ANALYSIS OF ECONOMIC JUSTIFICATION OF DRYING OF APRICOTS BY COMBINED TECHNOLOGY

ANALIZA EKONOMSKE OPRAVDANOSTI SUŠENJA KAJSIJE KOMBINOVANOM TEHNOLOGIJOM

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ABSTRACT

This paper presents the analysis of the costs and the results of dried apricot production by combined technology. The research refers to the dryer of the capacity of 450 kg of fresh material per day, which is very suitable for the production on family farms. The combined drying technology has been developed in the Laboratory of Biosystem Engineering of the Faculty of Agriculture of Novi Sad.

In the total costs of the dried apricot production, apart from the expected predominant share of fresh apricot (51.2%), there is a very important share of labour cost (30.9%). Energy represents a relatively modest cost item (4.0%), while the costs of capital assets amount to 5.9%. The cost price of dried apricot in packages of 200-500 g is 2.55€/kg. The wholesale price of 3.55€/kg makes the profit of 1,482€ for the intended apricot processing for the period of 20 days. Presuming that drying of other kinds of fruit makes approximately the same level of profit, the total earnings amount around 10,000 € for the period of 4.5 months of efficient work.

Key words: drying of apricots, combined technology, cost analysis, cost-effectiveness.

INTRODUCTION

U radu se analiziraju troškovi i rezultati proizvodnje sušene kajsije kombinovanim tehnologijom. Istraživanja se odnose na sušara kapaciteta 450 kg svežeg materijala na dan, koja je pogodna za proizvodnju na porodičnim poljoprivrednim gazdinstvima. Sušenje kajsije traje 20 dana (9.000 kg), odnosno sezona sušenja voća traje ukupno 135 dana godišnje. Kombinovana tehnologija sušenja razvijena je u laboratoriji za Biosistemsko inženjerstvo Poljoprivrednog fakulteta u Novom Sadu.

Pored očekivano dominantnog učešća sveže kajsije (51,2%), indikativan je vrlo značajan udeo troškova rada (31,6%). Ukupna energija čini 3,3% troškova, dok su troškovi osnovnih sredstava 5,9%. Cena koštanja suve kajsije, u pakovanjima 200-500 g, iznosi 237,1 din/kg (2,55 €/kg). Zamena pšenične slame prirodnim gasom, u procesu konvektivnog sušenja, poskuplja proizvodnju za 8,7%, ili za oko 1.870 €/godisnje.

Veleprodajna cena od 330 din/kg (3,55 €/kg) omogućuje dobit u proizvodnji suve kajsije od 1.482 €/20 dana. Uz pretpostavku, da sušenje drugih vrsta voća obezbeđuje prošireno nivo profita, ukupna zarada za 4,5 meseca efektivnog rada iznosi oko 9.980 €. Na svaki dinar troškova ostvaruje se 1,31 dinara vrednosti proizvodnje, što se može smatrati dobrim odnosom za ovu vrstu proizvodnje. Značajna dodatna korist može se ostvariti zapošljavanjem dva člana porodice (4.500 €/godisnje). Postoje značajni tržišni potencijali za razvoj ovog biznisa u našoj zemlji. Potrebno je čak 100 sušara opisanog kapaciteta da bi se zadovoljilo samo 9,5% domaćih potrošača suve kajsije, koja iznosi oko 190 t/godišnje.

Kljучне реcи: сушене кajsие, комбинована тeхнoлогия, анализа troшкова, isплативост.

If we deduct the export (re-export) of this product of around 18t (45,000$) from the total import of dried apricot, there is the net import of 190t (565,000$) (2008). This figure can serve as an approximate indicator of domestic consumption which has increased for 62.4% during the observed period. With the average consumption of about 26 g per capita, our country is far below...
the developed European countries. Hence, there is a great potential for further development of domestic market for this product, considering the expected growth of life standard as well as gradual changing of the customer habits.

Continual supply with high-quality raw material makes a pre-requisite for further development of the dried apricot production. In 2008, Serbia had 1.64 million of fruitful trees which gave 22.3 thousands tons of fresh apricots (in Vojvodina around 4.5 thousand tons, or 20.2%) (Statistical yearbook, 2009). The high-quality varieties suitable for drying (novosadska rodna, amrozija, keckemetska ruža) are present in sufficient quantities. A logical question that arises is whether it is possible to organize a profitable production of dried apricot under the domestic conditions. Finding the answer to this question is the essential part of this research and the primary aim of this paper. The research focuses primarily on the relatively small capacities, suitable for production on family farms.

