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THE IMPORTANCE OF CUCUMBER CULTURE IN THE VEGETABLE SECTOR IN 2012-2017

Eduard Alexandru DUMITRU, Elena Daniela ȘURCĂ

Research Institute for the Economy of Agriculture and Rural Development, 61 Marasti Boulevard, District 1, 011464, Bucharest, Romania, Phone: +4021.313.60.87, Fax: +021.313.60.96, E-mail: dumitru.eduard@iceadr.ro, surca.elena@iceadr.ro

Corresponding author: dumitru.eduard@iceadr.ro

Abstract

Cucumber is a plant belonging to the Cucurbitaceae family, including pumpkin, melon and green pumpkin. Due to the increasing demand on the domestic market, the area under cucumber (protected areas) for fresh consumption has increased significantly over the last 5 years, but nevertheless in the last two years this product has experienced a trade deficit in terms of the trade balance. The high price of the imported cucumbers compared to the exported ones shows that Romania is forced to import at this price because it fails to ensure the needs of the domestic market, especially during the off season.

Key words**:** *cucumbers, cucumber crop, cucumber surfaces*

INTRODUCTION

Cucumis sativus (Cucumis sativus) is a vegetable plant belonging to the Cucurbitaceae family, which includes other vegetables such as melon (yellow and red), but also pumpkin and zucchini. [1] [3]

Cucumber comes from India and it was also introduced in other parts of the world, like Europe, by Greeks and Romans. [7] [14]

The mode of growth consists in hanging the treadle or various supporting structures. The fruit has an elongated cylindrical shape with a length between 10 and 60 centimetres, being used both fresh and pickled. [2] [5]

Cucumber is rooted in the ground, and with the help of supports, they are wrapped, and if the plant does not benefit from support, it extends along the ground. [13] [15]

At present, there are varieties of cucumbers that produce vegetables without seeds and without being pollinated, but degrade the quality of the variety. Also most of the cucumber varieties resemble and require pollination. [11].

Cucumber is one of the vegetables that has a very low calories content, without fat or cholesterol, and which has many benefits for the body. [4] [6]

Table 1. Nutritional values for 100 grams of cucumber

Active principle	Nutrient value	Percent DRD (recommended daily dose)
Energy	15 Kcal	<1%
Carbohydrates	3.63 g	3%
Protein	0.65 g	1%
Total fat	0.11 g	0.5%
Cholesterol	0 mg	0%
Dietary fiber	0.5 g	1%
Vitamins		
Folic acid	7 µg	2%
Niacin	0.098 mg	<1%
Pantothenic acid	0.259 mg	5%
P yridoxine (B6)	0.040 mg	3%
Riboflavin	0.033 mg	3%
Thiamine	0.027 mg	2%
Vitamin C	2.8 mg	4.5%
Vitamin A	105 IU	3.5%
Vitamin K	16.4 µg	13.6%
Electrolytes		
Sodium	2 mg	0%
Potassium	147 mg	3%
Minerals		
Calcium	16 mg	1.6%
Copper	0.045 mg	5%
Iron	0.28 mg	3.5%
Magnesium	13 mg	3%
Manganese	0.079 mg	3.5%
Zinc	0.20 mg	2%
Phosphorus	24 mg	3%
Selenium	0 mcg	0%
Phytonutrients		
Beta-carotene	45 mcg	–
Lutein-zeaxanthin	23 mcg	–
Alfa- carotene	30 mcg	–
Beta-cryptoxanthin	26 mcg	

Source: USDA - US National Nutrient Data Base.

Cucumber is a culture of particular economic importance since in 2017 the value of imports amounted to 18.4 million euros, while the value of exports was 15.8 million euros. [9, 10].

