The subject of this research is an analysis of the export of processed vegetables from the Republic of Serbia in the period 2014-2018. The purpose of the research is to examine the actual trends in the export of processed vegetables from Serbia in the period under consideration relative to the volume, value and destination of the export. The average export of processed vegetables from the Republic of Serbia amounted to 22,607 tons per year, indicating a moderate increase at an average annual rate of 3.86%. Compared to fresh and frozen vegetables, processed vegetables claimed the smallest share in the total Serbian export structure (accounting for 13.8%). The average export value of processed vegetables was $47.3 million. From the value perspective, processed vegetables accounted for 35.6% of the Serbian vegetable export value, which is far more significant than the export volume share of processed vegetables.

Keywords: vegetable, export, Republic of Serbia

RESULTS AND DISCUSSION

Processed vegetables are fresh vegetables that transformed by various technological processes into semi-processed products for further processing or finished products for sale. According to Vlahović (2015), sterilization and pasteurization are the technological procedures most often used for vegetable processing. Sterilization is a process of food preservation that causes microorganisms, which are the sources of food spoilage, to be destroyed or removed. There are thermal sterilization, chemical sterilization with preservatives, cold sterilization with ionizing radiation and sterilization with membrane processes. Pasteurization is similar to sterilization, but this procedure is carried out at a temperature below 100 °C. As bacteria are more rapidly destroyed at a lower Ph value, sterilization is applied for poorly acidic foods (Ph greater than 4.5), whereas pasteurization is sufficient for acidic foods (Ph less than 4.5) (Seremešić et al. 2018). Drying extends the use of vegetables regardless of the season because it does not exert adverse effects on the basic mineral and vitamin properties of vegetables. Vegetables can be dehydrated by sun, air, heat, salt, etc. Biologically preserved vegetables are obtained by preserving sliced and salted vegetables under the influence of lactic acid microflora. Marinated vegetables are produced by canning fresh fruits, portions of fresh fruits or organically preserved vegetables using acetic acid. Vegetable juices and concentrates are obtained by processing fresh or frozen vegetables, resulting in vegetable porridge or clear vegetable juice, as well as by diluting concentrated vegetable juice previously preserved by physical processes. The process of vegetable juice production involves...
the following: mechanical straining of vegetables, filtering the resulting juice, pouring into the packaging and pasteurization. Other vegetable products such as sauce, ketchup and ajvar are produced using the appropriate technological processes from chopped vegetable parts and additional ingredients to achieve characteristic scents and flavors.

The average Serbian export of fresh, frozen and processed vegetables in the period 2014-2018 amounted to 163.8 thousand tons (RZS, 2019). Fresh vegetables claimed the largest share of 53% of the total Serbian vegetable export, followed by frozen vegetables with a share of 33% and processed vegetables with a minimum share of 14%.

![Fig 1. Trends in the export of processed vegetables from the Republic of Serbia (2014 to 2018)](data.stat.gov.rs: author’s calculation)

In the period 2014-2018, the average export of processed vegetables in Serbia amounted to 22,607 tons per year, indicating a moderate increase at an average annual rate of 3.86% (Graph 1). Vlahović and Veličković (2016) reported a slight decrease in the export of processed vegetables, by approximately 5 thousand tons, in the period 2010-2015. The smallest export was recorded in 2015, amounting to 18,929 tons, whereas the largest export of 25,494 was recorded in 2018. The average export value of processed vegetables was $47.3 million, with a stagnant trend of 0.8% annually. This indicates that export prices are falling. The highest export value of $54 million was achieved in 2018, whereas the lowest export value of $38.8 million was recorded in 2015. The value of processed vegetables accounted for 35.6% of the Serbian vegetable export value, which is far more significant than a volume share of 13.8% in the structure of total Serbian vegetable export. The Serbian export of processed vegetables per unit of product is $2.09 per kilogram, which is twice and four times larger than those of frozen and fresh vegetables, respectively. A slight increase in the Serbian export of processed vegetables generates the highest profitability, compared to the export profitability of frozen and fresh vegetables. The average Serbian export of other canned vegetables (except in vinegar, not frozen) amounted to 9,234 tons per year at an average annual growth rate of 5.53% (Table 1). The export value averaged $9.6 million, with an average annual growth rate of 2.45%. The largest export was made to the EU market (46.2%), followed by the Russian Federation (19.2%) and CEFTA Group countries (19%). By country, the largest export was directed to the Russian Federation (19.2%), followed by Germany (18.9%), Belarus (12%), Montenegro (7.5%), and Bosnia and Herzegovina (5.4%).