MATERIAL AND METHOD

Apricot can be dried by various technological procedures and by using various technological solutions for drying devices: from the simplest small capacity plants to highly automated drying plants. This paper analyzes the economic effects of low capacity drier and the required accessory equipment, based on the combination of osmotic and convective drying. The combined drying technology has been developed in the Laboratory for Biosystem Engineering at the Faculty of Agriculture of Novi Sad and it is based on originally designed devices (Babić, et al., 2004a). Previously conducted laboratory research showed that the named technology is suitable for drying of different apricot varieties because it gives the good quality products, positive mass balance, while the energy consumption is reasonable (around 21,000 kJ/kg of dried apricot); furthermore, there is the possibility of using solar energy and energy generated from various changing of the customer habits.

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The research is to verify whether the drying of apricot by applying this technology can be profitable on average farms. The calculations are based on the following most important technical-technological and production-economic presumptions:

- Production is performed on a registered commercial farm which, according to the income in the VAT system, has the entrepreneur status;
- Realistic capacity of the drier per day is 450 kg of fresh apricot; the pre-calculation of the costs and the results is based on the following mass balance:

| Halves dried | 15.00% | 67.5 |
| Cubes dried | 5.00% | 21.2 |
| Core dried | 0.78% | 3.5 |
| Peel | 3.14% | 14.1 |
| Usable waste | 3.36% | 16.5 |
| Unusable waste | 1.97% | 8.9 |
| Evaporated water | 70.75% | 318.4 |
| **Totally:** | **100.0%** | **450 kg** |

- Continual supply of raw material has been provided from the area within 60 km, cold storage is not necessary;
The cost of fresh apricot as a base raw material, logically, prevails with 51.2% (Figure 2). High participation of labour cost (30.9%) can be justified by the low level of plant automation. The share of energy consumption cost is low (4.0%), which is partially influenced by the use of biomass (wheat straw) in the process of convective drying. This fact questions the accepted opinion that the energy cost is crucial for cost (non)effectiveness of dried fruit production. Apart from the above mentioned low automation of the process, this can be attributed also to the low price of electric energy (about 4.5 EURO cent/kwh), and to the use of straw for convective drying. The price of around 8 EURO cent/kwh (which is a mean value in the EU countries with which we can be compared) increases the total cost of energy to 4.8%, which is still not very high.

Logically, there is the question of replacement of straw with the natural gas, which is a more suitable fuel from the technical and organizational point of view. The equivalent amount of natural gas, which is a more suitable fuel from the technical and organizational point of view, is 52.4 mn3/day, which amounts 1,770 RSD/day by the price of 33.78 din/m3.

This increases the cost of energy in apricot production for 247/20 days, i.e. 1,660 € annually. However, its share remains relatively acceptable: 8.7%. This figure should certainly be discussed in terms of the current production conditions.

Fixed costs amount 7.9% of total production costs. Amortization is calculated by applying the relevant rates (8.5% for the equipment and 2.5% for the facilities), while the maintenance is calculated by evaluation, approximately the amount of ¼ of the amortization cost. The share of the investment credits interest is not too high: 1.12%, i.e. 358 € per year. The costs of capital assets (amortization, maintenance and interest) increase the cost price of the product by 5.9%, which is acceptable. General costs include mostly the proportional share of overheads (administrative services, phone bills, consumer goods, fuel and travelling expenses, insurance, taxes and dues for the assets, possible sales expenses, etc).

As we have a tied production here, the cost price is calculated by the so called “new method”. The cost price of a by-product (core) equals the sales price, so the whole burden of the success or failure of the production is on the main product for which the production is organized in the first place. The cost price of the dried halves and the cubes is the same and it amounts 236.9 din/kg (2.55 €/kg).

### Analysis of results

When we calculate 20% of trade margin and 18% of VAT to the wholesale price of dried halves of 330 din/kg, we get the retail price of 467.3 din/kg (5.02 €/kg). That is about 20% lower than the average price of imported packed apricot (mostly from Turkey) which can be found in our shops. Besides, it is realistic to presume that the customers would prefer the domestic apricot for its quality, freshness, appearance, origin, packing, way of it advertising, etc.