MATERIALS AND METHODS

The survey is based on the statistical data collected by the National Institute of Statistics, Eurostat and TradeMap, which will determine the evolutions recorded by areas, outputs, average outputs, prices, imports and exports using absolute indicators (with fixed base and in chain), relative (dynamics index, dynamics and absolute value of a percentage of the change rate) and averages (average level, change of absolute mean and average dynamics index) presented below.
Absolute indicators are the absolute changes, so that absolute changes mean the abatement increase or decrease from time to time, expressed in the same unit of measure as that of the analyzed variable.
The abolished changes may be:
-with the fixed base, using the formula:

$$\Delta t / t\text{-}1 = yt\text{-}y1 \quad (1)$$

-with chain / mobile basis, using formula:

$$\Delta t / t\text{-}1 = yt\text{-}yt\text{-}1 \quad (2)$$

Relative indicators are represented by:
-The dynamics index shows how many times the variable has decreased or increased from one unit of time to another; this indicator can be calculated with a fixed base:

$$It / 1 = yt1 / y1 * 100 \quad (3)$$

or a chain base:

$$It / t\text{-}1 = yt1 / yt\text{-}1 * 100 \quad (4)$$

-Dynamics measure percentage changes from time to time; like the afore mentioned indicators, it can be calculated with a fixed base:

$$Rt = It1 * 100\text{-}100 \quad (5)$$

or mobile:

$$Rt / t\text{-}1 = It / t\text{-}1 * 100\text{-}100 \quad (6)$$

-The absolute value of a percentage of the change rate will be expressed in the unit of measure of the analyzed variable and shows the absolute measure of the change per unit, a percentage of the rate of change; fixed base:

$$At / 1 = y1 / 100 \quad (7)$$

and with chain base:

$$At / t\text{-}1 = yt\text{-}1/100 \quad (8)$$

The average indicators are represented by:
-average level:

$$y = (\Sigma yt)/n \quad (9)$$

where n = the number of terms of the chronological series;
-the absolute mean change showing how many units changed the average phenomenon that has been analyzed between two successive moments or intervals; is calculated by the following formula:

$$\Delta = (\Sigma \Delta t / t\text{-}1) / (n\text{-}1) = (Yn\text{-}y1) / (n\text{-}1) \quad (10)$$

-The average dynamics index that shows how many times or as many as the average phenomenon analyzed within the time horizon of the chronological series has averaged and will be calculated using the following formula:

$$I = \sqrt{} (\Pi It / (t\text{-}1)) = \sqrt{} (n\text{-}1 \text{ \& amp; } n / 1) \quad (11)$$

The average rhythm of dynamics will be expressed as a percentage of the phenomenon analyzed, averaged from time to time and calculated with the formula:

$$R = (I\text{-}1) * 10 \quad (12)$$

RESULTS AND DISCUSSIONS

The most significant areas planted with cucumbers are Turkey (36 thousand hectares), Poland (9.19 thousand hectares) and Spain (7.48 thousand hectares). Romania ranks 4th place, ahead of Serbia with 4.48 thousand hectares. It should be noted that the general trend is to decrease the areas cultivated with

cucumbers in the field, to the detriment of their cultivation in protected areas, where the most significant increase was registered in Poland, over 43% compared to 2012.

Regarding the absolute base-based changes we can see that the area cultivated with cucumbers decreased significantly compared to the base year, where the most marked change is registered in 2017, the area decreasing by over 2.2 thousand hectares (Table 2).

Analyzing the dynamics of the field cultivated with cucumbers in the field, reporting each year to the previous year, we can see that absolute changes with a base in a chain register an oscillating trend of the cultivated area. The most significant decrease is recorded in 2017 compared to 2016, where the area decreases by 1.22 thousand hectares, representing a decrease of over 20%. At the opposite end of the year, there is an increase of the area in 2014 compared to 2013, with 120 hectares (Table 2).

From the point of view of the absolute value of a percentage of the rate of change we can state that the result shows that the increase by 1% of the area of cucumbers cultivated in the field in any year compared to 2012 is equivalent to an absolute increase of 66.9 hectares (Table 2).

