The consumption of dried fruit has constantly grown in the world. Despite respectable natural and technological prerequisites, production of dried fruit in the Republic of Serbia is very modest. It is necessary to make organized efforts to raise this production to a much higher level in quantitative and qualitative terms. This paper discusses the organizational and economic aspects of the production of dried cherries with combined technology (osmotic and convective drying). Calculations and analysis of the key economic indicators are based on real technological normatives of consumption, and the current market prices of inputs and final products. Special attention was paid to the cost-effectiveness of different ways of removing pitted of the sour cherries.

The cost of fresh cherries make up 54.3% of total costs, labor costs 32.5%, while energy with 3.2% is not particularly significant item. Basic indicators of success show that this is a profitable production (profit 3,189 €/ in 15 days, economy of production 1.34; accumulation of production 25.6%). Application of mechanical removing pitted, significantly raises the level of profitability of the production. The share of labor costs falling to 9.2%, with increasing profit for even 58.2%.

Keywords: dried cherry, removing the pitted, calculation, cost-effectiveness.

INTRODUCTION

In the last 30 years the cultivation of cherries in the high world has significantly intensified. New varieties with high yield are created, with large fruit and good quality. New breeding forms and technology of growing, have made the production of cherries significantly more profitable. Unfortunately, Serbia does not follow the developments in the production of these fruit species in the world, so that in our country still dominate not follow the developments in the production of these fruit species in the world, so that in our country still dominate old varieties, generative species in the world, so that in our country still dominate old varieties, generative species in the world, so that in our country still dominate new breeding forms created, with large fruit and good quality. New breeding forms and technology of growing, have made the production of cherries significantly more profitable. New varieties with high yield are created, with large fruit and good quality. New breeding forms and technology of growing, have made the production of cherries significantly more profitable. Unfortunately, Serbia does not follow the developments in the production of these fruit species in the world, so that in our country still dominate not follow the developments in the production of these fruit species in the world, so that in our country still dominate new breeding forms created, with large fruit and good quality. New breeding forms and technology of growing, have made the production of cherries significantly more profitable. New varieties with high yield are created, with large fruit and good quality. New breeding forms and technology of growing, have made the production of cherries significantly more profitable. Unfortunately, Serbia does not follow the developments in the production of these fruit species in the world, so that in our country still dominate old varieties, generative species in the world, so that in our country still dominate new breeding forms created, with large fruit and good quality. New breeding forms and technology of growing, have made the production of cherries significantly more profitable.
continental fruit annually from Serbia, for about 12 million $ In addition of dried prunes, in the export are represented also dried peach, apple, apricot and pear. On the other hand, Serbia importing about 200 tons annually of dried continental fruit in amount about million dollars. Regarding the qulity, dried imported fruits, is usually not competitive towards domestic. Dried plums and apricots are most imported. Market of dried fruits in the world is increasing, and potentially represents a major export opportunity of Serbia (Serbian Chamber of Commerce, 2011).

**MATERIAL AND METHOD**

In the paper are discussed the organizational and economical aspects of dried cherries with combined technology (osmotic and convective drying). These are devices originally constructed in the laboratory of Bioystems Engineering Faculty of Agriculture in Novi Sad. Executed laboratory studies show that this technology has a positive effect on the conservation of mechanical, visual and nutritional properties of the product, the mass balance is favorable, and energy consumption is rational.

The fruit can be processed into various forms (whole fruit, halves, slices, rings, cubes, etc.) and in different ways (with or without osmotic dehydration). Energy needs of this production system, can be satisfied with renewable energy sources (biomass, solar energy). In this way, it is provided a cheaper production and independence from instability (increase) price of electricity and other conventional energy sources (Babić et al., 2003).

Analysis of economic indicators in the production of dried cherries is based on the analytical calculation of costs and results. Really daily capacity of the dryer is 1000 kg of fresh sour cherries in one day (2 shifts, 16 hours of work). The facility is effectively used 135 days a year, of which 15 days for drying cherries (a total of 15,000 kg of fresh or 2,568 kg of dried sour cherries), and the remainder for other dry fruits (apples, apricots, quinces, plums, pears, etc.). Calculation of costs and results are based on laboratory research conducted at the Faculty of Agriculture in Novi Sad. It was used the real prices of inputs and outputs from the second half of 2014, stated without VAT.

The most important indicators, in addition to the dinar, are expressed also in euros (€ 1 = 119 RSD).

Special attention was paid to the cost-effectiveness of different ways of removing pitted of sour cherries. The considered variants are: handheld of removing pitted (effect of 6-8 kg/h), and a variant using machines for removing pitted (effect of 80-90 kg/h of fresh sour cherries).

