

The logo for AgroSym 2022 is an oval with a dark red background and a gold border. The text "AgroSym" is in a gold serif font, with a stalk of wheat behind the 'y'. Below it, "2022" is in a smaller gold sans-serif font.

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A large, curved photograph of a sunflower field under a blue sky with light clouds. The sunflowers are in various stages of bloom, with bright yellow petals and dark brown centers. The leaves are green and large.

BOOK OF PROCEEDINGS

*XIII International Scientific Agriculture Symposium
"AGROSYM 2022"
October 6-9, 2022*

The logo for AgroSym 2022 features a green leaf icon above the text "AGRO 2022" in a bold, sans-serif font. Below "AGRO 2022" is the word "sym" in a blue, lowercase, sans-serif font.

AGRO 2022
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BOOK OF PROCEEDINGS

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Jahorina, October 06 - 09, 2022

INFLUENCE OF THE ECONOMIC CRISIS TO THE PRODUCTION PRICE OF WINE GRAPES IN THE REPUBLIC OF NORTH MACEDONIA

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Abstract

The grape production together with the wine industry contributes about 20% of the total agricultural GDP in the Republic of North Macedonia and occupation of around 30,000 rural households. Due to the Covid-19 pandemic crisis and the instability of the world situation, the prices of raw materials in agricultural production are constantly increasing. Hence, the main goal of this paper is to assess the impact of the global economic crisis on the production price of wine grape varieties. The main approach of the comparative analysis for the production prices between the reference years 2020 & 2021 and estimated 2022 is based on established normative calculations of grapes within the Institute of Agriculture. The total costs are calculated based on variable and fixed costs of grape production. The investment and inputs costs are collected by commercial companies, suppliers of raw materials and farmers. The findings demonstrate that the average production price of grapes at total costs for 2020 & 2021 accounts in average 0.30 EUR/kg. The results from the estimations of the production price of grapes for 2022 show increase by 20%, which implies that the economic crisis has a large impact on the viticulture and wine industry. It is anticipated that the socio-economic situation of grape producers will be negatively affected. Therefore, the public policies for development of this important sector for the Macedonian agriculture should correspond to the new situation.

Keywords: *socioeconomic situation, world crisis, wine grapes, production price.*

Introduction

The alarmingly high incidence of acute food insecurity and malnutrition starkly exposes the fragility of global and local food systems. Under mounting strain from the increased frequency and severity of weather extremes, the COVID-19 pandemic, increasing conflict and insecurity and rising global food prices. The interconnectedness of drivers is further laid bare by the unfolding war in Ukraine, which not only compromises the food security of those directly affected by the war, but compounds existing challenges faced by millions of acutely food-insecure people worldwide. Some countries facing food crises are particularly vulnerable to the risks to food markets created by the war in the Black Sea area, notably due to their high dependency on imports of food, fuel and agricultural inputs and/or vulnerability to global food price shocks (GFP, 2022). The impact of the COVID-19 pandemic and the related policy measures to curb the pandemic can be assessed from various perspectives. The socio-economic effects might be the most relevant concerning the development of the agricultural sector and the livelihoods of rural households. Among these effects, income from economic activities, other income streams, functioning input and output markets, food and nutrition security, or personal health might be considered. Furthermore, there will be direct effects for the agricultural

producers and rural households and also various indirect effects. (Djanibekov and Herzfeld, 2022).

The war in Ukraine has dealt a major shock to commodity markets, altering global patterns of trade, production, and consumption in ways that will keep prices at historically high levels through the end of 2024, according to the World Bank’s latest Commodity Markets Outlook report (WB, 2022). The World Bank’s Agricultural Price Index gained 11 percent in 2022Q1 (q/q), reaching an all-time nominal high (WB, 2022).

