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SOME CONSIDERATIONS ON VEGETABLES AND TOMATOES PRODUCTION AND CONSUMPTION IN ROMANIA IN THE PERIOD 2007-2014

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Abstract

The purpose of the paper was to analyze vegetables and mainly tomatoes contribution to fruit production and consumption in Romania. Based on the statistical data for the period 2007-2014, it was studied the dynamics of the surface cultivated with vegetables and tomatoes, vegetable and tomatoes production, tomatoes yield, vegetable and tomatoes production per inhabitant, and also consumption and producer's price. Although vegetable and tomatoes cultivated area declined by 22 %, and respectively by 10 %, vegetable production reached 3,808 thousand tons and tomatoes production 711 thousand tons in 2014. For this reason, Romania comes on the 8th position among the top tomatoes producers in the EU-28. The vegetable intake of 186 kg and tomatoes consumption of 38 kg per capita and year, Romania exceeds WHO's recommendations assuring a healthy offer to its inhabitants. Tomatoes are a top vegetable contributing by 18.3 % to the cultivated area with vegetables and by 18.9 % to vegetable production. But, tomatoes yield of 15.1 tons per ha in 2014 is still small compared to other top producers. And tomatoes price at farm gate is Euro 73/100 kg much higher than in other countries. For this reason, to increase productivity and efficiency along the product chain, it is needed to extend tomatoes growing in green houses by investing in modern farms where modern technologies to be implemented. Producers must join their capital and efforts into an associative forms, to enlarge farm size for getting cheaper farm inputs, for applying modern technologies, for better selling their products. An EU financial support is required, but the EU criteria should be revised and much better tailored to the concrete conditions of Romania's small holdings, which are the most numerous in the Community.

Key words**:** *consumption, production, tomatoes, trends, vegetables, yield, Romania*

INTRODUCTION

Tomatoes, scientifically named *Lycopersicon lycopersicum* (L.) H. Karst, have their origin in Central America, from where they were brought in Europe in 1556 [6].

Tomatoes are grown in the whole world and they occupy the top position among fruit, being followed by bananas, apples, oranges and melons [10].

Tomatoes are a very important fruit and vegetable as well, because of their energetic value (150 calories/100 g) and high nutritive value, given by the chemical composition, including many nutrients such as: minerals (P, N, Ca, Mg, and traces of Fe, Cu, Zn, Mn), vitamins (C, E), lycopene (a natural antioxidant which destroy the free radicals and protect human body against cancer, heart and lung diseases), beta carotene an important pigment, fibers, water [13].

In a tomato of 102 g, it is 93.9 % water, 0.62 % ash, 1.82 % fiber, 0.9 % protein, 9.93 % glucose, 1.02 % fructose [22].

Also, in 100 g tomato there are 250 mg K, 17 mg C vitamin, 1 mg E vitamin, 700 μg beta carotene and 16 μg folats.

Tomatoes have not only a nutritive value but also an energetic one. In 100 g of tomatoes there are 150 calories [23].

Due to their chemical composition, tomatoes have a therapeutic importance being recommended to be consumed for assuring an alkaline environment in the human body, for preventing and treating cancer, heart, stomach and lung diseases, for assuring a normal physiological activity of the organism [17].

Tomatoes are consumed as fresh vegetables in salads as such or combined with other vegetables, and also like processed vegetables (sauces, pastas, ketchup, juices etc).