**RESULTS AND DISCUSSION**

Drying fruit is seasonal, but with possession and build adequate capacity for storing fresh fruit, drying period during the year can be significantly extended, which contributes to better utilization of dryer capacity and economics of the production. It is necessary to master the production of high quality dried fruit products. The basic prerequisite for the production of quality dried fruit is the construction of modern facilities for drying fruit. In our country is produced different equipment for drying fruit, which is based on various drying technologies, which should be used in the context of modernization of existing and construction of new capacity for the production of dried fruit.

Preparation of fruit for drying involves a number of different methods that are implemented in order to obtain a better final product. Almost every type of fruit can be dried, and the drying is more successful if the moisture content in them is smaller. It is important that the fresh fruit are ripe, healthy and best quality. Drying fruit is done at the stage of technological maturity (when the raw materials have the highest quality). With drying, dry matter is concentrating and also its nutritious elements, because the amount of water is reduced. A special advantage of drying is presented in next:the loss of water reduce the weight and volume, and also the costs of packaging, transport and storage.

Freshly harvested raw materials should be prepared. The most important methods for the preparation of fruit for drying are:
- Browsing - fruit is unloaded at the tape from which workers manually eliminate all unhealthy fruits, leaves and twigs. This procedure is carried out for all kinds of fruits, especially plums and cherries.
- Remove stems - can be done manually or mechanically.
- Washing - all kinds of fruits are washed with water under pressure.
- Flaking - removes the bark (epidermis) of the fruit. The seeds are discharged with machine by the apples and pears.
- Cutting - in slices, slices or cubes. Apples are cutting by machine into slices of thickness up to 4 mm, also pear slices.
- Removing pitted-by apricots and peaches are done by hand, with sour cherry can be performed manually or using machines of different capacities.
- Blanching - is carried out with the help of of boiling water or water vapor.
- Sulfur dioxide - should prevent browning of fruit. It is done in a special chamber in which is burned clean sulfur. The reaction of SO₂ with pectins leads to the destruction of cell walls and allows faster drying fruit. The use of sulfur dioxide (as a gas or in the form of sulfuric acid) has lately been trying to replace other means, but it is still quite widespread.
- Processing solution of 0.5 % K - sorbate (or citric acid + ascorbic acid).

Calculation of the costs and results are based on the attached mass balance (Table 1).

<table>
<thead>
<tr>
<th>Title</th>
<th>Share (%)</th>
<th>kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dried sour cherries*</td>
<td>18.0</td>
<td>180.0</td>
</tr>
<tr>
<td>The evaporated water</td>
<td>72.0</td>
<td>720.0</td>
</tr>
<tr>
<td>Useless waste**</td>
<td>10.0</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>1000</strong></td>
</tr>
</tbody>
</table>

* Moisture of fresh sour cherries 85 % and dry 25 %
** The mass share of the seeds and juice, which is isolated during the outbreak of pitted 10 %

Cost of materials in the production of dried fruit depends on the intensity and volume of production, applied engineering and technology. Material production costs of dried fruit are the costs of fresh fruit, then the cost of water, sugar, packaging and others. Calculation in table 2 shows relates to a first variant of removing pitted handheld, with the effect of 8 kg / h. Daily costs in the production of dried sour cherry amounted to 73,699 din., which for 15 days is 1,105,478 din. (€ 9,290). Fresh cherries, as the main raw material, have the greatest impact on the price cost of dried cherries, with a share of 54.3 %. Labor costs are also very important in this variant (32.5 %), because it is necessary to have 9 employees per shift. The share of energy costs is relatively low (3.2 %), which can be explained using a straw for the purposes of convective drying, as well as the low cost of electricity in the country.

Fixed costs of depreciation and maintenance are 2.6 % and general costs and interest are 1.4 %. Overheads include a
pitted on the result of production of dried sour cherries (Table 3).

Variant "A" (described above): used handheld removing of pitted, the effect of 8 kg / h of fresh sour cherries, price 8 € / piece;

Variant "B": used machine for removing the pitted, the effect of 80 kg/h of fresh sour cherries, price 4,000 €, served by one worker.

