**TÜRK
TARIM ve DOĞA BİLİMLERİ
DERGİSİ**

**TURKISH
JOURNAL of AGRICULTURAL
and NATURAL SCIENCES**

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Comparative Analysis of Options for Investing in the Production of Table Grapes from Seed and Seedless Varieties

[a]Daniela DIMITROVA*, [a]Illiyan SIMEONOV, [a]Valeriy PEYKOV, [a]Emil TSVETANOV, [1]Vladimir DIMITROV
[a]Institute of Viticulture and Enology, Pleven, Bulgaria
* Corresponding author: vachevska_d@abv.bg

Abstract

The issue set by the World Health Organization concerning the healthy diet of the population highlights the need of increasing fresh fruit consumption, including table grapes. Achieving this goal is a challenge in Bulgaria, with a view of the constantly decreasing production and increasing market prices of the produce. Meeting the domestic market demands with table grapes of quality and price satisfying to the maximum level the tastes and preferences of consumers requires encouraging of investment activity in the sector. The specifics of the investment process in viticulture, resulting from the long period for the establishment of the vine plantation, the long operation life of the asset, the high need of capital and the considerable production and market risk, determine the complexity of investment choices. The evaluation of several possible investment decisions facilitates the choice of the production strategy. In this connection the object of the study is the effectiveness of investments in the production of table grapes from the seed varieties Bolgar, Alfons Lavale, Parvenets and Misket Hamburgski and the seedless Kishmish Moldovski, Byalo Edro Bez Seme, Kondarev 10, Kondarev 6 and Rusalka 1. The comparative economic analysis is based on the developed theoretical models of farms by net present value, profitability index and payback period. Comprehensive assessment of the economic viability of investment marks the highest values for the seedless variety Kondarev 6 and the seed variety Parvenets.

Keywords: table grapes, investments, payback period, profitability index

Introduction

The need of improving the health status of the population globally reaching the minimum set by the World Health Organization quantity of 400 g daily intake of fruits and vegetables highlights two main issues - increasing food provision and facilitating access to food. Development of production and stimulating consumption are the main areas requiring government intervention in the context of these objectives.

High nutritional value of table grapes determines its important place for the healthy diet of the nation (Markova and Zhekova, 1990, Crupi et al., 2011; Percival, 2009; Stalev and Angelov, 2011; Zhou and Raffoul, 2012). The suitable soil and climatic conditions and the existing traditions enable table grape production in Bulgaria.

The technological features of production, differentiated into two main stages - planting and cultivation of the vineyard until the stage of fruit-bearing and the stage of fruit-bearing, revealed the importance of investment activity as a driver of productivity and competitiveness of the table grapes viticulture. The specifics of investment process in the sector resulting from the length of the investment cycle, the long period of utilization of the plantations and the great value of the initial investment determines the complexity of the investment choice (Vachevska and Peykov, 2007, Borisov, 2010, Borisov and Radev, 2012, Borisov et al., 2014). The correlation between the biological requirements of the variety, agriecological conditions of the region and the main technological parameters – training systems and planting distances, limit largely the production risk, which is significant with a view of the high susceptibility of most of the table grapes varieties to the economically important diseases and pests and their relatively poor resistance to low winter temperatures (Nikov et al., 1990, Kostadinova et al., 2007, Ivanov et al., 2007).

Soil and climatic conditions of Bulgaria determine the more widespread varieties ripening for consumption in August and September. The

mass production in this period and the increased competitive pressure of imports from neighboring countries - Greece and Turkey determine the lower producer price compared to early and late ripening varieties. Minimizing the market risk arising from the annual fluctuations in the price level and the uncertain entrepreneurial income requires evaluation of many investment decisions with regard to choosing the most appropriate variant of varietal structure for the specific conditions (Borisov, 2010, Nan et al., 2009, and Kizilaslan Elmali, 2012).

The objective of this study was to assess the effectiveness of different variants of investments in the production of table grapes of medium ripening seed and seedless varieties.

Materials and Methods

The comparative analysis of the investment decisions was made based on developed models of farms producing table grapes of the seed varieties Bolgar, Alfons Lavale, Parvenets and Misket Hamburgski and seedless Kishmish Moldovski, Bialo Edro Bez Seme, Kondarev 10, Kondarev 6 and Rusalka 1. The selected varieties belonged to the group of medium ripening, reaching ripeness for consumption in the first half of September, in accordance with the classification adopted by Roychev (2012). The term of ripening determined the period when the produce was displayed on the market, on which the market price depended and which formed the amount of the revenue cash flow.