There are not specific amounts of tomatoes

which must be consumed daily, but it is firmly recommended vegetables intake including a large variety of vegetables for assuring the requirements of human body in vitamins (A,C,E,K), minerals (K, Ca, P, Mg, Cl, Fe, Se etc), carbohydrates, proteins, fats and water.
FAO recommends about 350 g vegetables per day for the people older than 12 years and 100 g intake per day for younger people [9, 14].
In Romania, tomatoes find good soil and climate conditions to be cultivated in the field mainly in the South, South West and South-East parts of the country. But they are also cultivated in greenhouses for covering market demand in extra seasons [19].
Tomatoes growing in green houses and plastic tunnels is more and more extended for increasing productivity by applying modern technologies, which allow tomatoes cultivation in non specific production areas like Transilvania Region of Romania [21].
Also, because the domestic production is not enough to entirely cover consumption in the unfavorable years, important amounts of tomatoes are imported from Italy, Spain, Netherlands, Greece, Bulgaria etc.
In Europe, the vegetable supply is higher in the Southern countries and lower in the Northern regions. For instance, in Greece, the average supply per day is only 756 g (276 kg/person), while in Finland, the average supply is 3.9 times smaller, i.e. 195 g/person a day (71 kg).
Regarding the consumption of fresh vegetables, based on household data, it was found that the vegetable consumption varies between 109 g/day in Norway and 284 g/day in Cyprus. Concerning the processed vegetables, the highest consumption is in Italy 56 g/day and the lowest in Cyprus (4 g/day) [5].
In Europe, the average vegetable intake (pulses and nuts included) is 220 g/day [8].
In general, WHO recommends more than 400 g vegetables and fruit per day, but only Poland, Germany, Italy and Austria meet this recommendation.
In this context, the paper aimed to analyze the main trends in vegetable and mainly tomatoes production and consumption in Romania based on the statistical data, and to identify the major problems and suggest solutions to develop tomatoes production in the future.

MATERIALS AND METHODS

The documentation was based on various information sources: scientific articles, books, press articles etc.
In order to set up this study, the empirical data were collected from the National Institute of Statistics Tempo-on line database, from Ministry of Agriculture and Rural Development Reports on Agriculture and from Eurostat Statistics Explained Database.
The analysis was focused on the following indicators: the area cultivated with vegetable, and with tomatoes, vegetable and tomatoes production, tomatoes yield, tomatoes price, vegetable and tomatoes consumption, the major problems the vegetable sector is facing.
These indicators were analyzed in dynamics for the reference period 2007-2014.
The empirical data were processed by usual methods such as index method and comparison method.
The tables and graphs included in the article text show the main results in an illustrative manner.

RESULTS AND DISCUSSIONS

Vegetables and tomatoes cultivated area. Romania has important surfaces cultivated with vegetables. However, in the analyzed period, the cultivated area with vegetables declined by 5.5 % from 253.4 thousand ha in 2007 to 239.5 thousand ha in 2014 (Fig. 1).
The same descending trend was followed by tomatoes cultivated area. Tomatoes were cultivated on 43.9 thousand ha in 2014, by 4.6 % smaller in comparison with the year 2007 when they were cultivated on 46 thousand ha (Fig. 2).
The share of the area cultivated with tomatoes in the cultivated land with vegetables registered a slight increase of 1.1 %, from 18.1 % in 2007 to 18.3 % in 2014.
The cultivated area with vegetables by Romania represented 7.3 % of the total cultivated area with vegetables in the EU-28 in the year 2015, which accounted for 2.075

million ha [7].

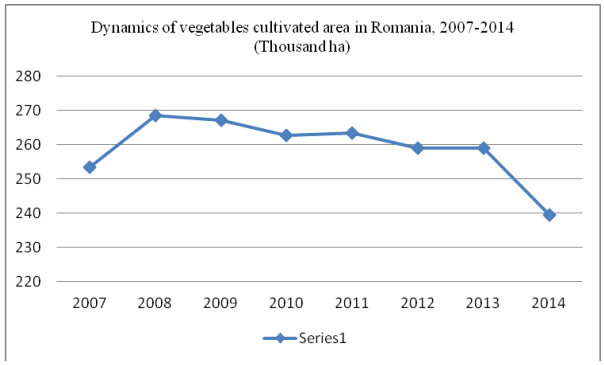

Fig. 1. Dynamics of the vegetables and tomatoes cultivated area in Romania, 2007-2014 (Thousand ha)
Source: Own design based on NIS Tempo-on line database

Photo 1.Vegetables and fruits.

