant financial investment to initiate garlic cultivation, availability and quality of planting material, soil composition, unfavorable weather conditions for garlic cultivation and low agricultural labor intensity (Muska & Saksone, 2019).

In the Czech Republic, garlic is considered to be an agricultural commodity with high production and export potential. Most of the garlic production in the Czech Republic capitalized on the basis of a contract between the producer and the buyer, in most cases the buyer is represented by the processing industries. In recent years, a steady increase in demand for garlic has been observed, due to both the increased affinity for its flavor and its health benefits, having antibiotic and antioxidant properties (Sapáková & Horký, 2015).

Wang et al. (2002) are of the opinion that the strong price volatility of the garlic crop has a negative impact on the sustainable development of the garlic market and that an accurate price prediction can facilitate producers' decisions that can avoid market risks and promote its sustainable development.

The results of the study by Geng et al. (2013), showed that the market orientations of farmers who grow garlic in China exert a positive impact on the economic efficiency of agricultural holdings. It is therefore important for the government to provide farmers with information on consumer needs as well as new garlic cultivation techniques to help farmers evaluate and make decisions tailored to market needs that will improve their economic performance.

Methodology

In order to make the estimates regarding the analysis of the breakeven point for the garlic crop, it started from the production framework technology, adapted to the existing conditions in the vegetable basin in the area of Buzău county, and the estimates were made for the year 2024. The production framework technology includes all the mechanical works, manuals and phytosanitary actions used for garlic culture. The method used in this paper refers to the technical-economic analysis method by which the structure of the income and expenditure budget was determined, with the presentation of the following main elements:

- Production value: It is determined by taking into account the average production per hectare and the estimated domestic market price for the main production
- Granted subsidies: represent the financial support granted by the Romanian state from the state budget to producers in the vegetable sector
- Gross product: it is determined by adding the subsidies granted to the surface unit to the planned revenues to be obtained from the capitalization of production
- Intermediate consumption: refers to the sum of the values recorded with the inputs and services used to obtain the agricultural product. Here we refer to the expenses for mechanical work, labor, organic and chemical fertilizers, planting material, phytosanitary products, irrigation as well as general and management expenses, interest and credits, insurance, etc.
- Taxable income: It was calculated by the difference between the value of total production and total production expenses.

- Net income: represents the deduction of 10% from the amount of taxable income
- Net income + subsidy: represents the value of the net income to which the subsidies granted per surface unit have been added.
- Rate of taxable income: It was determined by dividing taxable income by total production expenses.
- The rate of net income + subsidy granted: was determined by relating the net income + subsidies granted per surface unit to the total expenses for the estimated primary production
- Production cost per unit of product: It was determined by dividing the total expenses for the main production by the estimated average production.
- Predictable price on the domestic market: it represents the price at which it is estimated that the production will be capitalized in the harvest year for which the estimate is made, in our case for the 2024 production year.
- Breakeven point: was determined for the estimated average production (kg/ha), from which the crop can be considered to start to become profitable.

$PR (Kg/ha) = Ch (Ron/ha) / Pv (Ron/Kg)$, where: PR - breakeven point Kg/ha; Ch - main production expenses Ron/ha; Pv - selling price Ron/Kg

- Rate of return, expressed as a percentage (%), was determined by relating the benefit obtained to the production cost:

$$Rr = (B (Ron/ton) / Cost (Ron/ton)) \times 100$$

Results and discussions

At the European level, according to the Eurostat database, the largest area cultivated with garlic in 2022 was recorded in Spain with an area of over 29 thousand hectares followed by Romania and France with over 4 thousand hectares. Compared to 2010, the area cultivated with garlic in 2022 increased by 100.6% in Spain, by 64.5% in France and by 10% in Italy. Romania ranks 2nd in the area cultivated with garlic in 2022 with 4.82 thousand hectares, down by over 28% compared to 2010 (6.75 thousand hectares) and by 9.2% compared to the previous year (Figure 1).