The principle of uniformity in choosing the size of the cultivated area and the type of ownership upon the machinery was adopted for limiting the effect of the indicators on the economic modeling final results. The farms area was 10 hectares and the utilized machinery was privately owned. The different combinations of vine planting distances and the type of training formed the diversity of technological variants for the establishment of vineyards and their cultivation during its period of fruit-bearing. For the purposes of the research two main variants were chosen most often applied in practice: **improved ground Guillot training system** with planting distances 2.20 x 1.30 m (density of 3500 vines ha^{-1}) and **semi-high modified Mozer** training with stem height h 0.80 cm and planting distances 2.50 x 1.30 m (3080 vines ha^{-1}).

The models were developed by using the accounting-constructive approach (Nikolov, 1997), based on the feasibility standards defined by a team of the Institute of Viticulture and Enology - Pleven (Marinov et al., 1997). Labor costs were valued in accordance with the current norms and

rates at IVE – Pleven, while the material costs – according to the to market prices current by December 2013. The impact of agriecology of the region on the production was modeled through differentiation of the yield in qualitative and quantitative aspects (Extra Class, Class I, Class II and discard)[1] according to the type of vine formation. The ratio compared to the total value of production was as follows: for the ground growing technology applicable in the northern regions of the country - 35%, 45%, 15% and 5% while for the semi-high training system distributed in South Bulgaria - 50%, 40 %, 5% and 5%.

The valuation of the production was carried out by average market prices determined on the basis of official information on the wholesale price of table grapes per months for the period 2010-2013, published in the Bulletin of the State Commission on Commodity Exchanges and Wholesale Markets. Price differentiation according to the quality class was done by coefficients obtained in an expert way. The average market price used for the purposes of the economic analysis was 0.68 EUR kg^{-1} for Class I, 0.82 EUR kg^{-1} for Extra Class, 0.54 EUR kg^{-1} for class II and 0.26 EUR kg^{-1} for non-standard produce.

For calculating the present value of future revenue and expenditure flows it was applied the method of discounting with a discount rate 6.57% established as an arithmetic average between the annual interest rate on long-term loans, announced by the Bulgarian National Bank and the annual average inflation rate set by the National Statistical Institute.

The evaluation of the investment decisions effectiveness was derived using the method of net present value (NPV) and profitability index with discounting (PI) and payback period of investments (PBP).

The net present value of the evaluated variants was defined by the following formulae:

$NPV = \sum NCF_n \times DF_{tn} - I$, where

NCF – net cash flows for n^{th} year;

$DF_{tn} = 1/(1+r)^n$, where,

r – discount rate;

n – number of time intervals, years in this case.

I –initial amount of the investment costs.

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[1] Ordinance No. 16 of 28 May 2010 on the requirements for quality control of fresh fruits and vegetables, Prom. SG issue 43 of 8 June, 2010, as amended in SG, issue 71 of 13 September, 2011, suppl., SG, issue 44 of 17 May, 2013.

The profitability index with discounting allows the income ensured by unit initial investment for the entire economic life of the project to be determined. It is calculated by the formula:

PI $= \sum NCF_{nd} / I_{tn}$, where

NCF_{nd} – discounted net cash flows;

I_{tn} – the updated total value of the investment.

The payback period of investment shows the time of equalization of the accumulated amount of updated annual net cash flows with the updated value of investments:

PBP $= \sum NCF_{nd} = I_{tn}$.

Results and Discussion

According to the official statistics leading position in the varietal structure of vineyards in the country had Bolgar variety - about 43%, followed by the variety Misket Hamburgski (MAF, 2001). The exceptional commercial features of Bolgar variety specify in the future its major place in the production of grapes to meet the local demands. However, the changing trends in world consumption of table grapes with prevalence of preference for seedless varieties require updating of varietal structure in accordance with consumer demands. The restricted practical distribution of seedless varieties in our country in the recent past was mainly due to their lower fertility and their worse resistance to low winter temperatures and pests (Nikov, 1990, Roychev, 2012). With the development of the selection activity in this direction new white and red seedless varieties with big clusters were created such as Kondarev 10, Kondarev 6 and Rusalka 1, as their wider growing is perspective for enhancing the sector's competitiveness and expanding the market share of Bulgaria in the international trade of table grapes (Pandeliev et al., 2009).

Table 1 and Table 2 present the results of modeling the production of table grapes from seed and seedless varieties in two different technological variants of training systems – ground with hilling up and semi-high.

