ECONOMIC EFFECTS OF APRICOT BRANDY PRODUCTION ON A FAMILY FARM

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A R T I C L E I N F O	A B S T R A C T
	In this paper the focus of the authors was on the economic performance of apricot brandy production, realized on a family farm. The aim of this research was to determine the economic profitability of apricot brandy production in years 2017, 2018 and 2019. The sources of data used for the preparation of this paper were the internal documents/records of the family farm and the interviews conducted with family members. Contemporary scientific and professional literature relevant to the subject research was used as a theoretical basis. Several research methods were used in the paper, namely: observation method, content analysis, interview, descriptive method, calculation method, grouping method, and comparative method. The analysis showed that the production of apricot brandy on the family farm in the observed years was economically viable. © 2022 EA. All rights reserved.

Introduction

Apricot originates from north-eastern China, where it was cultivated 5,000 years ago and from where it began to spread around the world. The dissemination of apricot to the West began during the military campaign of Alexander the Great in Turkmenistan, in the IV century BC. It was brought to our region in the time of the ancient Romans, and its cultivation to a greater extent began with the arrival of the Turks, from whose language the Serbian word for apricot "kajsija" originated (Milatović, 2013). It is highly valued by consumers around the world. Today it is grown in all Mediterranean countries, in Central and South Asia, South Africa and North and South America

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(Greger & Schieberle, 2007). Fresh apricot fruits are valued as table fruit, but also as a raw material for the production of juices, jams, marmalades, sweets, compotes, etc. In addition, apricot fruits can be dried, as well as processed into brandy of excellent quality (Mratinić, 2012; Simić et al., 2021).

Brandy is a strong alcoholic beverage obtained by distillation of fermented fruit mash. It is assumed that the Serbian word for brandy – "rakija" is derived from the Arabic word "araki". Aristotle, in the 4th century BC, wrote about the process of distillation, and only later did Greek scientists describe primitive ways of obtaining something they called fire water (Malović et al., 2017).

For the production of fruit brandies, all fruit raw materials containing sugar can be used, from which ethyl alcohol (ethanol) is formed during the process of alcoholic fermentation. In the Republic of Serbia, the stone fruits (plums, apricots, peaches, cherries and sour cherries), apple fruits (apples, pears and quinces), berries (raspberries and blackberries), as well as grapevine fruits, are most often used for these purposes (Nikićević and Tešević, 2010). Herbal brandies are also made, which usually have apple, grape or plum brandy as a basis.

The process of extracting alcohol by distillation was introduced to Serbia with the Turkish invasion, at the beginning of the 15th century. At first, grape pomace brandy was made. Subsequently, the production of fruit brandies started, primarily from plum fruit. Fruit that was not eaten or processed into jams, marmalades, jellies was used for brandy.

The top quality of fruit brandies can be achieved by processing only fruits of good quality, i.e. those that are healthy and that are in the phase of full technological maturity. Satisfactory quality of brandy cannot be achieved by processing immature, rotten, mouldy or insufficiently formed fruits (Pischl, 2011). The fruit reaches full technological maturity at the moment when the maximum concentration of sugar and aromatic substances is achieved. At that stage of ripening, the fruit is the most suitable for the production of fruit brandies. Most varieties of fruit have characteristic aromatic substances, the processing of which produces brandies with characteristic aromas. Apricot brandy also has these properties.

The largest quantity of brandy in Serbia is produced on family farms. Brandy is produced to meet family's needs, as well as for sale. For Serbian population, manufacturing of brandy is also an opportunity to gather and socialize with family members, relatives, neighbours, friends. This ceremony takes place when there is no field work, in late autumn or during winter.

The subject of research in this paper is the economic performance of apricot brandy production, realized in a distillery, on a family farm, with primary fruit production, located in the city of Belgrade, in the municipality of Grocka.

The objective of the study was to determine the economic profitability of apricot brandy production in years 2017, 2018 and 2019.