The expected level of sales price ensures the profit of 1,482 €/ for the planned 20-day production of 1,800 kg of dried apricot. The total profit of the 135-day efficient work of a drier can be estimated to 10,000 €.

Gross margin is a very useful indicator of success, primarily in terms of short-term planning of the production structure (Table 3). Since the fixed charges mostly do not change during a short period of time, the cost-efficiency of certain production can be discussed more appropriately on the basis of the gross margin than on the profit base.

### Table 2. Additional indicators of success

<table>
<thead>
<tr>
<th>No</th>
<th>TYPE OF INDICATOR</th>
<th>€ / 20 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gross margin (C - A)*</td>
<td>1856</td>
</tr>
<tr>
<td>2</td>
<td>Farm income (D+1/2 Earning)**</td>
<td>2067</td>
</tr>
<tr>
<td>3</td>
<td>Cash flow (D+ Amortization)</td>
<td>1662</td>
</tr>
<tr>
<td>4</td>
<td>Time of investment return</td>
<td>1.56</td>
</tr>
<tr>
<td>5</td>
<td>Production efficiency (C / B)</td>
<td>1.31</td>
</tr>
<tr>
<td>6</td>
<td>Production accumulation (D / C)</td>
<td>23.9%</td>
</tr>
</tbody>
</table>

* Marks refer to the data given in Table 2
** It is presumed that 40% of labour force are family members

A farm can have important additional benefit if employing two members of its family, which is expectable. In that case the profit can be expressed by the income of the farm (2,067 €). The additional benefit amounts 585 € from the process of apricot production, i.e. about 3,948 € per 135 of work days.
Return period of invested assets represents one of the basic indicators of the justification of an investment project. In this case, the investment shall be paid back in 1.56 years (1 year and 7 months) which makes a very acceptable period of time.

Cost efficiency and accumulation (profitability) of the production enable us to make an effective comparison of various productions, as they are expressed in coefficients/percent. Every 100 RSD of cost makes 31 RSD of profit, i.e. the production value includes 23.9% of profit. This can be taken as a very valuable indicator.

Sensitive analysis shows the flow of the profit related to the change of market prices of fresh apricot or/dried apricot, for +/- 20% (Table 4). Financial result is more sensitive to the decrease of the final product price than to the increase of the raw material price.

Table 4. Sensitive analysis

<table>
<thead>
<tr>
<th>Fresh apricot (+/- 20%)</th>
<th>Dried halves (+/- 20%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>20.0</td>
<td>3497</td>
</tr>
<tr>
<td></td>
<td>9140</td>
</tr>
<tr>
<td></td>
<td>14783</td>
</tr>
<tr>
<td>25.0</td>
<td>1247</td>
</tr>
<tr>
<td></td>
<td>6890</td>
</tr>
<tr>
<td></td>
<td>10157</td>
</tr>
<tr>
<td>30.0</td>
<td>-1003</td>
</tr>
<tr>
<td></td>
<td>4640</td>
</tr>
<tr>
<td></td>
<td>10283</td>
</tr>
</tbody>
</table>

The result becomes negative with the increase of the fresh apricot price for 62% (40.5 din/kg), i.e. with the decrease of the dried apricot price for 24% (244 din/kg).

CONCLUSION

In order to satisfy only 9.5% of the domestic consumption of dried apricot (about 190 t/year), about 100 driers of the described capacities will be necessary. It is obvious that there is a great market potential for the development of this business in our country.

The analysis of technological and economic parameters shows that the production of dried apricot on family farms can be very profitable (profitability rate is 23.8%), even if the price of fresh apricot substantially increases (for about 40%).

Besides the price of fresh apricot (51.2%), labour cost (31.6%) dominates in the structure of the cost price, while the share of the energy cost is rather modest (3.3%).

The analysed processing potential (9,000 kg of fresh apricot in 20 days) makes the profit of 1,482 €, i.e. 10,000 € per year.

Additional profit in the form of earnings can be made in the amount of about 4,040 € per year, if employing the family members.

To start the production, not a big investment is needed (up to 18,000 €). The existing specific-purpose funds and credit lines in our country enable people to take loans under relatively favourable conditions. The investment is to be paid back in about 1.56 year, which is a very short period of time.

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LITERATURE


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