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ECONOMIC ANALYSIS OF GRAPE PRODUCTION IN MACEDONIA: THE CASE OF THE SMEDEREVKA VARIETY

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ABSTRACT

In the Republic of North Macedonia are 1,265 thousand hectares of agricultural land, of which about 520 thousand hectares are arable land. Of the total arable land, arable land and gardens account for 80%, meadows for 12%, vineyards for 5% and orchards for 3%. In the area under vineyards, wine varieties account for 70%, of which white varieties account for 40% and red varieties for 60% (State Statistical Office, 2025). The most common white varieties are: Smederevka, Chardonnay, Riesling and Sauvignon, and the most common red varieties are: Vranec, Kratošija, Cabernet Sauvignon and Merlot. The subject of research in this paper is the production of grapes, the Smederevka variety. The aim of the research is to analyze the results and economic justification of the production of the mentioned grape variety. Data were collected through a survey of 30 grape producers from the Vardar region. The data collected through the survey were processed using the Excel software package. Descriptive statistics indicators were also used. The results of the analysis indicate that the average yield of the Smederevka variety is 18,833 kg/ha, and the average total income is 293,937 denars. In the total income, income from the sale of grapes accounts for 73%, subsidies per area account for 14%, and subsidies per delivered quantities of grapes account for 13%. The average yield rate is 45%, and the average yield threshold is 17,055 kg/ha. The cost price of grapes is the lowest among producers with larger plantings, and they also achieve better operational results. Smaller producers should focus on association, consolidation, and modernization of their capacities, along with continuous education.

Key words: economic analysis, production, grapes, the Smederevka variety, profitability.

INTRODUCTION

Agriculture is an important industry in the Republic of North Macedonia, accounting for about 10% of the gross domestic product from primary production, and about 15% together with the processing industry (www.stat.gov.mk). Macedonia is in the process of European integration, and therefore approaching the Common Agricultural Policy of the European Union. The introduction of European regulations into Macedonian agriculture affects producers, who face the challenge of opening their domestic market and entering the EU single market, which creates a need for their sustainability and increased competitiveness (Manevska Tasevska, 2012).

Milić et al., (2016) define agriculture as a very complex system. In order for the agricultural economy to be competitive, it is necessary to adjust quality requirements and standards in accordance with domestic and international market demand (Sgroi et al., 2014). When analyzing

the efficiency of Macedonian grape producers, it was observed that the total area reduces the efficiency of the agricultural economy (Manevska Tasevska, 2012). The most important element for the sustainability of production is the analysis of total costs. Total costs are the sum of all costs incurred for the production of a particular product (Perez et al. (2017). To increase the competitiveness of vineyards, knowledge and understanding of key activities in vineyard production and their impact on costs are necessary (Alturria & Salsona, 2015; Delord et al. 2015). There is no optimal plantation size for wine grape production, but there is an optimal distribution of plantation sizes (Townsend et al., 1998; Vita di & D′Amico, 2013). The costs in viticulture production are highest for the following basic activities: pruning, removing shoots, tying bows, pressing shoots, thinning, protection, plowing, and others. (Alturria and Solsona, 2015).

Molenhuis (2014) divides the costs of establishing a vineyard into the costs of establishing the vineyard and the costs per individual year of growing the plantation. By applying various technologies to reduce physical labor, additional savings and improvement of viticulture production can be achieved (Duffy, 2009; Matese & Di Gennaro, 2015).

The subject of research in this paper is grape production in the Republic of North Macedonia, with a focus on the Smederevka variety. The aim of the research is to determine and analyze the economic indicators of the production of the analyzed grape variety, as well as recommendations for its improvement and sustainability.

MATERIAL AND METHODS

The research in this paper is based on data collected through a survey on farms with vineyards in the Vardar region, North Macedonia. The data collected through the survey were processed using the Excel software package. Descriptive statistics indicators were also used. Arithmetic mean (M_x) is obtained by adding the values of all elements (x_i) in a sequence and dividing the sum by the number of elements (N). The standard deviation is determined according to the formula:

$$\delta_x = \sqrt{\frac{\sum (x_i - M_x)}{N}}$$

For grouped data, the following formula for standard deviation was used:

$$\delta_x = \sqrt{\frac{\sum f_i x_i^2}{\sum f_i} - M_x^2}$$

The coefficient of variation was determined based on the formula:

$$C_v = \frac{\delta_x}{M_x} \times 100$$

The results from vineyard farms of different sizes were reduced to a unit size of 1 hectare. In the analytical calculation, the following were calculated: costs, revenues, gross margin, net income and product cost price. Indicators of economic business success were determined through quantitative indicators: labor productivity and production efficiency (Миланов & Мартиновска Стојческа, 2002). Productivity is calculated as the ratio between the number of units produced and the hours of direct labor.

