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WINE WASTE MANAGEMENT: MODEL OF SOCIAL ENTERPRISE IN THE WINE REGION OF NIŠAVA-SOUTH MORAVA

Abstract: According to the European Commission, circular economy not only means a more efficient use of resources, but also a wide range of possibilities for the development of entrepreneurship that would create 3 million jobs by 2030. The European Commission has adopted a new economy package in 2014 (up to 6 Billion EUR) to support businesses in their transition to a circular economy. The use of agro waste for value-added products, on the one hand brings an increase in gross domestic product, but on the other contributes to the protection of the environment. The winemaking leads to the generation of large quantities of grape waste (around 5-9 million tons per year, worldwide), which considerably increase the chemical and biochemical oxygen demand due to a high pollution load with detrimental effects on the flora and fauna. The practice of developed countries shows that wine waste could be used to obtain a large number of new products that may have the added usage and market value. In this paper explain how the wine processing waste can be a source of ideas for the creation of small social enterprise with 5 employees from rural areas of South Serbia. For testing the cost-effectiveness of this business model were taken wineries (14 total) from Nišava-South Morava wine region, which produce up to 600 000 liters of wine per year. According to FAO (2008) in the process of wine production, 20% of the waste is generated. This waste, usually is wine pomace consists of skins, stems and seeds. In the special technological process of cold pressing the seeds produced biological oil, which can have a specific application in the food and pharmaceutical industries. The market price of this oil, depending on the purity, quality and the manufacturer ranges from 6 to 40 EUR/100 mL. As for example in Croatia is 12 EUR/100 mL.

Keywords: Social enterprise, circular economy, management wine waste, value added products, Nišava-South Morava wine region

1. INTRODUCTION

Circular economy (CE) is a new economic model that aims to restore economic growth while preserving the environment. This economic model comes to strengthening the continuous flow of technical and biological materials in the value added products and materials and reduce waste to a minimum. CE model affords a viable business opportunity to successfully tackle environmental priorities, drive performance, innovation and competitiveness, and stimulate economic growth and development (Gerholdt, 2016).

The concept of CE is gaining in importance among policy makers in developed countries. In China since 2004, the CE is part of the national political strategy (Qi et al., 2016). Implementation a CE requires a change in all system level, involving all actors within the value chains (suppliers, manufacturers, retailers, consumers) of diverse economic sectors. At a firm level are needed new business models which offer new market opportunities. The most commonly

used Business Model Canvas (BMC) by Osterwalder and Pigneur (2010) as practical tool. Lewandowski (2016) has adapted and extended the BMC to the circular economy principles.

Many companies across the globe have already adopted circular principles to close the loop on energy and material through efforts such as renewable energy investments and recycling. A database launched by the CE Club reveals that about 62 percent of the 3,000 CE initiatives highlighted were based in European Union (EU). Research from Accenture identifies five distinct circular business models, each of which offers its own benefits for businesses, suppliers and end users of products and services (Accenture strategy, 2014).

Translation technology with environmental protection and the achievement of economic goals represents a transition to a circular economy in all sectors of the economy. The agricultural sector when using renewable sources then could be fundamental importance to an economy based on sustainable use of resources and circularity (Banzato, 2018). But a CE not just implies a more efficient use of resources, also a wide range of opportunities for entrepreneurship. European Commission has allocated EUR 6 Billion to support the Action Plan for a CE. This way, the EU expects 3 million jobs by 2030 (Accenture strategy, 2014).

Serbia, as a candidate for joining the EU has adopted a large number of development documents, including the National Strategy for Sustainable Development of the Republic of Serbia, which was adopted in 2008. One of the instruments to achieve the objectives set forth in this strategy is the development of circular economy (Official Gazette of the Republic of Serbia, No. 55/05 and 101/07). As the circular economy is a new way of linking economy with waste management, 7.09.2018. the Chamber of Commerce of Serbia (PKS), in cooperation with the center Cirekon, EIT Climate-KIC and UNDP launched the Academy of circular economy aimed at increasing the efficiency of the sector of small and medium-sized enterprises (MSPs) (Center of circular economy, Serbian Chamber of Commerce).