### Table 1. Export of processed vegetables from the Republic of Serbia (2014-2018)

<table>
<thead>
<tr>
<th>Product</th>
<th>Average (000 L)</th>
<th>CV (%)</th>
<th>Structure (%)</th>
<th>Rate of change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other vegetables, canned, except in vinegar, not frozen</td>
<td>9,234</td>
<td>13.76</td>
<td>40.85</td>
<td>5.53</td>
</tr>
<tr>
<td>Canned potatoes, except in vinegar</td>
<td>4,442</td>
<td>11.44</td>
<td>19.65</td>
<td>6.75</td>
</tr>
<tr>
<td>Canned tomatoes, except in vinegar</td>
<td>3,462</td>
<td>6.68</td>
<td>15.31</td>
<td>0.13</td>
</tr>
<tr>
<td>Other vegetables and vegetable mixtures, dried</td>
<td>2,793</td>
<td>25.19</td>
<td>12.35</td>
<td>16.18</td>
</tr>
<tr>
<td>Canned corn, except in vinegar</td>
<td>2,236</td>
<td>34.35</td>
<td>9.89</td>
<td>-10.39</td>
</tr>
<tr>
<td>Edible mushrooms and truffles, dried</td>
<td>253</td>
<td>28.18</td>
<td>1.12</td>
<td>-9.77</td>
</tr>
<tr>
<td>Onions, dried</td>
<td>187</td>
<td>20.83</td>
<td>0.83</td>
<td>-12.80</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>22,607</strong></td>
<td><strong>-</strong></td>
<td><strong>100.00</strong></td>
<td><strong>3.86</strong></td>
</tr>
</tbody>
</table>

Source: *Database of the Statistical Office of the Republic of Serbia data.stat.gov.rs: author’s calculation*

These countries imported a 63.1% share of the Serbian canned vegetables (except in vinegar) export.

The average Serbian export of canned potatoes (except in vinegar) amounted to 4,442 tons per year at an average annual growth rate of 6.75%. The export value amounted to $16.8 million per year, at an average annual growth rate of 4.2%. The largest export was made to the CEFTA countries (67.6%) and the European Union (32.3%). By country, the largest export was made to North Macedonia (31.8%), followed by Greece (21.6%), Bosnia and Herzegovina (16.7%), Montenegro (14%) and Poland (7.5%). These countries imported a 91.6% share of the Serbian canned potatoes (except in vinegar) export.

- The average Serbian export of canned tomatoes (except in vinegar) amounted to 3,462 tons with an average annual export growth rate of 0.13%. The value of export was $2.3 million, indicating a negative average annual growth rate of 4%. The largest export was made to the CEFTA market (50.7%) and slightly less to the European Union (47.5%). By country, the largest export was made to Hungary (28%), followed by North Macedonia (19%), Bosnia and Herzegovina (17%), Montenegro (14.8%) and Croatia (10%). These countries imported an 88.8% share of the Serbian canned tomatoes (except in vinegar) export.

- The average Serbian export of other dried vegetables and vegetable mixtures was 2,793 tons per year at a significant growth rate of 16.1%. The average export value was $8.3 million at an average annual growth rate of 10.2%. The highest export was made to the EU market (71.2%), followed by the CEFTA market (17.2%), whereas 7.7% was exported to the Russian Federation. By country, the largest export was made to Germany (40.5%), followed by Hungary (22.2%), Bosnia and Herzegovina (14.6%), the Russian Federation (7.7%) and the United States (3.4%). These countries imported an 88.4% share of the Serbian dried vegetable and vegetable mixture export.

- The average Serbian export of canned corn (except in vinegar) amounted to 2,236 tons per year at a negative average annual rate of 10.3%. The average export value was $1.9 million at a negative average annual growth rate of 21%. The largest export was made to the Belarusian market (62.8%), followed by the European Union (15.8%), the Russian Federation (14.1%) and CEFTA countries (3.83%).
- The average Serbian export of dried edible mushrooms was 253 tons per year, at a negative rate of 9.7%. The export value averaged $7.5 million, with a negative rate of 6.7%. The largest export by far was made to the European Union (81.6%), followed by Italy (46%), Germany (11.8%) and France (10%).

- The average Serbian export of dried onions was 187 tons at a negative rate of 12.8%. The export average value was $694,000, at a negative average annual rate of 20%. The largest export was made to the EU market (70.5%), i.e., mostly Hungary (67.1%), whereas 29.4% went to the CEFTA countries.

- The export of processed vegetables from Serbia was affected by a number of factors, the most important of which are the following: the physical volume of vegetable production, the volume of processed vegetables, the range of processing procedures, the competitiveness in international markets, the level of export prices, etc. (Vlahović et al. 2008).