Despite the greater labor intensity of the first variant, as a result of hilling up and hilling down of the plantations, it is recommended for northern areas of the country where critically low winter temperatures in the range of -16^0C, -17^0C occur once every five years. The amount of the investment costs for this variant formed by the sum of investments made during the first three years of the establishment of the vineyard to the time of its fruit-bearing was 17 716.67 EUR ha^{-1}. The amount of the investment included the cost of purchasing the vine propagation material - 26.0% of the total value of the initial investment, the cost of building a trellis system and drip irrigation - 25.3%, the cost of fertilizers, plant protection preparations and other materials - 16.1%, labor costs - 12.3% and costs for the implementation of mechanized operations - 20.3%.

Table 1. Efficiency of investment solutions in the production of table grapes – ground training system

Variety	Indicators					
	Average yield, kg ha^{-1}	Investment costs, EUR	Operational costs, EUR	NPV, EUR	PI, EUR	PBP, years
I. Seed						
1. Bolgar	13988	177166.65	39710.32	351321.37	1.63	9.1
2. Alfons Lavale	12240	177166.65	38499.01	258776.99	1.33	10.0
3. Parvenets	17485	177166.65	42132.94	536410.12	2.22	8.0
4. Misket Hamburgski	10491	177166.65	37287.70	166232.62	1.04	11.5
II. Seedless						
1. Bialo Edro Bez Seme	11190	177166.65	37761.41	203407.98	1.16	10.8
2. Kishmish Moldovski	13988	177166.65	39710.32	351321.37	1.63	9.1
3. Kondarev 10	16786	177166.65	41637.60	499549.98	2.11	8.4
4. Kondarev 6	17485	177166.65	42132.94	536410.12	2.22	8.0
5. Rusalka 1	13988	177166.65	39699.51	351478.98	1.63	9.1

Source: own calculations

The higher investment costs for semi-high training systems – 17 884.36 EUR ha^{-1} was due to the longer duration period of not fruit-bearing - 4 years. Therefore the share of costs for the purchase of fertilizers and plant protection preparations, as well as the cost for the

mechanized operations increased respectively to 20.5% and 22.5%. The costs of vine propagation material which absolute sum amounted to 4051 EUR ha^{-1}, represented 22.7% of the total investment. The funds needed for the construction of a trellis structure and irrigation installation took 23.4% of the investments share, while the labor costs were 11.1%.

The amount of the operating costs in the ground variant of vine growing exceeded on the average with 219.71 EUR ha^{-1}, or about 6.0% the level of that indicator in the semi-high training systems as a result of the larger number of vines per hectare and the additional agronomic operations for hilling up and down of the vine plantation. Structurally, the labor costs in the first variant were 57.2% of the total direct production costs and the material costs and the mechanized operation costs, respectively 19.3% and 23.5%. By increasing the stem height and eliminating the need of hilling up, the share of mechanized activities and material inputs, respectively, 25.3% and 19.7%, increased and the burden of the labor costs in the total production costs dropped down to 55.0%. The big amount of the labor costs was due to the specific agricultural activities within the production technology for obtaining quality table grapes related with a lot of manual labor on the plant itself during the vegetation period (tying, suckering, topping, pinching off, thinning of bunches), as well as the harvest and handling and preparation of production to be supplied to the market, which in this case were for the account of the producer.

The costs given in tables 1 and 2 for growing fruit-bearing vineyard included both the direct variable costs as well as the permanent ones – for insurance, depreciation and management.

Under the same technological indicators and levels of market prices, the average yield was the major determining factor of the investment decisions efficiency. The results given in Table 1 obtained on the basis of the defined theoretical yield, outlined the best parameters of the investment choice in the variant of ground training of the seed variety Parvenets and the seedless variety Kondarev 6 where the net present value of the project amounted to 536 410.12 EUR, the payback period was 8 years, and an unit of invested capital generated 2.22 EUR.

Table 2. Efficiency of investment solutions in the production of table grapes – semi-high training system

Variety	Indicators					
	Average yield, kg ha $^{-1}$	Investment costs, EUR	Operational costs, EUR	NPV, EUR	PI, EUR	PBP, years
I. Seed						
1. Bolgar	15385	178843.55	37193.42	471531.53	2.01	8.6
2. Alfons Lavale	13847	178843.55	36128.49	391663.46	1.77	9.2
3. Parvenets	20001	178843.55	40388.22	711135.45	2.78	7.10
4. Misket Hamburgski	12308	178843.55	35063.55	311795.58	1.50	9.11
II. Seedless						
1. Bialo Edro Bez Seme	12923	178843.55	35489.51	343749.40	1.61	9.5
2. Kishmish Moldovski	15385	178843.55	37193.42	595272.33	2.41	8.2
3. Kondarev 10	18462	178843.55	39323.28	631267.49	2.53	8.1
4. Kondarev 6	20616	178843.55	40814.18	743089.28	2.88	7.8
5. Rusalka 1	15385	178843.55	37193.42	471531.53	2.01	8.6