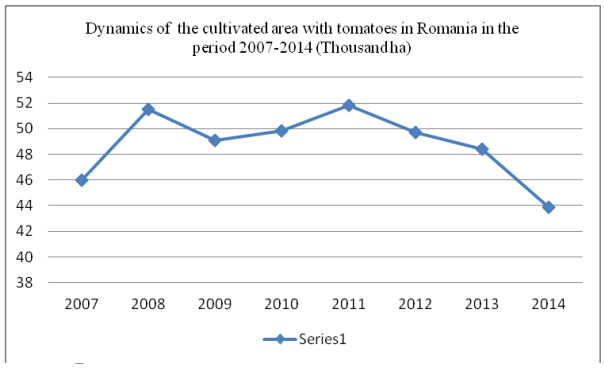

Fig. 2. Dynamics of the cultivated area with tomatoes in Romania in the period 2007-2014 (Thousand ha)
Source: Own design based on NIS Tempo-on line database

Vegetable and tomatoes production. Vegetable production increased by 22.1 % from 3,116.8 thousand tons in 2007 to 3,807 thousand tons in 2014 (Fig. 3).
Also, tomatoes production followed a similar increasing trend, raising by 10.9 % from 640.8 thousand tons in 2007 to 711 thousand tons in 2014, reflecting the need to cover much better the domestic market by internal output and to reduce imports (Fig. 4).

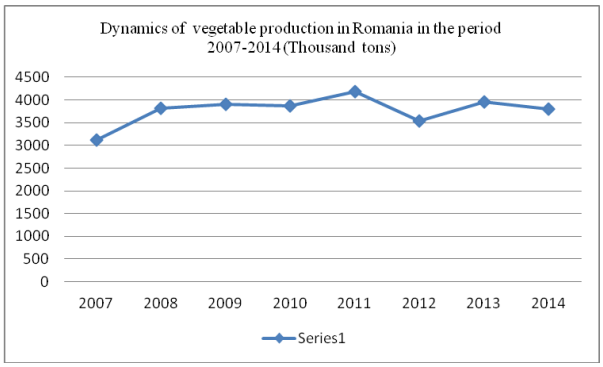

Fig. 3. Dynamics of vegetable production in Romania in the period 2007-2014 (Thousand tons)
Source: Own design based on NIS Tempo-on line database

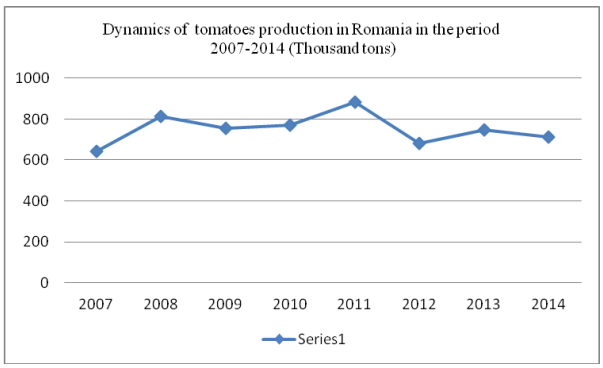

Fig. 4. Dynamics of tomatoes production in Romania in the period 2007-2014
Source: Own design based on NIS Tempo-on line database

Photo 2. Tomatoes production.

Vegetable and tomatoes production per inhabitant. As a result of the dynamics of vegetable and tomatoes production and of Romania's population, vegetable production per capita recorded an increasing trend in the analyzed period. In 2014, vegetable

production per inhabitant this indicator reached 191 kg, being by 29.3 % higher than in 2007, when it accounted for 147 kg/capita. The only decline was registered in 2012, when production/inhabitant accounted for 176 kg due to the reduction of output caused by drought. In the next years, production/capita has been recovered. (Table 1).