- Export products should be tailored to the needs and requirements of consumers in certain countries. A necessary prerequisite for efficient export is a balanced examination of the needs and demands of individual market segments: CEFTA, the European Union, the Russian Federation, etc. Furthermore, processed vegetables should meet the standards of a particular market relative to the product quality, packaging methods, types of packaging material etc. It is necessary to apply the HACCP (Hazard Analysis and Critical Control Point) system, whereas the GOST - R standard is required in the Russian Federation market.

- Future results in foreign trade will be greatly influenced by the ability of the agri-food sector to respond to market demands for improving competitiveness, and in particular, those related to compliance with standards and safety of product quality (Zekić et al., 2016).

- It is necessary to monitor and develop new vegetable preservation methods and processes that are intensely perfected: ionizing radiation, photodynamic inactivation, microwave processing (microwaves and radiofrequencies), heating and ultrasound, hydrostatic pressure treatment - high pressure, electrostatic and induction heating, high voltage pulse techniques - pulsating magnetic field and the new packaging material (Živković et al., 2000). and of course, the health and safety effect must be taken into account.

Regional destinations for the export of processed vegetables from the Republic of Serbia

- Export of processed vegetables from Serbia to the European Union - The average value of the export of processed vegetables from Serbia to the EU amounted to $22.9 million in the period under consideration, with a moderate increase of 2.4% per year. The Serbian export of processed vegetables to the EU market claimed a share of 48.4% in the total value of the Serbian processed vegetable export (Graph 2). The following products were mostly exported from Serbia to the EU: other dried vegetables and vegetable mixtures (with an export value of $6.2 million and a share of 27% in the Serbian processed vegetable export to the EU), dried edible mushrooms (with an export value of $6.1 million and a share of 26.3% in the Serbian processed vegetable export to the EU), canned potatoes (except in vinegar) (with an export value of $4.4 million and a share of 19.4% in the Serbian processed vegetable export to the EU) and other canned vegetables (except in vinegar) (with an export value of $4.3 million and a share of 18.8% in the Serbian processed vegetable export to the EU). By country in the European Union, the most important foreign trade partners in the export of processed vegetables were the following:

- Germany - The value of the Serbian processed vegetable export to Germany amounted to $6.1 million, at an annual growth rate of 11.3%. The following products were mostly exported to Germany: other dried vegetables and vegetable mixtures (with an export value of $3.7 million and a share of 60% in the Serbian processed vegetable export to Germany), dried edible mushrooms (with an export value of $1.2 million and a share of 20.8% in the Serbian processed vegetable export to Germany) and other canned vegetables, except in vinegar. (with an export value of $1.1 million and a share of 18.7% in the Serbian processed vegetable export to Germany).

- Italy - The value of the Serbian processed vegetable export to Italy amounted to $4.5 million, with a significant decline at a rate of 7.3% annually. The following products were mostly exported to Italy: dried edible mushrooms (with a value of $3.7 million and a share of 81.7% in the Serbian processed vegetable export to Italy) and other canned vegetables, except in vinegar. (with an export value of $0.6 million and a share of 12.5% in the Serbian processed vegetable export to Italy).

- Hungary - The value of the Serbian processed vegetable export to Hungary amounted to $3.3 million with a sharp decrease at an annual rate of 11.8%. The following products were mostly exported to Hungary: other dried vegetables and vegetable mixtures (with an export value of $1.7 million and a share of 53.3% in the Serbian processed vegetable export to Hungary), dried onions (with an export value of $0.6 million and a share of 18% in the Serbian processed vegetable export to Hungary) and canned tomatoes, except in vinegar. (with an export value of $0.5 million and a share of 14.6% in the Serbian processed vegetable export to Hungary).

- Greece - The value of the Serbian processed vegetable export to Greece amounted to $2.5 million (with a moderate decrease at an annual rate of 0.5%). Only canned potatoes (except in vinegar) were exported to Greece in the period under consideration.

- Romania - The value of the Serbian processed vegetable export to Romania amounted to $1.6 million (with a strong growth rate of 50% annually). Canned potatoes (except in vinegar) and dried edible mushrooms were mostly exported to Romania. The export value of canned potatoes (except in vinegar) amounted to $1.4 million with a share of 84.2% in the Serbian processed vegetable export to Romania, whereas the export value of dried edible mushrooms was $190 thousand (with a share of 11.7% in the Serbian processed vegetable export to Romania).