The coronavirus pandemic and military unrest in this period has affected all sectors of the country’s economy and in the social and political sphere. Viticulture and winemaking, as strategic sectors in the Macedonian agriculture and national economy, contributing 17 – 20 % of the agricultural GDP, are not spared from these market disruptions. Vineyards has a share of about 4.6% in the total cultivated land, accounting 23,776 ha in 2021. In the last decade there has been a slight increase in the vineyards area, with a rise of 14% in 2021 compared to the area in 2012 (SSO, 2022). The production of grapes, for the same period, in average amounts to 270,700 tons. In parallel with the increase of the vineyard’s areas, grape production also had a slight upward trend with a 12% increase, hence from 240,461 tons in 2012 to 269,131 tons in 2021. The average grape yields are around 10 tons/ha. Viticulture is most prevalent in the Vardar and Southeast regions of Macedonia (SSO, 2022). Grape growing includes about 30,000 economic entities, out of which about 70% are individual holdings and 30% are agricultural companies. The share of wine grape varieties in the total vineyards area is 70%, out of which 40% are white and 60% are colored varieties. The most frequent wine varieties are Vranec and Kratoshija, which have a longer tradition of growing, and the most frequent white varieties, are: Smedervka, Zhilavka, Chardonnay, Riesling, Sauvignon Blanc etc (MAFWE, 2021). The focus of this study is the production price of the Vranec wine variety, which is represented by 50% of the total vineyards with colored grape varieties, posing base for most of the red wines produced in Macedonia.

Materials and methods

Cost of production (CoP) as an economic indicator represents the average cost of production per one unit of a grape (kg product) and is the minimum selling price of the grape (break-even price) as a break-even point in order to work without losses. The break-even price is the price needed to cover all costs of grape production. The cost of grape production is calculated based on standard definitions and methodology used in different relevant literature (for example, see Ciaian et al., 2013; Kay et al., 2014; FAO, 2016), also customarily applied in the local context (Milanov and Martinovska, 2002; Martinovska *et al.*, 2009).

$$\text{CoP} = \text{TC} / \text{Y}$$

CoP - Cost of production (in EUR/kg)⁵; TC - Total cost (in EUR); Y - Yield (quantity of produced grape in kg)

The basis for calculation of CoP are the total costs of production calculated based on the used inputs and resources for producing the grape in typical (normative/normal) production year and market values of the inputs and resources based on their real yearly market value in 2020/2021

⁵ All values are presented in EUR. The average exchange rate for 2020/2021 is calculated as average yearly exchange rates in 2020 and 2021 (61.651 MKD/EUR) and average daily exchange rates in 2022 from 1st of January to 15 of June 2022 (61.677 MKD/EUR).

and 2022.⁶ The yields are normatively fixed on average yearly expected yields of 15,000 kg grape per hectare. The total costs are calculated based on variable and fixed costs of grape production. The variable yearly costs are calculated based on the direct costs used for materials (fertilizer, pesticides) and resources consumed, irrigation and machinery costs for soil cultivation including the labor for vineyard maintains.

$$TC = VC + FC$$

VC - Variable cost (in EUR); FC - Fixed cost (in EUR)

Additionally, the analysis took in consideration the value of fixed costs of production, calculating the costs of depreciation of the assets used for grape production. The fixed costs are calculated based on the value of establishment (cost of investment) the vineyard plantation and value of typical assets (machinery and equipment) used for producing grape on 1 (one) hectare in 2020/2021 and 2022.

$$D = VA \times DR$$

D – Annual depreciation (in EUR); VA – Value of the asset (in EUR); DR – Depreciation rate (in %, DR = 1 ÷ Years of assets utilization)

Results and discussion

It is evident that the world economic crisis as a result of the combined impact of Covid-19 pandemic and Ukraine war crises has huge impact on increased investment cost for vineyard plantation establishment.

Table 7. Investment in 1 ha vineyard establishment 2020/2021 and 2022 (in EUR)

	Unit measure	Quantity	Price		Total		Change (%)	
			2020/21	2022	2020/21	2022		
1	Planting material	seedlings	4,000	0.65	0.81	2,595	3,243	25%
2	Deep ploughing	ha	1	583.93	642.05	584	642	10%
3	Soil cultivation before planting	ha	1	486.61	535.04	487	535	10%
4	Pillars	number	800	1.95	4.86	1,557	3,891	150%
5	Setting pillars	number	800	0.24	0.24	195	195	0%
6	Wire	kg	400	0.97	1.62	389	649	67%
7	Setting wire	kg	400	0.08	0.08	32	32	0%
8	Drip by drip irrigation system	total	1	811.02	1,134.94	811	1,135	40%
9	Planting	days	25	19.46	19.46	487	486	0%
10	Basic fertilization	bags	10	21.09	24.32	211	243	15%
11	Ploughing	number	4	81.10	97.28	324	389	20%
12	Plant protection	number	5	97.32	113.49	487	567	17%
13	Irrigation	total	1	291.97	291.84	292	292	0%
14	Cultivation/digging	number	4	194.64	194.56	779	778	0%
	Total costs 1 year					9,229	13,078	42%
1	Ploughing	number	4	81.10	97.28	324	389	20%
2	Plant protection	number	6	97.32	113.49	584	681	17%
3	Irrigation	ha	1	291.97	291.84	292	292	0%
4	Cultivation/digging	number	4	194.64	194.56	779	778	0%
5	Plantation forming (pruning, etc.)	days	25	19.46	19.46	487	486	0%
	Total costs 2 year					2,465	2,627	7%
1	Soil cultivation	number	4	81.10	97.28	324	389	20%