Table 1. Vegetable and tomatoes production/inhabitant in Romania in the period 2007-2014 (kg/capita)

	2007	2008	2009	2010	2011	2012	2013	2014	2014/2007 %
Vegetable production/ inhabitant	147	185	191	190	207	176	198	191	129.9
Tomatoes production/ inhabitant	30.3	39.4	36.9	37.9	43.6	33.9	37.4	35.6	117.5

Source: Own calculations based on the data provided by [15].

Tomatoes production per inhabitant has also recorded an ascending trend, so that in 2014, it accounted for 35.6 kg/capita, being by 17.5 % higher than in 2007.

The only inflexion was noticed in 2012, when per inhabitant only 33.9 kg tomatoes were produced, by 22.25 % less than in 2011 (43.6 kg).

With a little bit more than 35 kg tomatoes/capita, Romania is situated over the EU-28 average of 35 kg/capita.

Tomatoes yield. Despite that the cultivated area declined by 4.6 %, tomatoes production increased by 10.9 % in the analyzed period and this was due to the yield growth by 16.5 %, from 13.9 tons/ha in 2007 to 16.2 tons/ha in 2014 (Fig.5.).

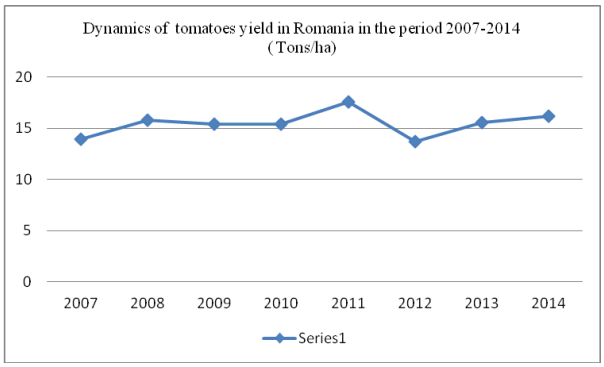

Fig. 5. Dynamics of tomatoes yield in Romania in the period 2007-2014 (Tons/ha)
Source: Own design based on NIS Tempo-on line database

Regarding tomatoes yield, Romania comes on the 8th position in the EU, after France, Portugal, Spain, Greece, Italy, Bulgaria and Poland, reflecting that it has a high potential to produce tomatoes (Table 2).

Table 2. Tomato yield in Romania and other EU countries

Country	2007	2008	2009	2010	2011	2012	2012/2007 %
France	174.3	174.3	161.1	137	140.8	146.8	84.2
Portugal	83.5	80.3	80.1	84.7	74.6	90.4	108.2
Spain	76.6	69.6	76.5	72.7	76.6	83.5	109.0
Greece	53.1	53.5	54.0	58.1	59.4	59.4	111.8
Italy	62.1	51.8	54.5	50.7	57.4	53.9	86.7
Bulgaria	27.8	38.3	34.7	32.7	23.0	27.6	99.3
Poland	24.1	24.5	23.9	15.5	23.3	22.3	92.5
Romania	15.6	17.7	17.0	14.5	20.1	15.2	97.4

Source: Own calculations based on the data provided by Eurostat, 2013

In Romania, the yield increased due to the farmers wish to produce more in green houses, using high productive hybrids and applying modern technologies with drip irrigation system. Tomatoes productivity is deeply influenced by cultivars, the Romanian ones being better adapted to the local conditions. Among the cultivars of high

potential there are: Siriana F1, Pontica 102, Viorica, Darsirius, Buzau 47, Kristinica, Carisma, Carolina [18].

Also, other varieties were imported to be tested regarding their performance under Romania's conditions and to find the possibilities to increase production. In 2012, about 90 % of tomatoes cultivars used in Romania were hybrids achieved by the Romanian research stations and just 10 % were represented by imported varieties [19].