- The EU countries stated above imported a 78.6% share of the Serbian processed vegetable export to the European Union.
Export of processed vegetables from Serbia to the Russian Federation - The average value of the Serbian processed vegetable export to the Russian Federation was $2.3 million (with a significant decrease at an annual rate of 8.8 %). The export of processed vegetables to the Russian Federation accounted for 4.8 % of the total value of the Serbian processed vegetable export. The following products were mostly exported to the Russian Federation: other canned vegetables, except in vinegar. (with an export value of $1.5 million and a share of 64.6 % in the Serbian processed vegetable export to the Russian Federation). other dried vegetables and vegetable mixtures (with an export value of $0.5 million and a share of 21 % in the Serbian processed vegetable export to the Russian Federation) and canned corn. except in vinegar. (with an export value of $0.3 million and a share of 13.7 % in the Serbian processed vegetable export to the Russian Federation). This market needs to be further investigated and the causes of a decline in the Serbian processed vegetable export to The Russian Federation need to be examined.

Export of processed vegetables from Serbia to the CEFTA countries - The average value of the Serbian processed vegetable export to the CEFTA countries was $17.8 million (with a moderate annual increase of 2.2 %). The Serbian export of processed vegetables to the CEFTA countries accounted for 37.4 % of the total value of the Serbian processed vegetable export. By country under the CEFTA agreement, the most significant foreign trade partners of Serbia are the following:

- North Macedonia – The Serbian processed vegetable export to North Macedonia amounted to $7.6 million (with a moderate annual increase of 3.3 %). Canned potatoes. except in vinegar. were mostly exported to North Macedonia (with an export value of $6.2 million and a share of 81 % in the Serbian processed vegetable export to North Macedonia).
- Bosnia and Herzegovina - The Serbian processed vegetable export to Bosnia and Herzegovina amounted to $4.7 million (with a stagnant annual increase of 0.5 %). The following products were mostly exported to Bosnia and Herzegovina: canned potatoes. except in vinegar. (with an export value of $2.3 million and a share of 50 % in the Serbian processed vegetable export to Bosnia and Herzegovina). and other dried vegetables and vegetable mixtures (with an export value of $0.8 million and a share of 19 % the Serbian processed vegetable export to Bosnia and Herzegovina).
- Montenegro - The Serbian processed vegetable export to Montenegro was $4.5 million at a moderate growth rate of 3.2% annually. Canned potatoes. except in vinegar. were mostly exported to Montenegro (with an export value of $3 million and a share of 67 % in the Serbian processed vegetable export to Montenegro).
- Albania - The Serbian processed vegetable export to Albania amounted to $0.8 million (with a declining annual rate of 4.24 %). Canned potatoes. except in vinegar. were the only processed vegetable product exported from Serbia to Albania.

With regard to other countries, the largest export of processed vegetables from Serbia was made to the Belarus market (a value of $1.9 million) including products such as canned corn. except in vinegar. and other canned vegetables. except in vinegar. The export of processed vegetables from Serbia to the USA was $1.2 million in the period under consideration. including mostly other dried vegetables and dried edible mushrooms.

Based on the trends recorded in the period under consideration. the export of processed vegetables from Serbia is expected to grow in the forthcoming period. The expected export of processed vegetables from Serbia in 2025 will amount to 37.2 thousand tons. an increase of 31.5 % compared to 2018.

The basic prerequisite for the production of processed vegetables is the existence of sufficient quantities of fresh vegetables. In addition. the application of modern technologies in the manufacturing industry is necessary. The obsolete equipment and technology in the manufacturing industry is a limiting factor for the development and production of new products and the expansion of the vegetable product array (Vlahović. Veličković. 2016). The privatization process in the previous period was quite turbulent for a large number of companies. so they have not been adapted to the current conditions of vegetable processing yet.

According to Begović and Matović (2011). the problems of vegetable processing industry are the following:

- Lack of information on the most favorable market for product marketing (Without sufficient information on the turnover. or the import of similar products into potential markets. it is not possible to make a decision about the best market for a certain product.)
- Lack of information on foreign markets (There is a serious lack of information on foreign markets. i.e. product characteristics. distribution. pricing and promotional mix. Without good market ideas and the knowledge about customer needs. it is not possible to achieve satisfactory product marketing.)
- Insufficient state support for exporters (Policy makers do not provide any form of support to the sector. aimed at strengthening the sector itself and building competitiveness. Conditions for the support in financing and ensuring the export (SIEPA. AOFI) are aimed mainly at large firms that have already achieved export performance in the previous period. thus neglecting the potential and needs of small-sized and medium-sized enterprises. even in conjunction (requirement for the financing of the association's performance should not be the export of 20% of individual member firms. but rather that the condition should be determined by the total export of the associate firms)).
- Lack of bargaining power in the procurement of raw materials (economies of larger scale remain an unattainable goal because of the poor bargaining position of companies individually. which is a direct reflection of the production costs).
- Lack of internal standards that would allow protection of autochthonous food brands (The existing legislation in the country supports importers who import low quality products. which harms the marketing of autochthonous brands. For example. instead of having at least 21 % of dry matter in its composition. according to the current legislation. this percentage is only 9 %. which creates the possibility for importers to import low-quality ajar with lower prices.