Materials and methods

The sources of data used for the preparation of this paper were the internal documents/records of the family farm and the interviews conducted with family members. Contemporary scientific and professional literature relevant to the subject research was used as a theoretical basis.

Several scientific methods were used in the paper, namely: observation method, content analysis, interview method, description method, calculation method, grouping method and comparison.

Results

In Serbia, a part of the harvested apricot is processed into brandy, which is named after it – "kajsijevača" (apricot brandy). It is obtained by distilling the mash/pulp of fresh fruits or apricots, with or without stones. The apricot fruit has a subtle and delicate scent and aroma which turn into brandy by distillation and give it specific organoleptic properties, which is why it is especially appreciated and recognized. It is consumed as a product of ethanol content of 40-45% v/v, often colourless. In order to express its likeable aromatic character, scent and taste, it should be aged for at least one year in an inert vessel. As it ages, over several years in an oak barrel, it gains in quality significantly. Then, in addition to its characteristic aroma, the well appreciated "bouquet" (aromatic quality, taste and scent) appears, which harmonizes well with the primary aroma of apricot brandy (Urošević, 2015; Leković et al., 2021; Pantić et al., 2019).

Apricot varieties of later ripening are more suitable for processing into brandy, these fruits contain more sugar and have a more pronounced aroma. Fruits intended for brandy are picked at full maturity or a little later, when they have the highest sugar content and the most pronounced aroma. The varieties of apricot that are most often used for the production of brandy are the Best Hungarian and Kecskemét rose.

The process of brandy production consists of the following operations:

- Mulching fruits and separating stones
- Boiling
- Distillation of fermented fruit mash/pulp
- Aging
- Finalization of brandy

The fruits can be used with or without stones, but better quality is obtained if the stones are removed. Separation of stones is done manually or by machine. For the destoning of fruits, the so-called destoning/straining machines are used. By using these machines, the stones are easily and well separated from the mesocarp that is also being well mashed, initiating the quick fermentation of the whole mass in such an environment and bringing it faster and more completely to the end of fermentation. Mashed mesocarp is easily transferred by pumps, which greatly facilitates all the operations.

The prepared fruits are placed in fermentation vessels. These can be stainless steel or plastic containers, concrete pools or wooden barrels. It is important that the dishes are well washed and cleaned before introducing the fruit. Fermentation vessels should not be filled above 80% of the volume (Urošević, 2015; Pantić et al., 2021).

Fermentation must take place without the presence of air, preventing the development of undesirable microorganisms and therefore a lid is placed over the fermentation vessel. The optimum fermentation temperature is 16-20°C. The duration of fermentation depends on the temperature and is usually 3-4 weeks. The course of fermentation should be monitored, so when it is finished, distillation should start immediately.

The distillation of the fermented mash is performed in devices that can be of different constructions and volumes. The best machines are made of copper. The parts of the distillation apparatus or cauldron are: the body of the cauldron, the lid-dome, the cap, the conduit tube, the cooler. The boiler of the distillation apparatus is filled with a fruit mash up to 2/3 of its volume.

Fresh distillates have a sharp, inharmonious taste and are not immediately suitable for consumption. Before use, the distillate needs to be aged for 3-6 months in glass or stainless steel vessels, during which complex chemical processes take place, and a colourless brandy is obtained. If ripening is done in oak barrels, golden-yellow brandy is obtained.

Finalization is the final preparation of the distillate for use and includes reducing the strength of the brandy/alcohol content by volume to 40-50% v/v by adding distilled water and filtering. After that, brandy is poured into bottles, bottles are closed with metal caps, labelled and packaged.

Depending on the amount of sugar and the share of stones, 10-16 l of apricot brandy is obtained from 100 kg of apricots.