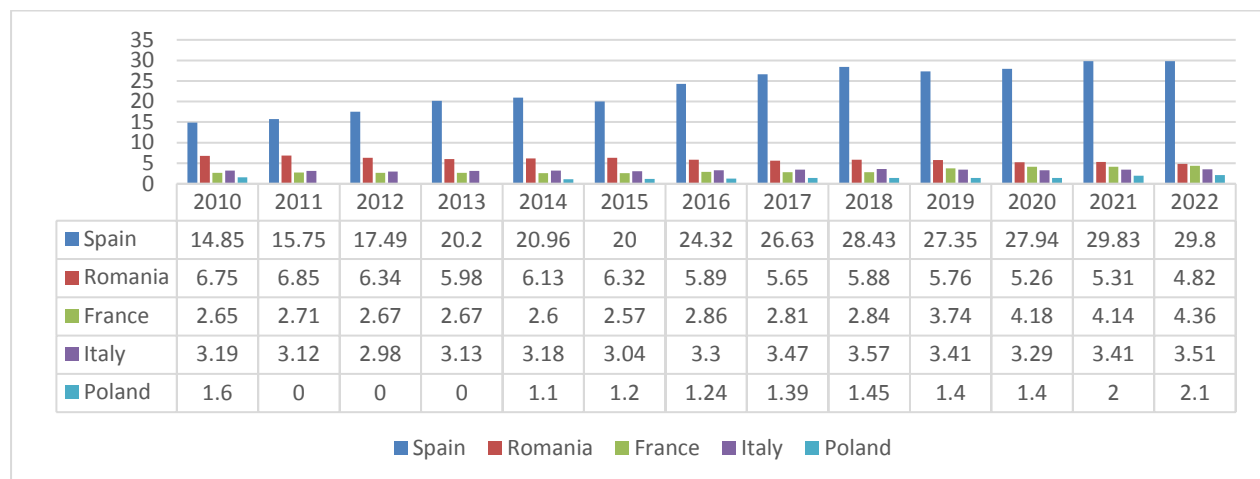


Figure 1. Evolution of the areas cultivated with garlic in Europe during the period 2010-2022 (1000 ha)

Source: Eurostat, data browser, accessed January 2024,
https://ec.europa.eu/eurostat/databrowser/view/apro_cpsh1__custom_9509520/default/table?lang=en.

Regarding the productions obtained with garlic at the level of the European Union, it was found that, on average, more than 400 thousand tons are produced annually. With a total production, obtained in 2022, of over 281.9 thousand tons, Spain is the largest producer of garlic in Europe, followed by Italy with 27.87 thousand tons and Romania with 21.04 thousand tons.

According to Eurostat data from 2022, the top of the largest producers of garlic in the EU is continued by Poland (20.5 thousand tons), France (19.43 thousand tons) and Greece (7.83 thousand tons).

Compared to 2021, the production of garlic in the EU countries decreased by 14.55% in 2022. The biggest decreases in production were recorded in France (-32.58%), Romania (-30.17%) and Poland (-18.65%) (Table 1).

Table 1. Evolution of garlic production in Europe during 2010-2022 (1000 t)

Year	EU	Spain	Italy	Romania	Poland	France	Greece
2010	-	136.56	29.66	34.80	19.14	19.70	9.48
2011	-	140.76	30.09	36.30	-	19.99	8.15
2012	-	154.36	27.01	29.59	-	17.82	9.03
2013	299.81	188.84	28.41	32.39	-	20.06	10.86
2014	302.71	177.42	29.25	33.59	14.20	18.08	13.72
2015	296.30	178.42	27.12	34.45	13.10	17.34	10.04
2016	335.27	209.80	29.57	27.95	16.10	21.92	5.84
2017	396.04	274.71	29.98	29.43	16.69	20.46	6.08
2018	398.65	273.48	30.50	30.57	15.83	20.12	6.13
2019	398.68	271.35	29.27	27.70	15.10	28.14	4.39
2020	414.45	269.09	27.97	31.56	15.30	30.28	7.77
2021	469.92	315.72	28.66	30.13	25.20	28.82	8.23
2022	401.54	281.90	27.87	21.04	20.50	19.43	7.83
2022/2021	-14.55	-10.71	-2.76	-30.17	-18.65	-32.58	-4.86
2022/2010	-	106.43	-6.04	-39.54	7.11	-1.37	-17.41

Source: Eurostat, data browser, accessed January 2024, https://ec.europa.eu/eurostat/databrowser/view/apro_cpshl__custom_9509520/default/table?lang=en