Source: own calculations

Both varieties had the best results in the variant of semi-high training system too. The difference between the discounted value of net cash flows and the value of the initial investment reached the highest amount –743 089.28 EUR in variety Kondarev 6 (Table. 2). The lower amount of the production costs combined with the increased productivity per unit area and thus the increased rate of the obtained total production determined the higher profitability of the semi-high variants compared to the ground technology of growing. The increase in the seed varieties ranged from 32.6% for the red seed variety Parvenets to 87.6% for Misket Hamburgski, while for the seedless it was within the rate of 26.4% for variety Kondarev 10 to 69.4% for Kishmish Moldovski.

The comparison between the values of the profitability index of investments outlined higher efficiency of investment decisions for the variant of semi-high training (Fig. 1). The indicator for that

variant had an increase, ranging from 0.38 EUR to 0.56 EUR per unit of invested capital for the seed varieties and from 0.38 EUR to 0.78 EUR for the seedless varieties.

The presented results suggested a high degree of attractiveness of investment decisions in the production of table grapes with semi-high training systems. This is one of the main reasons for the established geographic concentration now of the production potential of the sector in South Bulgaria - 75.8% of the fruit-bearing vineyards with table grapes in the country in 2012 and 90.7% of the area of young plantations not yet in fruit-bearing stage (MAF, 2010, 2013).

With a view of the negative demographic trends in rural areas located in Northern Bulgaria, it should not be ignored the potential of table grape production as a source of income by ensuring permanent and seasonal employment. It

was a fact that in the recent past the soil fertility in the regions along the Danube River ensured table grapes of Bolgar variety of superior quality and amber colour, reaching an average yield of 12664 kg ha^{-1} in some places on the average for the period 1963-68. (Cholakov, 1969). The implementation of the existing agroecological potential requires a serious complex of economic measures and mechanisms to promote investment activity in the sector, increasing its importance in the socio-economic aspect of balanced regional development. The challenges for the realization of this target included mainly the recovery of the mother plantations necessary to ensure vine propagation material from the selected in the country table grape varieties and overcoming the limitations arising from the shortage of skilled labor force by raising the technological level of development of the sector.
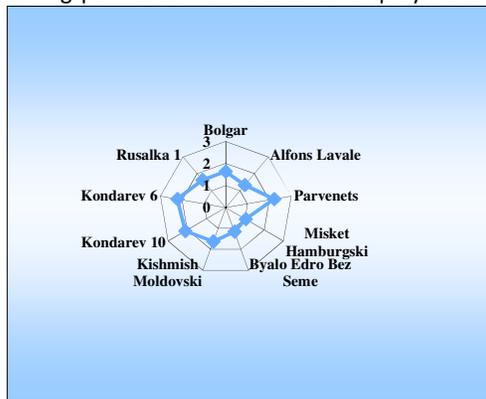
a) ground training
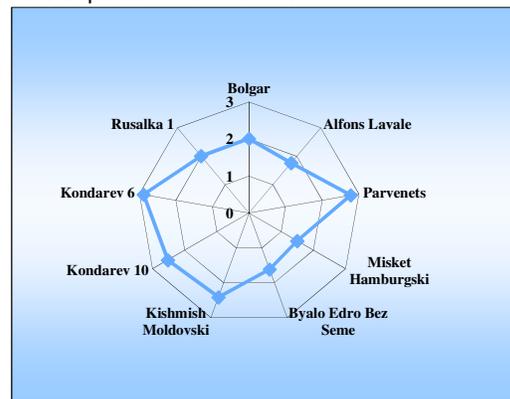
b) semi-high training

Figure 1: Comparison of profitability index per varieties

Conclusion

The results of table grapes production modeling from medium ripening seed and seedless varieties outlined a satisfactory level of profitability in all investigated variants.

The high efficiency of investment decisions for the seed variety Parvenets and the seedless varieties Kondarev 10 and Kondarev 6 in addition to the excellent qualitative indicators characterizing the table grapes determined the possibility of wider practical application in order to diversify the range of the supplied grapes in suitable areas and under conditions ensuring the achievement of that level of yield and providing the demanded market price.

The diversification of sources of income by setting up production structure of seed and seedless varieties is an important tool for risk management and enhancing the adaptability of farms specializing in the production of table grapes.

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