Table 2. Dynamics of field cultivated with cucumbers in the ground during 2012-2017 in Romania

Year	Cucumber in the ground	Dynamics index		Dynamic rhythm (%)		The absolute value of a percentage of the change rate	
		with fixed base	with chain base	with fixed base	with chain base	with fixed base	with chain base
	thousands of hectares	It/1=yt1/y1	1=yt1/yt-1	Rt=It1*100-100	Rt/t-1=It/t-1*100-100	At/1=y1/100	At/t-1=yt-1/100
2012	6.69	-	-	-	-	0.0669	-
2013	6.32	0.9447	0.9447	-5.5306	-5.5306		-0.0037
2014	6.44	0.9626	1.0190	-3.7369	1.8987		0.0012
2015	5.73	0.8565	0.8898	-14.3498	-11.0248		-0.0071
2016	5.70	0.8520	0.9948	-14.7982	-0.5236		-0.0003
2017	4.48	0.6697	0.7860	-33.0344	-21.4035		-0.0122

Source: Eurostat data processing, accessed 20.11.2018 [8].

Analyzing the average dynamics index, we can state that the area cultivated with cucumbers in the ground shows an absolute value of 0.1116 in the period 2012-2017 (Table 2).

Regarding the production of cucumbers cultivated in the field, Romania is advanced by countries such as Turkey, Spain or Poland, especially their higher yields of 50.8 t/ha, 84.8 t/ha and 49.1 t/ha, compared with the average annual production of Romania, of 17.8 t/ha (2017).

Table 3. Dynamics of production obtained with cucumbers in the field during 2012-2017 in Romania

Year	Cucumber in the ground	Dynamics index		Dynamic rhythm (%)		The absolute value of a percentage of the change rate	
		with chain base	with fixed base	with chain base	with fixed base	with chain base	with chain base
	thousands of tons	It/1=yt1/y1	1=yt1/yt-1	Rt=It1*100-100	Rt/t-1=It/t-1*100-100	At/1=y1/100	At/t-1=yt-1/100
2012	102.54	-	-	-	-	1.0254	-
2013	103.76	1.0119	1.0119	1.1898	1.1898		0.0122
2014	115.31	1.1245	1.1113	12.4537	11.1315		0.1155
2015	102.47	0.9993	0.8886	-0.0683	-11.1352		-0.1284
2016	88.75	0.8655	0.8661	-13.4484	-13.3893		-0.1372
2017	79.87	0.7789	0.8999	-22.1084	-10.0056		-0.0888

Source: Eurostat data processing, accessed 20.11.2018 [8].

From the point of view of absolute changes with a fixed base, we can see that the production of cucumbers in the field shows a downward trend compared to the reference year, with the exception of 2013 and 2014 with outputs of over 103 thousand tons and respectively 115 thousand tons (Table 3).

Analyzing the yield of cucumber yields in the

field reporting each year the previous year, we can see that absolute base chain changes register increases until 2014, after which they keep a downward trend until 2017. The most significant increase is recorded in 2014 compared to 2013, where production increases by 11.55 thousand tons and the most pronounced decrease is recorded in 2017 as compared to 2016, with a decrease of 8.88 hectares, representing a decrease of production by more than 10 % (Table 3).

Analyzing the average dynamics index, we can state that the yield obtained with cucumbers in the field shows an absolute value of 0.1298 in the period 2012-2017 (Table 3).

And with regard to the area cultivated with cucumbers in protected areas, Romania occupies the 4th position among countries in Europe, after countries such as Turkey (8 thousand hectares), Spain (6.75 thousand hectares) and Poland (1.72 thousand hectares), while Romania's area cultivated with cucumbers in protected areas at the level of 2017 was 1.22 thousand hectares.

Table 4. Dynamics of the area planted with cucumbers in protected areas during 2012-2017 in Romania

Year	Cucumber in protected areas	Dynamics index		Dynamic rhythm (%)		The absolute value of a percentage of the change rate	
		with chain base	with fixed base	with chain base	with fixed base	with chain base	with fixed base
	thousands of hectares	It/1=yt1/y1	1=yt1/yt-1	Rt=It1*100-100	Rt/t-1=It/t-1*100-100	At/1=y1/100	At/t-1=yt-1/100
2012	1.09	-	-	-	-	0.0109	-
2013	1.12	1.0275	1.0275	2.7523	2.7523		0.0003
2014	1.24	1.1376	1.1071	13.7615	10.7143		0.0012
2015	1.23	1.1284	0.9919	12.8440	-0.8065		-0.0001
2016	1.22	1.1193	0.9919	11.9266	-0.8130		-0.0001
2017	1.22	1.1193	1.0000	11.9266	0.0000		0

Source: Eurostat data processing, accessed 20.11.2018 [8].