Production efficiency is expressed through the efficiency coefficient as the ratio between the market value of production and the amount of production costs, which can have values less than, equal to, or greater than 1. If the efficiency coefficient is greater than 1, production is considered economical. As an indicator for determining the level of business profitability, it was obtained as

the ratio between the net income generated and the market value of production. The opportunity costs of invested family labor were also calculated. The break-even point was calculated as the ratio between fixed costs and the difference between the selling price and total production costs.

RESULTS AND DISCUSSION

The highest concentration of viticulture in North Macedonia is in the Vardar region, covering an area of 11,230 ha. The research covered 2,627 ha of vines in the municipality of Negotino, 622 ha of vines in the municipality of Demir Kapija, and 4,622 ha of vines in the municipality of Kavadarci.

Of the total arable land, 32% is under viticulture in the municipality of Negotino, 26% in the municipality of Demir Kapija, and 58% in the municipality of Kavadarci (www.stat.gov.mk).

Figure 1. Distribution of vineyards by statistical regions of North Macedonia

Source: State Statistical Office of the Republic of North Macedonia, 2025, www.stat.gov.mk

The data collected through the survey were divided into three groups: group 1 consists of farms with plantations up to 1 ha, group 2 consists of farms with vineyards from 1 to 5 ha, and group 3 consists of farms with plantations over 5 ha. According to the analyzed data, the average yield of the Smederevka variety is 18,833 kg/ha, the maximum is 20,000 kg/ha, and the minimum is 16,500 kg/ha.

The average yield in group 1 is 19,400 kg/ha, the maximum is 20,000 kg/ha, and the minimum is 18,000 kg/ha. In group 2, the average yield is 17,900 kg/ha, and ranges between 16,500 and 19,000 kg/ha, and in group 3 the average yield is 19,200 kg/ha, the maximum is 20,000 kg/ha, and the minimum is 18,000 kg/ha.

The average purchase price of the Smederevka variety is 11.47 MKD/ha, the maximum is 12.50 MKD/kg, and the minimum is 11.00 MKD/kg. The average purchase price in group 1 is 11 MKD/kg, in group 2 it is 11.2 MKD/kg, ranging between 11 and 12 MKD/kg. The average

purchase price in group 3 is 12.2 MKD/kg, with a maximum price of 12.50 MKD/kg, and a minimum of 12 MKD/kg (Table 1).

The average total income of the Smederevka variety is 293,937 MKD, income from grape sales accounts for 73% of total income, subsidies per area account for 14% of total income, and subsidies per delivered quantities of grapes account for 13% of total income.

Table 1. Average income from grapes, Smederevka variety

(MKD/ha)

Average incomes	Group 1 (<1 ha)	Group 2 (1-5 ha)	Group 3 (>5 ha)
Yield (kg)	19.400	17.900	19.200
- Highest yield (kg)	20.000	19.000	20.000
- Lowest yield (kg)	18.000	16.500	18.000
- Standard deviation	894	1.140	758
- Coefficient of variation	5%	6%	4%
Selling price (MKD/kg)	11.00	11.20	12.20
- Highest price	11.00	12.00	12.50
- Lowest price	11.00	11.00	12.00
- Standard deviation	0	0.44	0.27
- Coefficient of variation	0%	4%	2%
Sales revenue (MKD)	213.400	200.200	234.250
- Highest income	220.000	209.000	243.750
- Lowest income	198.000	187.000	216.000
- Standard deviation	9.839	9.203	10.805
- Coefficient of variation	5%	5%	5%
Subsidies per area (MKD)	48.000	44.160	28.800
- Highest subsidies	48.000	48.000	28.800
- Lowest subsidies	48.000	28.800	28.800
- Standard deviation	0	8.586	0
- Coefficient of variation	0%	19%	0%
Subsidies per delivered grapes (MKD)	38.800	35.800	38.400
- Highest subsidies	40.000	38.000	40.000
- Lowest subsidies	36.000	33.000	36.000
- Standard deviation	1.789	2.280	1.517
- Coefficient of variation	5%	6%	4%
Total income with subsidies (MKD)	300.200	280.160	301.450
- Highest income	308.000	295.000	311.550
- Lowest income	282.000	262.800	280.800
- Standard deviation	11.628	14.728	12.152
- Coefficient of variation	4%	5%	6%

Source: Author's calculation based on survey data

Grape purchase is carried out in September and largely depends on supply and demand. Payment to farmers varies, with some farmers receiving funds immediately or within a month, and some within 6 months.