Given the fact that the processing wastes wine for Serbia represented the innovation, and that entrepreneurs and small and medium enterprises are very flexible and willing to innovate can be expected that the existing or potential entrepreneurs to accept the idea of processing waste wine (Jakopin, 2018). Acs and Varga (2005) examined the role of entrepreneurship in the application of innovative knowledge to 9 in developed European countries and found that SMEs sector positively affect the application of new technologies. Number of SMEs and entrepreneurs play a significant role in all economies, particularly in transitional developing countries such as Serbia (Moreno et al., 2007; Ivanović-Djukić et al., 2018). Their importance can be concluded based on the analysis of statistical data on the participation of this sector in the total number of enterprises, number of employees and turnover.

SME sector is an important segment of the economy of Serbia, which has a positive move. In the period 2008-2017, the number of SMEs increased by 17.7%; the number of entrepreneurs increased by 19.8%, for micro by 15.2% and for small enterprises by 1.6%, while the number of medium enterprises decreased by 11.3% (Serbian Ministry of Economy). Based on recent statistics from 2017 in the structure of the SME sector is dominated by micro enterprises (344,279.0) with a share of 99.4%, while according to the form of the organization of the most numerous were entrepreneurs (257,267.0) with a share of 72.0% of this sector.

The winemaking leads to the generation of large quantities of grape waste (around 5-9 million tons per year, worldwide), which considerably increase the chemical oxygen demand (COD) and the biochemical oxygen demand (BOD) due to a high pollution load with detrimental effects on the flora and fauna of discharged zones (Oreopoulou et al., 2007).

The waste generation of the winery industry was estimated for a wine production of 159.3 Miohl in, approximately 1138×10^3 tons/year of grape stalk, 3186×10^3 tons/year of grape marc, 1365×10^3 tons/year of wine lees and 95×10^6 m³ of winery wastewater (OIV). Wine pomace is major waste generated in the winemaking process and the utilization of its components, such as skins (51%), stems (2%) and seeds (47%), have an important environmental impact in waste reduction and permit the production of value-added food products (Andjelkovic et al., 2015; Arvanitoyannis et al., 2006).

Processing wine waste into new products would comply with the decision of the European Commission, adopted in late 2015 that encourage investment through the transition of the economy in the direction of implementation of the circular economy, to ensure sustainable economic growth. In this way, in addition to waste reduction, leads to the profit - of up to 90% in energy and water, 40-70% of savings in materials, 30-60% savings on the needs of the waste treatment or pollution, and increase the profit of the total up to 26% (Table 1):

Table 1. Processing and application of products from grape waste

Grape by-products	Treatment processing	Application of new products
Grape waste	Composting	Fertilizers for corn
Grape waste	Extraction	Nutrients and pharmaceuticals
Grape waste	Gasification	Gas
Skin of grape	Composting	Fertilizers
Wine pomace	Extraction	Antioxidants -Pharmaceuticals
Grape seeds	Extraction	Antioxidants -Pharmaceuticals
Stems and wine residue	Extraction	Antioxidants -Pharmaceuticals
Skin, seeds and stem grape and wine pomace	Physical-chemical treatment	Animal feed

Grape seeds	Fermentation	Antioxidants - Pharmaceuticals
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Source: Arvanitoyannis et al., 2006

Analysing alternative products for which there is demand in the market and the enormous untapped material in wine industry can reach a large number of new ideas for a new business that can lead to profit entrepreneur and lead to economic development. By observation of the global trends may be observed that there is strong demand for consumers for use functional foods, such as such as antioxidants and bio-oils, which can be prepared from the wine waste. Also, pharmaceutically trends suggest the use of natural bioactive supplements as well as prevention of health and good anti-aging cosmetic products (Iora et al., 2015). The practice of developed countries shows that wine waste could be used to obtain a large number of new products that may have the added usage and market value. At the same time, such operations would lead to solving environmental problems related to waste management and the development of circular economy in Serbia. Disposal of waste wine producers is economic problem that affects wine production. The use wine waste as an animal feed has been shown that some animals were non-tolerant to some of its components, which inhibit certain enzymes digestion.

According to available data, the production of oil from the seeds of grapes in Italy, France and Spain in the total amount of over 42,000 tons per year. Its price on the world market depends on the quality of the oil, which is closely linked to the process of production. Market analysis has found that unrefined quality oil from the seeds has significant economic value. Virgin grape seed oil for human consumption, specializing cosmetic ingredients or antioxidant supplements has different price on the market depending on its purity and purpose. For example, "Virgin cold pressed Chardonnay grape seed oil" and "Virgin cold pressed Merlot grape seed oil" for consumption, made at Kieu Hoang Winery of Napa Valley (California, USA) at a price of 12 \$/200 mL or 10.68 EUR/200 mL; 100% "Virgin French grape seed oil" made in Florihana (Provence, France) at a price 6,12 EUR/50 mL; "Mayam grape seed oil" made in Oradea (Romania, as cosmetic ingredient at a price 40, 26 EUR/100 mL, in Croatia is 12 EUR or "Amazon" is selling it as a body-oil at price 8 EUR.

