

PRODUCTION OF APPLES AS A POSSIBILITY FOR FAMILY FARMS DEVELOPMENT

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ABSTRACT

The paper analyzes cost effectiveness of invested funds for apple orchard establishment on the family farm located in Rasina District in Central Serbia. It is assumed that the apple orchard establishment on the family farm can contribute to reducing unemployment in rural areas and increasing income of individual farms. As a primary source of information accounting calculations were used, technological table of apple orchard establishment, internal records and the pilot version of the business plan of apple producers at the family farm. For more accurate view and better monitoring of data domestic and foreign literature, internet web sites, available statistical data on the production of apples and publications related to apples production has been used. Methods used for the paper preparation were: calculation of plantation establishment, cash inflows and outflows for the period planned for orchard exploitation, and indicators of economic efficiency. Total cost of planting of apple orchard on the family farm amounts to € 16,080 for one hectare. All economic indicators show positive results. The production is efficient, since the ratio is greater than zero. Planned production is profitable, because profits participate with 71% in total production value. Calculating productivity, it was found that production of one tonne of apples required 822 hours of workers' labour. Establishing apple orchard is certainly high-budget investment, but it can be concluded that the economic effects of raising apple orchards on the farm was economically justified and cost-effective, based on the analyzed result.

Key words: Production, apples, family farm, development.

INTRODUCTION

Serbia is a country with very favourable natural conditions for growing all kinds of continental fruit crops, including apples. Producers of apples in Serbia are mostly family agricultural holdings that are characterized as producers with small property and small economic power. Rural households and farms with agricultural land at their disposal are the basic resources for agricultural production in the Republic of Serbia (Jelić and Živković, 2011).

The subject of this paper is to analyze the conditions and results of growing crops and apple production on a family agricultural household, located in Central Serbia, in the Rasina District. Besides the impact of the specificities of fruit crops production on apple growing on the country holding, the paper presented a comprehensive financial analysis of investments in the establishment and maintenance of plantations. Profitability of invested assets was determined through flow of inflows and outflows for the planned period of plantation use.

MATERIAL AND METHODS

Accounting calculations and technological map of growing of apple orchards were used in the process of creation of this paper. Dynamic and static methods were used for the evaluation of the economic efficiency of investments. Capital value and the period of return on investment

were used as dynamic methods, and indicators of cost effectiveness, profitability and productivity were used as static methods.

The main data sources in the preparation of this work were internal records and the pilot version of the business plan of the growers of agricultural holdings from Brus. In addition, we used the domestic and foreign professional literature of recent date, which refers to the growing and exploitation of apple orchards, statistical data on the production of apples, as well as publications that are related to the production and growing of apples and instruments of economic analysis, organization and business economics.

RESULTS AND DISCUSSION

When deciding on the cultivation of plantations, first of all it is determined if the analyzed fruit culture was introduced for the first time into production in the observed area. If the production has already been present, what is considered are years of experience, which is primarily related to selection of cultivars, soil and position of planting. If it comes to the land on which the production is planned for the first time, it requires a certain sequences of operations that need to be made so that the future production and maintenance of plantations would run in the right direction (Milić *et al.*, 2013). The advantage of family agricultural holdings from Brus is that it is located on the slopes of mountain Kopaonik, which is an ideal location for the production of apples. In fact, in this area there is a sufficient number of sunny days, mild temperatures during the growing season, and sufficient amounts of rainfall, which in drought years can be compensated for by using irrigation systems. Also the plantations are close to major roads, which provides an advantage for transport and placement on the market.

Looking at the progress of fruit production in our country, it can be concluded that fruit growing is not satisfactory. Specifically, the results achieved today in fruit production are significant, but still well below our capabilities (Keserović *et al.*, 2008). The reasons are found in fragmented parcels on which production takes place, which entails higher costs, then, one of the reasons is the high share of obsolete cultivars that offer reduced fruit quality standard, and all these have an effect on the inability to parry competition. One of the significant factors affecting the underdevelopment of agriculture in Serbia is the unresolved ownership structure of the land. Specifically, this problem hinders holders of registered agriculture holdings to access free incentive funds that are given by the Ministry of Agriculture and local governments in order to promote agriculture and rural areas.

As presented in Table 1 it can be noted that in recent years the area under apple in Serbia increased by 686 hectares, mainly in Central Serbia. In Vojvodina, there was a decrease of 1,588 hectares. The yield per hectare in 2014 decreased by 1.9 tons per hectare compared to the base year.