Production of apricot brandy on the farm

Apricots and apricot brandy are produced on the agricultural farm located on the territory of the city of Belgrade, in the municipality of Grocka. This is a famous fruit region. Due to the very favourable geographical position and composition of the soil, the proximity of the Danube River, and the favourable air flow, Grocka has very good conditions for growing various fruit crops. Apricots, peaches, cherries, but also other continental fruit crops thrive best in these areas. The observed farm has a long tradition in the production of fruit and brandy. All members of the household are active, so there is no need to hire permanent additional labour, except seasonal workers who are hired as needed.

The owner of the farm also has a registered company for the production of brandy. The distillery started operating in 2009. The incentive for its opening was the fact that by producing brandy, members of the farm can earn significantly more income than by selling fresh fruit. The distillery produces apricot, plum, grape and peach brandies, according to traditional technology. It has a capacity of 16 tons of fruit in series. The total average annual production is just over 1000 litres. Raw materials for the production of plum and grape brandy are bought. The main product is apricot brandy, which is

entirely produced from apricot varieties Hungary Best and Kecskemét Rose, produced on the observed farm. They are late varieties in regard to the time of ripening, they have high sugar and dry matter content, as well as a good aromatic complex. The amount of brandy produced depends on several factors: the quantity and quality of apricots produced on the farm, market prices, brandy stocks, brandy demand, etc. The amount of raw material needed to obtain 1 litre of brandy varies from year to year, primarily depending on the amount of sugar and dry matter in the fruit. Sometimes 8-9 kg of fruit is needed for 1 litre of brandy, and sometimes 12-13 kg of fruit.

The main stages of production of high quality brandy are: selective harvesting of the highest quality fruit, processing, controlled fermentation and light distillation.

In the orchard of the agricultural farm, the harvest is done selectively and only ripe fruits are selected. After harvesting, the stones are separated from the fruit using a strainer machine. The mashed fruit is placed in a fermentation vessel.

The fermented mash, or fruit pomace, is pumped into the body of a copper cauldron that has been previously washed, and which is then closed, a fire is lit and the mash/pomace is heated to a certain temperature of alcohol evaporation. Alcohol vapours are collected in the lid of the cauldron and brought to the cooler via a steam pipe, where the vapour condenses into a liquid by cooling and exits the cauldron through a pipe into the receiving vessel.

Brandy is stored in glass balloon-like vessels, stainless steel tanks and wooden oak barrels. Numerous medals and recognitions from various festivals, fairs and competitions testify to the top quality of brandy produced in the observed distillery. The distillery mainly sells its products in restaurants and cafes in the city of Belgrade.

Business analysis

One of the main goals of agricultural farms is to generate income. By using certain inputs on the farm, a certain amount of product is produced. A part of the produced quantity is mainly used to meet the needs of household members, and the other part is placed on the market. On the observed family farm, in order to generate income, among other things, apricots and apricot brandy are produced.

In order to determine the amount of realized income from the sale of goods placed on the market, and then profit, and to measure the efficiency of using engaged resources, as well as the efficiency of using certain inputs in the production process to produce a certain amount of products (output) on the farm, it is necessary to conduct an economic analysis of the results of the observed production. One of the methods that is most often used as a basis for the analysis of the achieved results is the calculation of the production of the observed products. In order to conduct the highest quality analysis, it is necessary, as accurately as possible, to specify the quantities and value of inputs, i.e. costs of invested funds on the one side, and production results, yields, i.e. income, on the other.

The calculations of apricot brandy production in 2017 and 2019 are shown below.

Calculation of apricot brandy production in year 2017

In year 2017, the farm produced 700 l of apricot brandy with alcohol content by volume of 43.0% v/v. The total production costs amounted to 411,510.00 dinars, i.e. the cost of 1 litre of brandy was 587.87 dinars (Table 1).