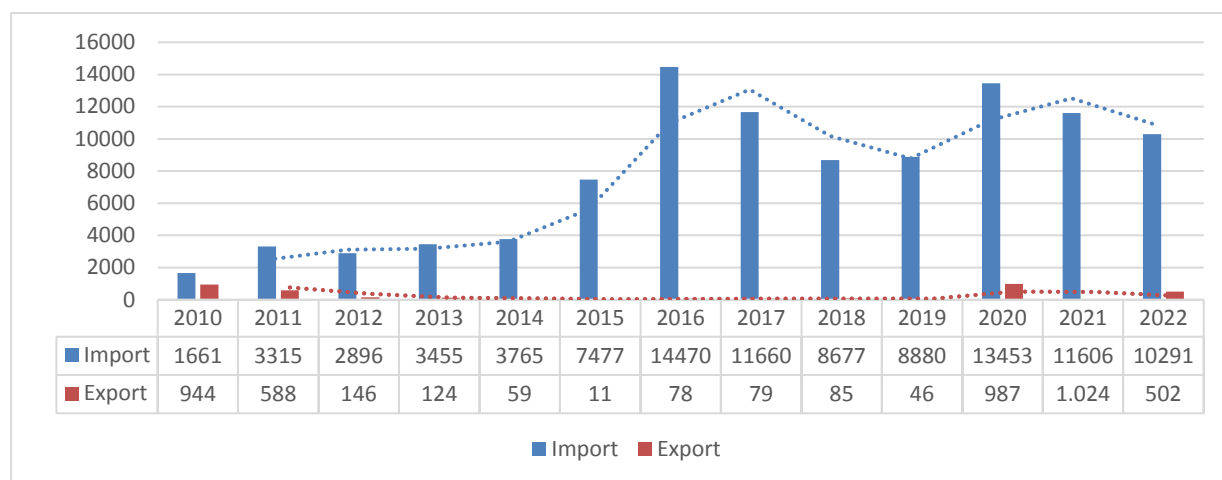


Figure 2. The evolution of the import and export of garlic in Romania in the period 2010-2022 (thousands of euro)

Source: TradeMapp database, accessed January 2024, product code 070320 – Garlic, fresh or chilled, www.trademapp.org

A significant imbalance is observed in the import and export of garlic from Romania. In 2022, Romania imported garlic worth over 10 million euro and exported 502 thousand euro, the import being 20.5 times higher than the export. The value of the import of garlic in 2010 was 1.6 million euro, reaching in 2022 the value of 10.3 million euro, showing an increase of over 519% (Figure 2).

With a net increase in imports over exports, Romania's demand for garlic is greater than its export. Because of the potential consequences of this situation, it is essential to pay special attention to vegetable groups and to pursue the development of strategies. Thus, in order to ensure a continuous market for Romanian vegetables, the Ministry of Agriculture and Rural Development decided to grant “de minimis” aid for certain groups of vegetables, including garlic production.

The structure and analysis of production expenses contained in the production framework technology for the garlic culture, estimates for the year 2024

The production framework technology for the garlic crop includes all agrophytotechnical, agrochemical and phytosanitary measures and works, substantiated from a technical and economic point of view, through which they act in periods determined by the biological characteristics of the plant and the evolution of climatic factors in the traditional areas for the culture of garlic.

For the calculation of the profitability of the garlic crop, an average production level of the Romanian varieties of 7,000 kg/ha was taken into account. For example, one of the most popular garlic varieties in Romania is the Ager variety, recommended for the early spring crop, but also in the autumn crop ensuring competitive productions. For the Ager variety, the recommendations for sowing are 1,000-1,200 kg/ha seed material (bulbs). Another variety, recently approved by SCDL Buzau, is the Benone variety, with a production of 7 - 8 tons per hectare. Another example would be Copalău garlic, its cultivation being the main occupation of the villagers in this locality.

Table 2. The structure of production costs for the garlic crop – estimates for the production year 2024

Checks for main production		Value
Total agrotechnical expenses, from which:	Ron/ha	78,933.82
	Euro*/ha	15,949
	%	100
Mechanized works	Ron/ha	3,513.00
	Euro*/ha	710
	%	4.47
Manual works	Ron/ha	13,582.42
	Euro*/ha	2,746
	%	17.20
Raw materials and materials	Ron/ha	61,831.40
	Euro*/ha	12,949
	%	78.33

Note: *Euro exchange rate = 4.949 Ron

Source: authors' own research.

From the analysis of expenses for the main production in the case of the culture of garlic, to obtain an estimated production of 7,000 kg/ha, agrotechnical expenses totaling 15,949 euro are necessary. Of these, it is noted that the expenses for mechanized works have an insignificant weight

of 4.47%. The largest share, of 78.33%, is owned by the expenditure on raw materials and materials (expenditure on seed material, irrigation, chemical fertilizers, products to combat diseases and pests, etc.). The manual work expenses amount to 2,746 euro, which represents 17.20% of the total amount of expenses for the main production.

Analysis of the income and expenditure budget for garlic cultivation, with and without the application of “de minimis” aid for garlic production

From the analysis of the data contained in the income and expenditure budget (Table 3) shows that:

At an average production estimated at 7,000 kg/ha, a production value of 19,802 euro/ha is obtained, and by adding the APIA subsidy planned for 2024 in Option 1 (264 euro/ha), a gross product of 20,066 euro is obtained /ha, and in Option 2 by adding the APIA subsidy planned for 2024 (264 euro/ha) but also the “de minimis” aid for garlic production (3,000 euro/ha), a gross product of 23,066 euro/ha is obtained.