⁶ Difference of market prices in 2020 and 2021 is minor. Modest increase in the value of the fertilizers can be noticed, which does not have huge impact on costs of production and unit price.

2	Plant protection	number	6	97.32	113.49	584	681	17%
3	Fertilization	bags	10	21.09	24.32	211	243	15%
4	Protection/Fertilizer application	number	2	97.32	113.49	195	227	17%
5	Irrigation	ha	1	291.97	291.84	292	292	0%
6	Tying and tangle green shoots	days	10	19.46	19.46	195	195	0%
7	Material for tying	total	1	113.54	113.49	114	113	0%
8	Winter pruning	days	6	19.46	19.46	117	117	0%
9	Pruning and tying green shoots	days	15	19.46	19.46	292	292	0%
10	Removing green shoots	days	2	19.46	19.46	39	39	0%
11	Harvest	days	20	19.46	19.46	389	389	0%
12	Transport	kg	7,500	0.02	0.02	122	182	50%
13	Other variable costs	total	4	19.46	19.46	78	78	0%
Total costs 3 year						2,873	3,159	10%

Table 8. Value of 1 ha vineyard plantation establishment 2020/2021 and 2022 (in EUR)

Total investment costs (Σ investment costs 1, 2 and 3 year) in EUR	14,568	18,864	29%
Income (yield 3 year, average 7.500 kg/ha) in EUR	2,366	2,638	12%
Total vineyard establishment value (Total investment costs) in EUR	12,202	16,225	33%

The value of establishment of 1 ha vineyard has increased by 33% in 2022, amounting at 16,225 EUR per hectare comparing to the 12,202 EUR in the period 2020/2021.

Main increase of investment costs of 42% can be noticed in the first year of vineyard establishment, amounting at 13,078 EUR/ha in 2022, compared with only 9,229 EUR/ha in 2020/2021. The main impact on investment costs raise is the price increase of the pillars (150%) and wire (67%). Additionally, the rise of the price of drip-by-drip system (40%), seedlings (25%), protection materials (17%), fertilizers (15%) and fuel affecting the cost of land cultivation significantly contribute towards the increase of investment costs. In the second year of establishment the investment cost is expected to increase for 7% (from 2,465 EUR calculated based on the prices in 2020/2021 to 2,627 EUR based on prices in 2022) and 10% in the third year (from 2,873 EUR to 3,159 EUR), calculated based on the hypothesis that the present prices in 2022 will have the same range in next years.

Table 9. Average (normal year) annual cost of grape production 2020/2021 and 2022 (in EUR)

	Unit measure	Quantity	Price		Total		Change (%)	
			2020/21	2022	2020/21	2022		
1	Ploughing	number	4	81.10	97.28	324	389	20%
2	Plant protection	number	6	97.32	113.49	584	681	17%
3	Fertilization	bags	10	21.09	24.32	211	243	15%
4	Protection/Fertilizer application	number	2	81.10	97.28	162	195	20%
5	Irrigation	ha	1	291.97	291.84	292	292	0%
6	Tying and tangle green shoots	days	10	19.46	19.46	195	195	0%
7	Material for tying	total	1	113.54	113.49	114	113	0%
8	Winter pruning	days	6	19.46	19.46	117	117	0%
9	Pruning and tying green shoots	days	15	19.46	19.46	292	292	0%
10	Removing green shoots	days	2	19.46	19.46	39	39	0%
11	Harvest	days	20	19.46	19.46	389	389	0%
12	Transport	kg	15,000	0.02	0.02	243	365	50%
13	Other variable costs	total	4	19.46	19.46	78	78	0%
Total variable costs						2,962	3,309	12%
Yearly depreciation (fixed costs)						1,534	2,088	36%
Total costs in normal year						4,496	5,398	20%
Grape yields		kg	15,000					