The average total costs of the Smederevka variety are given in Table 2.

Table 2. Average total costs of grape production, Smederevka variety

(MKD/ha)

Average total costs	Group 1 (<1 ha)	Group 2 (1-5 ha)	Group 3 (>5 ha)
Variable costs including family labor	159.642	155.975	132.435
- Highest variable costs	195.140	176.335	136.463
- Lowest variable costs	134.699	143.650	126.027
- Standard deviation	23.600	13.137	4.256
- Coefficient of variation	15%	8%	3%
Variable costs excluding family labor	115.245	111.933	132.435
- Highest variable costs	150.049	125.335	136.463
- Lowest variable costs	99.199	100.440	126.027
- Standard deviation	20.233	10.262	4.256
- Coefficient of variation	18%	9%	3%
Total fixed costs	48.840	53.890	39.358
- Highest fixed costs	52.419	66.376	46.130
- Lowest fixed costs	44.728	35.063	30.908
- Standard deviation	2.872	11.620	6.613
- Coefficient of variation	6%	22%	17%
Total costs including family labor	208.482	209.865	171.793
- Highest total costs	245.316	229.094	182.593
- Lowest total costs	183.902	181.903	161.315
- Standard deviation	23.227	19.629	7.536
- Coefficient of variation	11%	9%	4%
Total costs excluding family labor	164.084	165.823	171.793
- Highest total costs	200.225	179.066	182.593
- Lowest total costs	148.402	135.503	161.315
- Standard deviation	20.615	18.561	7.536
- Coefficient of variation	13%	11%	4%

Source: Author's calculation based on survey data

The average gross margin of grape production for the Smederevka variety is 145,831 MKD. The average gross margin (including family labor as an opportunity cost) in group 1 is 140,558 MKD and ranges between 165,664 MKD and 112,860 MKD (Table 3).

Table 3. Average gross and net margin of grapes, Smederevka variety

(MKD/ha)

Average gross and net margin	Group 1 (<1 ha)	Group 2 (1-5 ha)	Group 3 (>5 ha)
Gross margin including family labor	140.558	134.939	161.995
- Highest gross margin	165.664	172.010	178.273
- Lowest gross margin	112.860	125.350	142.625
- Standard deviation	19.174	21.900	15.006
- Coefficient of variation	14%	16%	9%
Gross margin excluding family labor	184.955	178.981	161.995
- Highest gross margin	204.864	220.310	178.273
- Lowest gross margin	157.951	161.140	142.625
- Standard deviation	17.718	24.356	15.006
- Coefficient of variation	10%	14%	9%
Net income including family labor	91.718	81.049	122.637
- Highest net income	113.245	105.634	132.412

Average gross and net margin	Group 1 (<1 ha)	Group 2 (1-5 ha)	Group 3 (>5 ha)
- Lowest net income	62.684	68.252	104.318
- Standard deviation	18.636	20.164	11.400
- Coefficient of variation	20%	25%	9%
Net income excluding family labor	136.116	125.091	122.637
- Highest net income	152.445	153.934	132.412
- Lowest net income	107.775	102.988	104.318
- Standard deviation	18.073	23.382	11.400
- Coefficient of variation	13%	19%	9%

Source: Author's calculation based on survey data

The average gross margin in group 2 is 134,939 MKD, with a maximum gross margin of 172,010 MKD and a minimum gross margin of 125,350 MKD. The average gross margin in group 3 is 161,995 MKD, in the interval from 178,273 MKD to 142,625 MKD. The average net margin for the Smederevka variety represents 67% of the average gross margin. The average net margin in group 1 is 65% of the average gross margin, the average net margin in group 2 is 60% of the average gross margin, and the average net margin in group 3 is 76% of the average gross margin.

The average cost price of the Smederevka variety is 10.46 MKD, the maximum is 11.73 MKD, and the minimum is 8.94 MKD (Table 4). The average cost price in group 1 is 10.74 MKD, the maximum is 12.27 MKD, and the minimum is 9.74 MKD; in group 2 the average cost price is 11.74 MKD, the maximum is 12.74 MKD, and the minimum is 10.11 MKD, while in group 3 the average cost price is 8.95 MKD, the maximum is 9.13 MKD, and the minimum is 8.77 MKD.