Tomatoes quality is an important production and marketing aspect with a deep impact on product rice and consumer behaviour. Tomatoes quality depends on cultivars and it is reflected by a large range of fruit features such as: fruit height, spherical shape, flesh aspect, firmness. The strong correlation, r = 0.784 between tomato fruit shape index and its firmness shows that the flesh is firm if the shape is spherical. This aspect is important for producers and traders, because tomatoes with a firm flesh are resistant to handling and losses are lower. But, from the consumers' point of view, tomatoes with a firm flesh are not so juicy. Fruit thickness is also important both for producers and traders, but also for consumers, assuring a longer period of preservation and a reduced percentage of losses. The tomatoes quality is also given by the chemical composition of the fruit, mainly by the content in dry matter, carbohydrates and titrated acids. The content in dry matter is strongly correlated with fruit weight (r = 0.843), and, of course, with tomatoes yield [4, 20].

Photo 3. High quality tomatoes.

Average vegetable and tomatoes producer's price. Both the average price of vegetables and of tomatoes recorded an increasing trend. However, sometimes, the average price for tomatoes was almost similar with the average price of vegetables and sometimes even it exceeds it, as shown by the statistical database of the National Institute of Statistics.

For instance, in 2011, both the averageprice at the farm gate for vegetables and for tomatoes accounted for Lei 1.41 per kg, while in 2007 it was different, Lei 1.22/kg vegetables and, respectively Lei 0.82/kg tomatoes.

In the period 2008-2010, the average tomatoes price exceeded the average vegetable price by 29.2 %, 0.9 % and, respectively 68.2 % [16].

Tomatoes price, and in general, vegetable price in Romania is higher than in other EU countries.

For instance, producer's price for tomatoes produced in the field increased by 7.3 % from Euro 68/100kg in 2007 to Euro 73/100 kg. In the period 2007-20145, Poland registered the highest tomatoes price growth (+ 166 %) from Euro 15/100 kg in 2007 to Euro 40/100 kg in 2014.

However, in Poland, tomatoes producer's price is by 45.21 % lower than in Romania. In Italy and Greece, in 2014, tomatoes price was by 60 % and, respectively 10 % higher than in Poland (Table 3).

Vegetable and tomatoes consumption per inhabitant. The average vegetable consumption has followed a sinuous trend from 169.2 kg/capita in 2007 to the maximum level 191.8 kg/capita recorded in the year 2011.

After the year 2011, in the year 2012, the mean vegetable consumption was 177.4 kg/inhabitant, explained by the lower internal production and the high price in the market caused by the high producer's price.

In the period 2010-2014, the mean tomatoes consumption declined from 40 kg/capita in 2010 to 38.1 kg (- 4.8 %) in 2014. This was caused by the higher and higher price of tomatoes in the market. (Table 4).

Table 3. Average price for tomatoes produced in the field in Romania and other EU countries in the period 2007-2014 (Euro/100 kg)

	2007	2008	2009	2010	2011	2012	2013	2014	2014/2007 %
Romania	68	65	49	80	50	68	54	73	107.3
Italy	60	60	62	60	65	72	68	64	106.7
Greece	60	64	53	63	48	47	44	44	73.3
Poland	15	20	15	26	22	30	37	40	266.6

Source: Own calculation based on the data from [2, 7].

Table 4. Average vegetable and tomatoes consumption in Romania in the period 2010-2014 (kg/capita)

	2010	2011	2012	2013	2014	2014/2010 %
Vegetable consumption	184.6	198.8	177.4	180.7	186	100.7
Tomatoes consumption	40	38.6	38.4	35.4	38.1	95.2

Source: NIS, Romania's Statistical Yearbook, 2015 [16].