Table 1. Volume and dynamics of production of apples in Serbia (2011- 2014)

Year	Surface area (ha)			Production (t)	Yield (t/ha)
	Central Serbia	AP Vojvodina	Republic of Serbia		
2011	23,051	15,114	7,937	371,213	16.1
2012	23,737	14,827	8,910	243,987	10.3
2013	23,737	13,768	9,969	458,409	19.3
2014	23,737	17,390	6,349	336,313	14.2
Difference	686	2,276	- 1,588	-	- 1.9

Source: Statistical Office of the Republic of Serbia, Belgrade

Apple tree plantations in the analyzed agricultural holding were formed in straight rows planting, usually in the north - south direction, depending on the relief elements. Silvicultural form was applied - row on M9 rootstock. Spacing is 3.8 x 1 m. According to the density of

planting apple trees on the observed family agricultural holding it ranks to a very dense frame. The total number of plants, which is planted on an area of 2 hectares is 7,200 pieces.

The time period until the entry into yield lasted three years. The entire process of planting apple orchards can be divided into three phases. In the first phase, activities related to the regulation works and immediate preparation of land for planting were carried out. Since there are the remains of trees, rocks, etc. on the designated land for planting orchards, everything must be previously must cleared and taken outside the terrain in order not to interfere with the performance of trenching and planting, and subsequently with the plantation care. After plowing, grading is done. It is best to perform straightening directly before planting in order to activate the land and allow it to gradually settle.

In the second phase there are the activities related to the immediate preparation for planting and apple planting consisting of a large number of different working operations, such as preparation for marking, preparation of seedlings, transporting seedlings to the plots, setting the pillars, and many others that will be listed in the following table overview with corresponding costs. The seedlings must be healthy, well-developed, with a real trunk and branched root system (Mišić, 2004). These qualities characterize certified planting material which is a condition for the formation of good fruit plantations. At this stage most of the costs comprise costs of seedlings.

After the first two phases, planting enters the third phase, consisting of the activities related to the care of planted apples to the entry in the fruiting. Working operations that are performed in the first year, are repeated in the next two years, with the note that the needs of the materials are usually less, and operating results higher (Bijelić and Vračarević, 2008). Operations performed in the first years of cultivating and maintaining of plantations are similar to operations in regular production. Consequently, the cost of plantation care successively increases every year. During this period, households that are oriented towards commercial production are required to build storage facilities for final products according to the planned dynamics and organization.

At the end of the required number of years for the entry of plantations in full yield, we can determine the total cost of raising apple orchards in the analyzed family agricultural holding which is shown in Table 2.

Planned exploitation period of the apple plantations on the agricultural holding is 25 years. It is assumed that in the third year of plantation tending there are the first significant economic benefits. In the sixth year, the overall plantation should now reach the projected full yield of 40 tons per hectare.

It is planned that the share of the first class apple fruit is 85% and the minimum average purchase price is 50 dinars per kilogram, while the remaining 15% is to be sold as an industrial apple at a price of 30 dinars per kilogram. It must be noted that the purchase prices vary and the price has the most influence on the overall result of the investment. To calculate expected returns and costs, the prices as of the year 2014 were taken into account.

Table 2. Total cost of raising of 1 hectares of apple orchard

Costs	Amount (€)	Participation (%)
Costs of preparing the land	811	2.8
Costs of planting	16,080	57.5
Costs of care in the first year	2,243	9.3
Costs of care in the second year	3,038	12.0
Costs of care in the third year	4,731	18.4
Total	26,093	100.0

Source: Own calculations, internal documentation of analyzed family agricultural holding

ECONOMIC JUSTIFICATION FOR RAISING PLANTATIONS

Identifying indications of economic efficiency of investments is based on calculating the difference between investments and actual cash income during the investment period.

The investment is profitable for the agricultural holding, because the capital value of the investment is positive ($C_0 > 0$), i.e. on the basis of the relationship between the sum of allowances and the sum of cash issuance, discounted at the initial moment of the investment period it is greater than 1, which is shown as in the example.