Serbia is one of the major producers and consumers of grapes and wine in the Western Balkans. According to data from the "Wine Atlas" issued by the Republic Institute for Statistics of the Republic of Serbia, in 2015 there were 369 registered wineries that have employed 3415 (Republic Institute for Statistics of Serbia). Average annual wine production in Serbia amounts to over 2 million liters of wine and over thousands of tons of wine waste (20- 25% of the used grapes), which remains unused even though they have great practical value.

In this paper as a model for the creation of a small social company has taken wineries (14 totals) of the Nišava-South Morava wine region. The paper will be explained how the wine processing waste can be a source of ideas for the creation of a small social enterprises with at least 5 employees for rural areas.

Also, it might be an idea to potential entrepreneurs to establish a company that will deal only with the collection and processing of wine waste. This small companies such as oil mills can be intended for the production of: oils that are missing in the range of large manufacturers, of special oils according to claim macrobiotic as a specific group of consumers, and oil cakes arising from the rest of during extraction of seeds for use in the bakery industry as a vitamin supplement or in animal nutrition, and so on.

2. POTENTIAL SOCIAL ENTERPRISE FOR PROCESSING WINE WASTE OF NIŠAVA-SOUTH MORAVA WINE REGION

The establishment of mini oil mill that would use as a raw material, in addition to part of the wine pomace starts by providing the technological plan, the initial capital and related equipment. Mini oil mill with a smaller capacity require simple technology and equipment. To assess how much start-up capital was required, first should be an analysis of the production process, and require the necessary material resources for each of its phases.

The process of obtaining oil from the by-products of wine takes place in three main phases containing more continuous steps (Radovanovic et al., 2011). In the first phase: of reception and the preparation of raw materials (wine waste), which must be stored at -20⁰C; the isolation of grape seeds from other parts of the wine pomace (skins and stems), which can be separately processed into other value added products (such as extracts of antioxidants, pharmaceuticals); grinding due to increase oil yield and the required drying at temperatures lower than 50 ⁰C in order to present humidity less than 8 to 10% (Trainer, 2006). In the second stage, there is a process of bio-oil production, the clarification of the crude oils and especially separation of the secondary product in the form of flour or oil cake. In the final stage: to the chemical control of the quality of the obtained product in order to meet European standards and packaging, bio- oil, in bottles of 100 mL, and oil cakes in the carton box of 1 kg. At the end of the process products are mostly stored, if necessary, or go directly to the market.

Regulation of the European Union and *Codex Alimentarius* regulations require that manufacturers need raw materials and unrefined oil, throughout the production process must be at a temperature below 50° C. If during pressing, an increase in temperature, there is a reduction in the quality of oil. Vegetable oils in higher temperature oxidise and change the chemical composition and reduce its nutritional value and the biological properties (Radovanović i sar., 2011).

Regulations of HACCP system require that the bio-oil in relation to the basic substance - the raw material, it is necessary to be 98% purity, free of dirt and metals. So the oil obtained can be sold as unrefined vegetable oils in domestic and foreign markets. For the establishment of mini oil mill required at least 50 m² space and storage of raw materials and finished products at least 100 m². It is assumed that the space for oil production exists and has its infrastructure (roads, electricity, water, sewer, telephone, internet, etc.). This may be the case when wine producers perform the processing of their waste. Equipment used to perform activities must be made of stainless steel that does not come to the adverse impact on the quality of oil under the influence of oxidation. Mini oil mill for small producers usually has a capacity of 10 kg to 40 kg of raw material/ hour. Calculations were made for the mini oil mill with a capacity of 20 kg raw material/hour, which would employ 5 people for rural areas from Nišava-South Morava wine region.