CoP (at variable costs)	EUR/kg				0.20	0.22	12%
CoP (at fixed costs)	EUR/kg				0.10	0.14	36%
CoP (at total costs)	EUR/kg				0.30	0.36	20%

The increase vineyard plantation establishment investment and value of vineyard means additional 4,023 EUR fixed costs as a basis for annual depreciation of the vineyard value as an asset which causes annual rise of this costs of 33% or additional 268 EUR comparing annual costs of 819 EUR in 2022/2021 and 1,087 EUR in 2022. In addition, the prices of the basic assets used for grape production (tractor, atomizer, milling machine, trailers, pumps and filters, other small equipment) has increased in average 40%, which results with increasing of the total annual depreciation and fixed costs for 36% or additional 554 EUR per hectare (1,534 rise to 2,088 EUR).

Beside the increase of fixed costs, the annual variable costs of production have increased for 12% in 2022 with increase of additional 347 EUR per hectare (from 2,296 in 2020/2021 to 3,309 EUR in 2022), primarily as result of the increase of fuel price which results with increase of transport costs (50%), ploughing (20%) and protection and fertilization application (20%), but also as result of increased prices of protection materials (17%) and fertilizes (15%). This increases the grape production price calculated based only on variable costs from 0,20 EUR/kg in 2020/2021 to 0.22 EUR/kg in 2022 or additional 0.02 EUR per kilogram grape. At this stage, there is still no evidence of increasing the labor costs. As a result of the economic crisis inflation and impact on increased prices, the total costs of grape production have increased for 20% in 2022 with increase of additional 901 EUR per hectare (from 4,496 EUR in 2020/2021 to 5,398 EUR in 2022). This increases the full grape production price calculated based on total costs from 0.30 EUR/kg in 2020/2021 to 0.36 EUR/kg in 2022 or additional 0.06 EUR per kilogram grape.

The Government has subsidies for the wine grape production in 2020 with 0.03 EUR/kg for the grape sold to the wineries. In 2021, these subsidies increased to 0.05 EUR/kg. Additionally, there are subsidies for producing grape paid per hectare ranging from 649 up to 778 EUR/ha or in average 0.04 and 0.05 EUR/kg calculated based on average 15,000 kg yield. In total, the subsidies paid by the Government can be estimated in average to be maximum 0.10 EUR per kilogram of grape, which added to the average buyout price of wine grape of 0.21 EUR/kg increase the average grape price up to 0.31 EUR/kg. It can be noticed that this was sufficient to cover full production costs of grape in 2020/2021 of 0.30 EUR/kg, but it is insufficient to cover the increased production costs and full production price of grape in 2022 of 0.36 EUR/kg. The Government did not plan any additional supporting measures and subsidies for the grape in the new programme for Intervention fund and Programme for agriculture in 2022, which are primary planned for the subsidizing for fertilizers used in production of wheat, barley, sunflower, maize and livestock production (lamb, pigs and laying hens).

Conclusion

It is evident that the world economic crisis and inflation as a result of the combined impact of Covid-19 pandemic and Ukraine war crises has a huge impact on increasing the grape cost of production in North Macedonia. Having in mind that the average buyout price of the wine grape is only 0.21 EUR/kg, which is significantly below the calculated full grape production price of 0.30 EUR/kg before the crises, it is expected that the grape producers will face even higher negative impact with the new calculated and expected production price in 2022 of 0.36 EUR/kg. We can anticipate that some increase in grape buyout price will occur in 2022 as a result of the

global trend of inflation. Nevertheless, if the trend of grape buyout prices stays the same as before the economic crisis, the average buyout price of the wine grape of 0.21 EUR/kg will not be sufficient to cover even the variable cost of grape production. This will have a huge negative impact on the wine grape producer's households, but at the same time it'll also have a negative impact on the wine industry in North Macedonia. Although the wine and wine grape are not the most crucial products in the period of world economic and food crisis and can be perceived as luxury, still having in mind that this sector contributes with about 20% of the total agricultural GDP and more or less enables income and contributes to existence of around 30,000 rural entities in the Republic of North Macedonia, it is highly recommended that the Ministry of Agriculture, Forestry and Water Economy (MAFWE) and the Government should take in consideration the negative impact of the world economic crisis, analyze, review and plan future strategic sector development steps and take in consideration additional measures of support the wine and wine grape supply chain.

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