Table 3. Revenue and expenditure budget for garlic cultivation – calculations per hectare – estimates for the production year 2024 (estimated production 7,000 kg/ha)

Not. Crt.	indicator	UM	Variant 1*		Variant 2**	
			Ron	Euro	Ron	Euro
1	Production value	Ron/Euro	98,000.0	19,802	98,000.0	19,802
2	Subsidies	Ron/Euro	1,308.9	264	16,155.9	3,264
3	The raw product	Ron/Euro	99,308.9	20,066	114,155.9	23,066
4	Total expenses	Ron/Euro	90,468.4	18,280	90,468.4	18,280
5	Variable expenses	Ron/Euro	72,528.4	14,655	72,528.4	14,655
6	Fixed expenses	Ron/Euro	17,940.1	3,625	17,940.1	3,625
7	Taxable income	Ron/Euro	7,531.6	1,522	7,531.6	1,522
8	Net income + subsidies	Ron/Euro	8,087.3	1,634	22,934.3	4,634
9	Rate of taxable income	%	8.3	8.3	8.3	8.3
10	Net income rate + subsidies	%	8.9	8.9	25.4	25.4
11	The breakeven point in value units	Ron/Euro	69,022.9	13,947	69,022.9	13,947
12	The breakeven point in physical units	to	4.9	4.9	4.9	4.9
13	Production cost	Ron/Euro /t	12,924.1	2,611	12,924.1	2,611
14	Predictable domestic market price	Ron/Euro /t	14,000.0	2,829	14,000.0	2,829

Note: *Variant 1 = APIA subsidy application planned for 2024 through the National Strategic Plan of Romania (264 euro/ha) = BISS: Basic support for income for the purpose of sustainability (97.85 euro/ha), CRISS: Complementary redistributive support for income for the purpose of sustainability (51.42 euro/ha), PD-04: Environmentally beneficial practices applicable to arable land (56.28 euro/ha), Payment for young farmers (47 euro/ha), ANT-1: National aid transitory (11.92 euro/ha)

**Variant 2 = “de minimis” aid to support garlic production (3,000 euro/ha) + APIA subsidy planned for 2024 (264 euro/ha)

Source: authors' own research.

For both variants, variable expenses hold 80% of the value of the total expenses for obtaining the main production. This category of expenses includes expenses for raw materials and materials (planting material, fertilizing substances, chemical fertilizers, substances to fight diseases and pests, etc.) with a weight of 75.8% of the total variable expenses, expenses for mechanized works with 4.8%, irrigation expenses by 9.48%, etc. Fixed expenses, which hold 20% of total

expenses, are represented in a proportion of 76% of permanent labor expenses, followed by general and management expenses, depreciation for buildings and utilities, etc.

In Variant 1, by applying the subsidy planned by PNS 2023-2027, it is found that its value can cover only 1.44% of the value of total expenses, and in V2 - 17.85%.

By subtracting the total expenses from the production value, the taxable income results in the amount of 1,522 euro/ha with a rate of return of 8.3%.

By lowering the tax, it ultimately results in the case of Variant 1 a net income + subsidies of 1,634 euro/ha and a net income rate of 8.9%, and in the case of Variant 2 adding a net income + subsidies and the “de minimis” aid, 4,634 euro/ha are obtained, with a the rate of net income that increases at 25.4%.

The garlic crop can be considered a profitable crop starting from an estimated average production of 4,900 kg/ha and a production value of 13,947 euro/ha.

For both variants, the production cost of 2,611 euro/to is calculated by dividing the total production costs of 18,280 euro/ha by the estimated average production for crop year 2024 of 7,000 kg/ha.

Conclusion

Considering the fact that, for both variants, the unit production cost for the production of a kg of garlic is 2.6 euro/kg, then the profitability of this crop stands out in terms of a profit of 0.2 euro/kg.

The breakeven point denotes the level of production that is fully covered by the value of production, which indicates the fact that the profitability of garlic cultivation begins with an estimated average production of 4,900 kg/ha having a value of 13,947 euro/ha. So that in order to make a profit, farmers in an agricultural year must obtain at least this production, but also be able to sell it at the estimated price. He must also have the financial resources necessary to support the production process throughout the agricultural year, which makes the aid granted by the Romanian state indispensable.

It is noted that, in the case of variant V2, the amount of applied subsidies can cover 17.85% of the total expenses necessary to obtain an estimated production for the year 2024 of 7,000 kg/ha.

Also, by applying the subsidies planned for the 2024 agricultural year, the rate of return in the case of the V1 variant is 8.9%, and in the case of the V2 variant 25.4%, which represents an increase of 185% compared to the first variant.

Thus, it can be concluded that, by regulating the financing regarding the cultivation of garlic, agricultural producers will be able to show more interest in the development of this culture as well as the creation of collection centers for the cultivation of vegetables. In addition, more spaces can be created for sorting, packing and storing garlic, as well as preserving the areas that were traditionally used for its cultivation.

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