The shortest period of time for which the investments will be returned is 4 years. Repayment period (Pay-off) is defined as the number of years required to compensate the net cash flow invested in the plantation:

$$A_0 = (b - u) \frac{(r^t - 1)}{r^t(r - 1)} \quad (1)$$

Applying the static method, a particular part of the investment period is considered, usually an interval of one year and the estimate is brought on the basis of cash payments and cash earnings. These are the so-called one-period methods. Due to disregard the time factor, it is possible to get only approximate results. Indicators of productivity, cost effectiveness and profitability are crucial for assessing the operating performance of the agricultural holding.

Cost effectiveness represents the ratio of the value of production and production costs. "The lower the expenditure of the production factors of the production processes for a particular scope of products and services is, the higher the benefit of their spending is, and vice versa" (Gogić, 2009).

It is expressed with the coefficient of cost effectiveness and is obtained in the following manner: *coefficient of cost effectiveness (E) = planned production value / planned production costs*. As an example, 7 (seventh) year of production is taken, and the result is 3.76 €. At invested € 1, the realized value of production is in the amount of 3.76 €. The production is more economical if $E > 0$, and this is confirmed by this example. The tendency of each production is that this ratio is as large as possible, and that costs are kept to a minimum, all that without jeopardizing product quality and production value.

Profitability represents the effectiveness of the funds invested in manufacturing, i.e. the ability of a company to achieve the maximum profit with the funds invested:

$$\text{profitability rate (R)} = \frac{\text{planned profit}}{\text{planned production value}} \times 100 \quad (2)$$

Profit participates in overall production value with 71%, which leads to the conclusion that the planned production is viable.

The investment of human labour is a necessary condition for getting new products and services. The achieved level of productivity depends on many factors such as technical equipment, work organization, external environment, the level of education of employees, motivation of employees, market conditions, and many others. Labour productivity can be expressed in values and in kind.

$$\text{productivity rate (P)} = \frac{\text{quantity of obtained products}}{\text{cost of work}} \quad (3)$$

Human work invested in the production process can be expressed (in hours, weekdays), and the available capacity of this production factor by the number of employees (permanent and seasonal). For the assumed case of family agricultural holdings in terms of apple production on the holding, there are 4 full-time employees (family members) and 20 temporary workers, which gives us a figure of 24 employees who work in average 200 days per one year. If we assume that the working day lasts 12 hours, then the total number of working hours spent is: 200 working days x 12 hours with 24 workers = 57.600. If we consider that during the

growing of apple plantation, the yield per year was: 1st year 10 t/ha, 2nd year 20 t/ha and 3rd year 40 t/ha (in total 70 t/ha): $P = 70 \text{ t}/57,600 \text{ working hours} = 1.215 \text{ t/working hours}$. Therefore, per hour of invested work, this is the obtained amount of apples 1.215 t. From the reverse relationship it is obtained that: $P = 57,600 \text{ w.h.}/70 \text{ t} = 822 \text{ w.h./t}$. On average 822 working hours are spent for 1 t of apple.

Agricultural holding plans to expand the storage capacity in the future by building a new cold storage and by increasing production. The idea of setting up anti-hail nets is being considered, but it is an investment that requires large funds in order to be implemented and the household cannot provide it in any other way except by borrowing from banks in the form of loans. Providing a loan to the agricultural production in Serbia is a very specific topic, primarily due to people's mistrust in the banking system. On the other hand, a large number of agricultural producers furthermore emphasizes that a hindering factor for taking a bank loan are high interest rates, as well as the impossibility of providing credit guarantees (incomplete cadastre, unresolved property-legal relations, unregistered properties).

CONCLUSIONS

Apple producers in Serbia are mostly family agricultural holdings that are characterized as producers with small holdings and small economic power.

This study was aimed to determine the economic effects of raising the apple orchards on the agricultural holding in Brus. In this sense, the levels of profitability and efficiency of production are estimated through dynamic and static methods for assessing the economic effectiveness. The capital value, which established that the investment in apple plantation is economically justified, and the period of return on investment, which is 4 (four) years, were used as dynamic models for assessing the economic efficiency. All economic indicators show positive results. In the assessment of static models of economic efficiency of investment, the indicators of cost effectiveness, profitability and productivity were used, which also have positive results. The production is economical, since the ratio is greater than zero. Planned production is viable, since the percentage of the profit is 71% in total production value. By calculating productivity indicators, it was found that 822 hours of workers are required for one ton of apples.

The research shows that the apple orchard establishment on the family farm could contribute to reducing unemployment in rural areas, increasing income of individual farms, and thus, to some extent, affects the overall poverty reduction and economic development in rural areas of the Republic of Serbia.

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