Table 1. Costs of apricot brandy production in year 2017

Type of cost	Unit	Quantity	Price per unit (dinars)	Amount (dinars)
A. Materials				
Basic material - raw material	kg	7.000	30,00	210.000,00
Distillation (water, electricity, wood)				20.250,00
Redistillation (water, electricity, wood)				16.200,00
Distilled water	l			2.000,00
Total A.				**248.450,00**
B. Mechanical works				
Raw material processing	hour	6	1.010,00	6.060,00
Fermentation	hour	8	1.000,00	8.000,00
Depreciation of equipment				4.000,00
Total B.				**18.060,00**
C. Labour				
Production services	hour	130	461,54	60.000,20
Total C.				**60.000,20**
D. Other costs (bottling costs, excises, taxes, administration contributions)				85.000,00
Total D.				**85.000,00**
F. Total cost				**411.510,20**

Source: The authors

Of the total amount produced in the observed year, the farm sold 430 litres of apricot brandy at a price of 1,375.00 dinars and generated a total income of 591,250.00 dinars.

Calculation of apricot brandy production in year 2018

In year 2018, there was no production of apricot brandy in the distillery on the farm, because the yield of apricots was very bad, as a result of bad weather, especially frost during the apricot flowering period. This caused the price of fresh apricots to be high, so it was not profitable to use it for processing. Also, only the apricots produced on the farm are used in the distillery in the production of apricot brandy.

In year 2018, the farm sold 510 litres of apricot brandy, which was produced in previous years, at a price of 1,375.00 dinars, and generated a total income of 701,250.00 dinars.

Calculation of apricot brandy production in year 2019

In year 2019, the farm produced 680 l of apricot brandy with an alcohol content by volume of 40.0% v/v. The total production costs amounted to 381,510.00 dinars, i.e. the cost of 1 litre of brandy was 561.04 dinars (Table 2).

Table 2. Costs of apricot brandy production in year 2019

Type of cost	Unit	Quantity	Price per unit (dinars)	Amount (dinars)
A. Materials				
Basic material - raw material	kg	6000	30,00	180.000,00
Distillation (water, electricity, wood)				20.250,00
Redistillation (water, electricity, wood)				16.200,00
Distilled water	l			2.000,00
Total A.				**218.450,00**
B. Mechanical works				
Raw material processing	hour	6	1.010,00	6.060,00
Fermentation	hour	8	1.000,00	8.000,00
Depreciation of equipment				4.000,00
Total B.				**18.060,00**
C. Labour				
Production services	hour	130	461,54	60.000,20
Total C.				**60.000,20**
D. Other costs (bottling costs, excises, taxes, administration contributions)				85.000,00
Total D.				**85.000,00**
F. Total cost				**381.510,20**

Source: The authors

The farm sold 530 litres of apricot brandy, of the total amount of 680 l produced that year, at a price of 1,425.00 dinars and generated a total income of 755,250.00 dinars.

Analysis of apricot brandy production results

The total profit in agricultural production on the farm can be determined when the total costs (fixed and variable costs) are deducted from the total income. We can calculate the breakeven margin when we subtract variable expenses from the operating income.

Table 3 shows revenues, expenditures and gross breakeven margin by years.

Table 3. Revenues, expenditures and gross breakeven margin by years (dinars)

Year	Revenues	Expenditures	Gross breakeven margin
2017	591.250,00	411.510,20	179.739,80
2018	701.250,00	-	701.250,00
2019	755.250,00	381.510,20	373.739,80

Source: The authors

In the period from 2017 to 2019, the farm recorded an increase in income as a result of the commitment of each member, as well as better positioning in the market. What is specific about the production and sale of brandy is that it is not sold in the same year when it is produced, it is not sold, but put to age.

Production costs are presented with the market price of the raw material. Considering that apricots are produced on the farm and that the cost of apricots they produce is 12.00 dinars, and the market price is 30.00 dinars, we conclude that the profitability of fruit processing is higher than if apricots were purchased from other producers.

Indicators of business success in the production of apricot brandy

In order to calculate the economic efficiency of business operations in a certain accounting period, it is necessary to compare the achieved results with the results from the previous period, and to make a time comparison.