The descriptive statistics regarding mean, standard deviation, median, kurtosis, skewness, minimum and maximum value and the coefficient of variation for cultivated vegetable area, cultivated tomatoes surface, vegetable production, tomatoes production and tomatoes yield is presented in Table 5.
The variation coefficient recorded small values in case of all the indicators mentioned in the table. The small values ranged between 3.57 % in case of the vegetable area and 10.02 % in case of tomatoes production.
These results reflect that each the series of values for each indicator are homogenous and that the calculated average is a representative one.

Table 5. Descriptive statistics for the main studied indicators characterizing vegetable and tomatoes sector in Romania in the period 2007-2014

Descriptive Statistics	**Vegetable area (Thou ha)**	**Tomatoes area (Thou ha)**	**Vegetable production (Thou tons)**	**Tomatoes production (Thou Tons)**	**Tomatoes yield (Tons/ha)**
Mean	259.07	48.77	3,772.7	750.41	15.45
Standard deviation	9.27	2.57	319.21	75.22	1.24
Median	260.85	49.4	3,841.75	752.3	15.50
Kurtosis	2.54	0.19	2.24	-0.18	0.40
Skewness	-1.47	-0.86	-1.28	0.36	0.13
Minimum	239.5	43.9	3,116.8	640.8	13.7
Maximum	268.6	51.8	4,176.3	881.0	17.6
Variation Coeff. (%)	3.57	5.26	8.46	10.02	8.02

Source: Own calculation.

The major problems of the tomatoes sector. Tomatoes are produces mainly in small subsistence and semi-subsistence farms, where in most of cases technical endowment is low, technologies applied are traditional ones, production is risky due to the climate change and the appearance of the extreme meteorological phenomena (storms, floods, severe drought etc), causing substantial damages, production costs are high, tomatoes selling is difficult, because only a few number of the producers are members of associative forms. But tomatoes are also produced in green houses and tunnels, where modern technologies are applied and the use of certified seeds is the guarantee of a high production performance. Also, in vegetable production there are not climate controlled

ware houses for vegetables preservation. For this reason, after harvest, most of the small producers used to sell their production to intermediaries at a low price a little bit over the production cost. The tomatoes chain is therefore fragmented, and we can discuss about direct sale in the market, but about a medium chain including producer - intermediary (whole seller) - retailers, which led to a high consumer price [1].

Also, another major problem is related to the restrained access of the Romanian vegetable producers to the EU payments according to CAP Pillar One. More than this, because the small size of the farms, more than 50 % of the Romanian producers remained outside the eligible criteria mentioned by Pillar Two [12].

CONCLUSIONS

While the cultivated area with vegetable and tomatoes had a decreasing trend from 2007 to 2014, in the last year of the analysis, accounting for 239.5 thousand ha and, respectively for 43.9 thousand ha, vegetable and tomatoes production increased by 22 % and, respectively by 10 %, reaching 3,808 thousand tons, and respectively 711 thousand tons in 2014. This had a positive impact on production per inhabitant which accounted for 191 kg vegetables and 35.6 kg tomatoes in the year 2014.

With a consumption of 186 kg vegetables and 38 kg tomatoes/capita, Romania exceeds World Health Organization's recommendations and shows that Romanians could benefit of a healthy diet.

Tomatoes are the main vegetable in Romania contributing by 18.3 % to the cultivated area with vegetables and by 18.9 % to vegetable production.

Romania is among the main producers in the EU-28, coming on the 8th position. With 15.1 tons/ha tomatoes yield, Romania produces much less than France, Portugal, Spain, Greece, Italy, Bulgaria and Poland. More than this producer's price is Euro 0.73/kg much higher than in other countries.

For improving tomatoes efficiency along the product chain, it is required to extend tomatoes growing in green houses by investing in modern farms where modern technologies to be implemented.

Producers must join their capital and efforts into an associative forms, to enlarge farm size in order to get cheaper farm inputs, to apply modern technologies, to assure a better marketing of their products, to grow productivity and competitiveness.

An EU financial support is required, but the EU criteria should be revised and much better tailored to the concrete conditions of Romania's small holdings, which are the most numerous in the Community.

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