Regarding the absolute base-based changes, it is noted that the area cultivated with cucumbers in protected areas shows significant increases over the base year, so that the most significant change is registered in 2014 as compared to 2012 when the area cultivated with cucumbers in protected areas increased by approximately 150 hectares compared to the reference year (Table 4).

Analyzing the dynamics of the cucumber-growing area in protected areas reporting each year the previous year, we can notice that absolute base chain modifications register surface increases until 2014, after which a decreasing trend is maintained. The most significant increase is recorded in 2014 as compared to 2013, where the area increased by 120 hectares, representing a 10.7% increase. At the opposite end, the most pronounced decrease is recorded in 2016 as compared to 2015, when the area decreased by about 10 hectares (Table 4).

The absolute value of a percentage of the change rate that we can state that the result shows that the increase by 1% of the area cultivated with cucumbers in any year compared to 2012 is equivalent to an absolute increase of 10.9 hectares (Table 4).

From the point of view of changes in fixed-bed absolute changes, we can see that the production obtained with protected cucumbers has increased significantly compared to the base year, so the only period in which a decrease is recorded is in 2013, when production decreased by 2.26 thousand tons, representing a decrease of the production by 6.3% (Table 5).

Regarding the dynamics of the production of cucumbers in protected space, it is observed that absolute changes with chain base register oscillating values. The most significant decline is recorded in 2016 as compared to 2015, when cucumber production decreased by 7%, and the most significant increase is recorded in 2017 as compared to 2016, showing an increase of about 12% compared to the reference year (Table 5).

Table 5. Dynamics of production obtained with cucumbers in protected areas during 2012-2017 in Romania

Year	Cucumber in protected areas	Dynamics index		Dynamic rhythm (%)		The absolute value of a percentage of the change rate	
		with chain base	with fixed base	with chain base	with chain base	with fixed base	with fixed base
	thousands of tons	It/1=yt1/y1	1=yt1/yt-1	Rt=It1*100-100	Rt/t-1=It/t-1*100-100	At/1=y1/100	At/t-1=yt-1/100
2012	35.95	-	-	-	-	0.3595	-
2013	33.69	0.9371	0.9371	-6.2865	-6.2865		-0.0226
2014	44.62	1.2412	1.3244	24.1168	32.4429		0.1093
2015	56.97	1.5847	1.2768	58.4701	27.6782		0.1235
2016	52.98	1.4737	0.9300	47.3713	-7.0037		-0.0399
2017	59.41	1.6526	1.1214	65.2573	12.1367		0.0643

Source: Eurostat data processing, accessed 20.11.2018 [8].

From the point of view of the absolute value of a percentage of the change rate we can state that the result shows that the 1% increase in the production of cucumbers cultivated in protected space in any year compared to 2012 is equivalent to an absolute increase of 359.5 tons (Table 5).

Table 6. Dynamics of the sale price of cucumbers during 2012-2017 in Romania

Year	Cucumbers	Dynamics index		Dynamic rhythm (%)		The absolute value of a percentage of the change rate	
		with chain base	with fixed base	with chain base	with chain base	with fixed base	with chain base
	euro / 100 kg	It/1=yt1/y1	1=yt1/yt-1	Rt=It1*100-100	Rt/t-1=It/t-1*100-100	At/1=y1/100	At/t-1=yt-1/100
2012	62.12	-	-	-	-	0.6212	-
2013	53.63	0.8633	0.8633	-13.6671	-13.6671		-0.0849
2014	48.38	0.7788	0.9021	-22.1185	-9.7893		-0.0525
2015	52.64	0.8474	1.0881	-15.2608	8.8053		0.0426
2016	45.65	0.7349	0.8672	-26.5132	-13.2789		-0.0699
2017	80.55	1.2967	1.7645	29.6684	76.4513		0.3490

Source: Eurostat data processing, accessed 20.11.2018 [8].

With regard to absolute base-based changes, it can be noted that the sales price of cucumbers is oscillating to the reference year where the only increase compared to the reference year was registered in 2017 when the cucumber price increased with approximately 23% compared to the reference year (Table 6).