The calculation refers to the 15 working days of the driers, the daily capacity of 1000 kg of fresh sour cherries for two shifts (16 hours of work), labor cost is 170 din / h (€ 11.43 / day). The variant "B" - two workers are needed for two shifts (Table 3, column 4), because this is the minimum for servicing machines, although mathematical calculation shows that should be 1.79 workers. Obviously, much more cost effective is variant "B" with machine removing of pitted, which requires a total cost for removing of pitted of 843 € /15 working days of the driers (column 9). Using handheld removing of pitted (variant "A"), the costs of removing are even 3.2 times higher (2,699 € / in 15 days; column 9), despite significantly lower fixed costs of depreciation and maintenance (column 8). Application of machine removing (variant "B") reduces the total cost proportionate part (for 15 days) of mainly overheads costs (insurance, fees, taxes and contributions of property, telephone, fuel and travel costs, administrative expenses, the eventual cost of sales, etc.). The price cost of dried sour cherries is 409.4 din / kg (3.44 € / kg). The retail price of 792 din / kg (6.66 € / kg) is obtained when on the wholesale price of dried cherries of 550 din / kg is added the average trading margin of 20 % and the amount of VAT at the general rate of 20 %. With this price, dried sour cherry is very competitive, especially when it takes into account the relationship between price and quality.

In this relationship between the purchase and sales price, in the 15-day production of dried sour cherries, is realized a profit of 379,522 dinars (€ 3,189), which can be considered as a very high costs of labor and the production of dried sour cherries for € 2,335/15 days, and their participation falls from 32.5 % to 9.2 %. By increasing fixed costs for 480 €, the realized profit is € 5,045 / in 15 days, which represent the increase by 58.2 %. The economics coefficient increases from 1.34 to 1.68, and the rate of accumulation of production from 25.6 % to 40.4 %. Apparently, that mechanical removing of pitted is much more cost-effective, and also in technological and organizational terms is more suitable solution. Additional investment in the purchase of machines is not too large (about 4,000 €) and practically can be repaid in about 30 days.

Any increase in the daily capacity of the dryer and / or the number of its working days, has a significant impact on the change of the costs of variants "B". By increasing the daily capacity dryer for 30 % (from 1000 to 1300 kg/day), the costs of removing of pitted move the ratio to 1: 4.16 in favor of the variant "B". Or, prolonging the period of drying sour cherries by 30 % (from 15 to 19.5 days), the ratio of costs of removing of pitted give 1: 3.7 in favor of the variant "B". Using the machines during the year for removing the pitted and for other fruits, also reduces the costs by the variant "B", because of the distribution of fixed costs to a greater number of working hours. This reduction, however, is much milder than in increasing the volume of work in the production of dried sour cherries.

### Table 3. Costs of hand and machine of removing the pitted of sour cherry (1€ = 119 RSD)

<p>| Daily capacity of 1000 kg of fresh cherries for two shifts (16 hours) Costs of removing the pitted for 15 working days |
| --- | --- |</p>
<table>
<thead>
<tr>
<th>Capacity for 2 shifts (kg)</th>
<th>The effect of machine (kg / h)</th>
<th>Hours of work</th>
<th>Workers</th>
<th>Per diem of workers (€ / for 8h)</th>
<th>Daily operating costs (€)</th>
<th>€ for 15 days</th>
<th>Fixed costs(€)</th>
<th>TOTAL (€)</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1000</td>
<td>8</td>
<td>125.0</td>
<td>15.63</td>
<td>11.43</td>
<td>178.2</td>
<td>2679</td>
<td>20.0</td>
<td>2699</td>
</tr>
<tr>
<td>B</td>
<td>1000</td>
<td>70</td>
<td>14.3</td>
<td>2.00</td>
<td>11.43</td>
<td>22.9</td>
<td>343</td>
<td>500.0</td>
<td>843</td>
</tr>
</tbody>
</table>
CONCLUSION

Production and consumption of dried fruit in the world and in our country is growing. The Republic of Serbia has significant natural, technical, technological and market potential for the development of the production of dried fruit, and great opportunities for export. The current volume of drying fruit in Serbia is very modest. Traditional production of dried fruit in Serbia is based on small family dryers which are mainly used for drying plums and apples. This drying model has serious flaws because, as a form of direct drying does not contain adequate technology to prevent oxidation of the fruit.

Analysis of the most important economic parameters shows that the production of dried sour cherries with combined drying technology is very cost-effective (profit € 3,189 for 15 days, economics of production 1.34; accumulative production 25.6 %). By applying mechanical removing of pitted, these results are significantly improved (profit rises for 58.2 %). It is necessary to take advantage of growth in consumption of dried fruit in the world, and take organizational measures to increase production and exports. Planning and implementation of export of dried fruit has to start from the primary production of basic raw materials (healthy planting materials and strict control of the application of pesticides, etc.).

For successful performance in foreign markets, it is necessary to make a good preparation and selection of appropriate varieties of fruit drying, to adopt and implement international standards of production, to improve quality control, packaging, logistics and select the appropriate marketing strategy.

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