It is necessary to associate small-sized producers because they are the bearers of vegetable production. Establishing collectives opens the possibility of building smaller processing capacities that would grow in capacity over time. The support of the state towards this form of organization is necessary. According to Puškarić et al. (2011) the conditions that need to be implemented in order to develop the manufacturing industry oriented towards the export are the following:

- The existence of a significant base of good quality fresh vegetables.
- Continuous expansion of the processed vegetable range.
- Finding and applying new solutions to vegetable production and processing technology.
When exporting processed vegetables, it is important to create a product brand. There is a greater market demand for branded processed vegetables than for frozen and especially fresh, non-branded vegetables. When creating a brand, its protection through geographical indications also plays a major role. The geographical indication may be, and most often is, a significant marketing tool that guarantees the authorized user an advantage over competition in the market, as it guarantees a controlled and special quality of the product and its origin (www.zis.gov.rs).

In order to be competitive in the export of vegetable products to international markets, it is necessary to pay much greater attention to the development of innovative marketing strategies, the segmentation and differentiation of offers, the implementation and certification of food safety and quality systems (GLOBAL GAP, HACCP), and the effective distribution and more aggressive product promotion (Cvijanović et al., 2008). A continuous increase in the export of processed vegetables from Serbia should be expected in the forthcoming years unless some major problems occur such as weather conditions, poor quality, insufficient volumes, etc. If Serbia reaches an agreement on duty-free trade with the countries of the Eurasian Union (Russia, Belarus, Kazakhstan, Kyrgyzstan, Armenia), this will pave the way for the potential marketing of Serbian products to this large market of 180 million inhabitants. The European Union will continue to be a major market for the Serbian export of processed vegetables in the future.

CONCLUSION

The average export of processed vegetables from the Republic of Serbia in the period 2014-2018 amounted to 22,607 tons annually, indicating a moderate increase at an average annual rate of 3.86%. Processed vegetables accounted for 13.8% of the total Serbian export structure, thus claiming a significantly smaller share than fresh and frozen vegetables. The average export value of processed vegetables from Serbia was $47.3 million, with a stagnant trend of 0.8% annually, which indicates that export prices are falling. From the value perspective, processed vegetables accounted for 35.6% within the total value of the Serbian processed vegetable export, which is far more significant than the volume share.

The processed vegetable export from Serbia is dominated by the following product categories: other canned vegetables, except in vinegar and not frozen, (with 9,234 tons and accounting for 40.8% of the total Serbian processed vegetable export), followed by canned potatoes, except in vinegar, (with 4,442 tons (19.6%) and canned tomatoes, except in vinegar, (with 3,462 tons (15.3%)). The categories stated above accounted for three quarters of the total export of processed vegetables from the Republic of Serbia.

The most significant market for the Serbian export of processed vegetables is the European Union, which has claimed a share of $22.9 million of the total export value (with a moderate annual growth rate of 2.4%). The export of processed vegetables from Serbia to the EU market accounted for 48.4% of the total value of the Serbian processed vegetable export. This is followed by the CEFTA countries with $17.7 million, indicating a moderate annual growth rate of 2.2%. The export of processed vegetables to this market accounted for 37.4% of the total value of the Serbian processed vegetable export. The Serbian export of processed vegetables to the Russian Federation amounted to $2.3 million, with a declining trend at an annual rate of 8.8%. The export of processed vegetables from Serbia to this market accounted for 4.8% of the total value of the Serbian processed vegetable export. The most important Serbian export markets by country are the following: North Macedonia ($7.6 million), followed by Germany ($6.1 million), Bosnia and Herzegovina ($4.5 million), Italy ($4.5 million) and Montenegro ($4.5 million). These countries claimed a share of 60% of the total processed vegetable export from the Republic of Serbia.

The value of processed vegetables per export unit is $1.96 per kilo, which is twice and four times as much as frozen and fresh vegetables respectively. Processed vegetables represent added-value products. It is necessary to have a greater share of processed vegetable products in the export structure. Accordingly, the capacities of the domestic processing industry and the workforce employed therein would be better utilized, resulting in greater export profitability. The export of vegetables is an important factor in the development of total vegetable production in the Republic of Serbia.

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