Taking into account the dynamics of cucumbers' sales price reporting each year to the previous one, it is noted that the absolute values with the base chain register the most pronounced increase in 2017 compared to 2016. The most significant decrease in the sales price was registered in the year 2013 compared to 2012, is approximately 14% (Table 6).

From the point of view of the absolute value of a percentage of the change rate we can state that the result shows that the 1% increase in the sales price of cucumbers in any year compared to 2012 is equivalent to an absolute increase of 0.66212 euro/100 kg (Table 6).

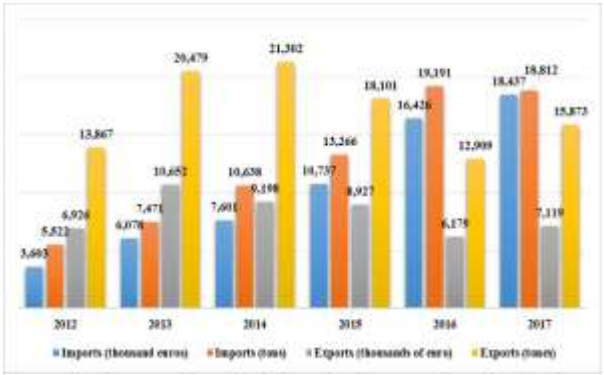

Fig 1. Evolution of imports and exports of cucumbers in Romania during 2012-2017
Source: TradeMap database, accessed 22.11.2018 [16].

Imports of cucumbers in terms of value show an upward trend, as in 2012 their value was 3.6 million, while in 2017 they exceeded the value of 18.4 million, thus increasing 5 times (Figure 1).

While the evolution of imports shows an upward trend, the value of exports shows an oscillating trend, determined by the total flow of cucumbers, fluctuating, which affected their sales price. It should also be noted that

since 2015, the value of cucumber imports exceeds that of exports (EUR 10.7 million imports compared to EUR 8.9 million exports) (Figure 1).

CONCLUSIONS

Cucumbers are of particular economic importance, as evidenced by the value of imports and exports made in 2017, which amounted to EUR 7.1 million and EUR 18.4 million respectively. While the area cultivated with cucumbers in the field has a downward trend, in terms of their production in protected areas, there is an upward trend, due in particular to the multiple benefits of cultivating cucumbers (and vegetables in general in this type of system), from getting richer productions, reducing dependence on weather conditions, and ensuring cucumber requirements, including over-season satisfying demand.

The yields obtained with cucumbers in the field are mainly influenced by the area under cultivation and the recorded yields, which are much lower than in other European countries (Spain - 85 t/ha, Poland 49 t/ha, compared to Romania 18 t/ha). In the case of the production of cucumbers in protected areas there is a significant difference in the production recorded by other states in Europe compared to Romania, so in Turkey or Spain, the average annual production in 2017 was 137 t/ha, respectively 91 t/ha, while in Romania the annual average production was about 49 t/ha, due mainly to the cultivation technology, but also to the fact that a large part of the vegetable production areas in these countries is represented by the greenhouse, and not the sun, with productivity differences being significantly higher in the case of greenhouse.

At the level of 2017, Romania imported EUR 18.4 million, mainly from countries like Greece (5.3 million), Turkey (4.2 million) or Spain (3.4 million) and exported only 7.1 million euros to countries like Germany (3.9 million), Hungary (1.2 million) or Poland (1.2 million).

It should be noted that at the level of 2017 the price of one tonne of imported cucumbers amounted to EUR 980, while the price of exported cucumbers amounted to EUR 448 ton, with a significant difference due to the fact that the import of the product is carried out during the off-season, when the price of cucumbers is high (also being grown in protected areas whose production costs are higher), while the production of cucumbers exported is predominantly the field production used with preponderance towards industrialization.

It is very important to continue encouraging vegetable producers and other products (other than tomatoes) and, in conjunction with this aid, to support investments in the creation of protected areas and, in particular, protected areas as being more advantageous from several points such as greenhouses, to the detriment of sunscreens, thus preventing the situation found in 2017 when the production of tomatoes grown in solariums was affected by the adverse weather conditions that led to their partial or total destruction.

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