Table 4. Average cost price of grapes, Smederevka variety

(MKD/ha)

Average price costs	Group 1 (<1 ha)	Group 2 (1-5 ha)	Group 3 (>5 ha)
Cost price including family labor	10.74	11.74	8.95
- Highest cost price	12.27	12.74	9.13
- Lowest cost price	9.74	10.11	8.77
- Standard deviation	0.96	0.98	0.15
- Coefficient of variation	9%	8%	2%
Cost price excluding family labor	8.45	9.29	8.95
- Highest cost price	10.01	10.67	9.13
- Lowest cost price	7.78	7.53	8.77
- Standard deviation	0.91	1.12	0.15
- Coefficient of variation	11%	12%	2%

Source: Author's calculation based on survey data

The average profitability coefficient of grape production, the Smederevka variety, is 1.12. The higher purchase price of grapes from larger producers is most often a consequence of a more standardized offer in terms of quality and quantity of grapes. The difference in prices is also reflected in the income from the sale of grapes, which generally increases per unit of area and ranges from 213,400 MKD/ha to 234,250 MKD/ha.

Within the framework of the Macedonian Agrarian Policy, various instruments and measures are envisaged to assist agricultural producers (www.ipardpa.gov.mk). The most important measures for grape producers are direct payments, per area and per quantity delivered for purchase in domestic wineries (www.mzsv.gov.mk). For example, according to the support criteria in 2019, subsidies for planting areas up to 5 hectares amounted to 48,000 MKD/ha, or 100% of the total amount; for areas from 5.1 to 30 hectares, payments amounted to 60% of the total amount; for areas from 30.1 to 50 hectares, they amounted to 30% of the total amount; and for areas over 50 hectares, 20% of the total amount. For beneficiaries of the subsidy measure based on delivered grapes in 2019, payments amounted to 2 MKD per kilogram of grapes for winegrowers who had areas under the following varieties: Vranec, Smederevka, Kadarka, Žilavka, Kratošija, Stanušina, and Crn Burgundec. The condition for receiving these payments is that winegrowers deliver grapes to domestic wineries. The main recommendation of the research points to the advantages and economic effects that arise from economies of scale, where larger farms achieve better operational results.

CONCLUSION

The research aimed to determine the success of grape production in the Republic of North Macedonia using the Smederevka variety as an example. The research results show that with an increase in the size of the area, the main indicators of business success show an upward trend. In group 3 (holdings with areas under vineyards over 5 ha) the best results are achieved, i.e. these holdings show the highest economy and profitability. In smaller holdings in group 1 (holdings with areas under vineyards of 1 ha each) and in group 2 (holdings with areas under vineyards between 1 and 5 ha), business success largely depends on the valuation of family labor. The lowest cost price is in group 3 (about 9 MKD/ha). If family labor is not included in the costs, the cost price of smaller producers is comparable to the cost price of larger producers. It can be concluded here that when calculating the cost price of family wine farms, it is of great importance to take into account the opportunity cost of family labor when compared to larger producers, which use exclusively paid labor. The lowest profitability thresholds, i.e. the minimum required quantity of grapes to cover costs, are found in larger producers.

Positive indicators of success are found in all groups of producers, with income from subsidies playing a more significant role in smaller groups of producers, and larger producers having higher values of key economic indicators. The produced quantity, reduced to a hectare, is the highest in group 3 (and in group 1 in the case of Smederevka). The purchase price increases noticeably for farms with a larger area under vineyards - for both varieties, the highest average selling price occurs with producers from group 3, and the lowest average selling price is with producers from group 1.

Subsidies, due to the modular approach, are higher per unit of area for smaller producers, but are more significant overall for larger producers. One way to overcome the problem of small structure, especially present in smaller family farms, is to unite them into agricultural cooperatives or other forms of producer organization. In this way, on the one hand, the possibility of reducing costs would open up (for example, joint procurement of inputs at more favorable prices), and on the other hand, producers would enter the market with larger quantities and more uniform quality. Small producers could focus on adding value and producing their own products. Of course, other challenges facing producers should also be taken into account, such as climate change, the orientation of policies more towards sustainable development, socio-economic changes, changes in the agricultural and food market, etc.

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