The economic result of business operation can be expressed per unit of invested or spent factors of production, and then it is possible to make a time comparison and calculate economic efficiency. The basic economic principles of business are: economy, productivity and profitability.

Productivity in apricot brandy production

Labour productivity is an important economic indicator of business success. By comparing business results with the volume of invested work, productivity indicators are obtained. The basic indicator of labour productivity (P_r) is calculated when the quantity of manufactured products and the volume of labour used are put into relation (Gogić, 2009).

Quantity of products obtained / Labour consumption = Labour productivity

In this way, the level of labour productivity is expressed naturally, i.e. the amount of products obtained per unit of labour used (Table 4).

Table 4. Productivity of apricot brandy production

Year	Quantity of products (liters)	Labour consumption (man hours)	Labour productivity (l/m.h.)
2017	700	144	4,86
2018	-	-	-
2019	680	144	4,72

Source: The authors

It was not possible to calculate labour productivity per working hour for year 2018 because apricot brandy was not produced in that year.

Economics of apricot brandy production

Economics means the economic benefit of the utilization/consumption of factors of the production process. The lower the consumption of production process factors for a certain volume of production, the greater the benefit of their consumption.

Economic efficiency is expressed by the coefficient of economics (E_k) and can be expressed as the ratio of production value and total costs:

Production value / Total costs = Production economy

The economics expressed in this way shows the amount of production realized per unit of costs incurred (Gogić, 2009).

Table 5. Economics of apricot brandy production

Year	Production value (dinars)	Total costs (dinars)	Gross breakeven margin (dinars)	Economic efficiency coefficient
2017	591.250,00	411.510,00	179.740,00	1,44
2018	701.250,00	-	701.250,00	-
2019	755.250,00	381.510,00	373.740,00	1,98

Source: The authors

The obtained results presented in Table 5 show that the coefficients of economics (E_k) are higher than 1, which means that the production of apricot brandy was economical. The cost-effectiveness ratio (EC) is on the rise. Namely, a higher coefficient of economics was achieved in 2019.

Profitability of apricot brandy production

Profitability is the ability to maximize profits with invested resources. Profitability is a basic prerequisite for growth and development. The goal of measuring profitability is to measure the efficiency of investment management.

Profitability of production (R_p), is expressed as the ratio of financial results and value of production (Gogić, 2009):

(Breakeven margin / Production value) x 100 = Production profitability

Profitability of apricot brandy production is presented in table 6.

Table 6. Profitability of apricot brandy production in years 2017 and 2019

Year	Production value (dinars)	Total costs (dinars)	Gross breakeven margin (dinars)	Production profitability (%)
2017	591.250,00	411.510,20	179.739,80	30,40
2018	-	-	-	-
2019	755.250,00	381.510,20	373.739,80	49,40

Source: The authors

The obtained results show that in the observed years, the production of apricot brandy was profitable.

Conclusion

Based on the economic analysis of apricot brandy production in a distillery on a family farm, it can be concluded that the obtained economic results are positive. Economic profitability was achieved by a favourable ratio of the selling price of apricot brandy and the cost price (producer price). By subtracting the incurred variable costs per litre of apricot brandy produced, 787.13 dinars remained in year 2017, or 863.96 dinars in year 2019, to cover fixed costs and make a profit (net income). The coefficient of economics shows that for every dinar of total costs of apricot brandy production, 1.44 dinars of production value was realized in year 2017, and 1.98 dinars in year 2019. In other words, the value of production was by 44% and 98% higher than the total costs, respectively, which indicates that it is a profitable production. In year 2017, 4.86 litres of apricot brandy were produced per working hour, and in year 2019, 4.72 litres of apricot brandy. In the observed years, production was profitable because the rate of profitability was 30.40 in 2017, and 49.40 in 2019. It was not possible to calculate the indicators of business success for 2018, because apricot brandy was not produced in that year.

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Conflict of interests

The authors declare no conflict of interest.

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