In wine region of Nišava-South Morava region operate 14 small wineries: Wine cellar Vasić (40 000 L wine/year), Winery Krstić (200 000 L wine/year), Winery Aleksić (150 000 L wine/year), Wine cellar "Old day" (10 000 L wine/year), Wine cellar Dušan Cakić (10 000 L wine/year), Lindjer (35 000 L wine/year), Wine cellar Milorad Petrović (30 000 L wine/year), Wine cellar Novica Garčić (20 000 L wine/year), Wine cellar Petar Petrović (30 000 L wine/year), Wine cellar Radovan Nikolić (10 000 L wine/year), Wine cellar Sretko Vidosavljević (20 000 L wine/year), Wine cellar Zoran Cvetković (15 000 L wine/year), Winery Zdravković (10 000 L wine/year) and Vinica Grković (20 000 L wine/year). These wineries during winemaking produced 600 000 L wine and 158 400 kg (20%) wine pomace, while contain to 47% grape seeds, i.e. from 74 448 kg. After processing from this grape seeds can be expected production of 8 934 kg (12 %) or of a bio oil with a density of 0.92 g (Kurki et al., 2008).

Economic analysis in this study was conducted based on profitability, sensitivity, outcome and cost-effectiveness of processing grape seeds isolated from wine waste. Potential profitability is determined by comparing the total incomes and total costs, in terms of the volume of production. To calculate the total (approximate) costs are calculated first, partial (approximate) cost-based grouping, and this: the basic material - wine waste, equipment, and adaptation space, transport costs to the place of processing and to the point of sale, storage costs, depreciation of tools and other unpredictable costs. To start this business, the entrepreneur needs financial resources in which to look into possible investments. In order to begin this business, social entrepreneur must have some financial resources for the intended process activities (Table 2):

Table 2. Funds required starting a business

Investment	Value (EUR)
Equipment	28 550
Depreciation	3000
Spare parts	0
Wine waste	0
Inventory	2 000
Other assets (patent, software etc)	0
Total	33 550

Source: authors

If vegetable oils obtained from seeds of grapes is packed in the bottle only by 100 mL to obtain from 89 340 bottles. Based on the market price of grape oil, depends on the quality, manufacturers and purposes ranging from 6 to 40 EUR/100 mL. As our product has application as the diet of a specific customer group and a cosmetic ingredient, we took the minimum price at 3 EUR/100 mL. The expected total annual income is 268 020 EUR.

In order to come to the financial indicators of profitability of this mini oil mill, you first need to create a spending plan. The material costs are taken into account: the supply of a main raw material - wine pomace (if the entrepreneur does not have its winery), the purchase costs of support materials (bottles, labels, caps, etc.), the cost of energy (electricity and water), the chemical control of the product quality, security, fire protection, HASSP system, and marketing. Also, in the total expense inputs were depreciation costs of equipment, the transport of raw material and the finished products divided by 200 km, as well as gross pay for 5 employees (Table 3):

Table 3. The annual budget of operating costs of social oil mill (EUR)

Name of cost	Unit of measure	Unit price	Annual quantity	Total annual costs
Raw material cost (wine waste)	kg	0	0	0
Second material cost	piece	0.2	100 000	20 000
Energy costs				5 000
Other costs				3 000
Depreciation				3 000
Gross salary per person (x5)	month	700	12	42 000
Transport cost				10 000
Total costs				83 000

On the basis of cost- benefit analysis can be obtained cost-effectiveness and profitability of recycling one part of wine waste in a highly value added product.

Table 4. Cost-benefit analysis of the mini enterprise

Indicator of profitability	Value (EUR)
Total income	185 020
Net profit	166 518
Cost-effectivities coefficient	3.22
Recovery time investment	0.20

Source: authors

This study shows that processing a part of wine waste – grape seeds in vegetable oils, in addition to protecting the environment is a profitability business. Profitability indicators, particularly economy coefficient creating mini enterprise - oil mill with 5 employed is 3.22 with a small time period of investment (0.20 year).

High quality virgin grape seed oil from a part of wine waste may find application in the diet of a specific customer group and anti-aging cosmetic ingredients. In this way, in addition to environmental protection, recycling wine waste into value-added products becomes profitable and economically feasible.

3. CONCLUSION

The tendency of the agricultural processing waste is in line with the decisions of the EU through investments that encourage the transition of the economy in the direction of applying the circular economy and environmental protection. Recycling of by-products generated in the process of wine production, on the one hand reduces manufacturing costs of wine and increases in gross domestic product, but on the other contributes to environmental protection. According the interest of consumers for the use of functional foods, antioxidant supplements and natural cosmetic preparations, we conducted a techno-economic study utilization of part of the wine pomace - grape seeds for obtaining bio oil with a special potential application. We studied shown that the formation of a mini social oil mill with 5 employed from rural areas of South Serbia, which according to the principles of the circular economy, waste wine used as basic raw material for the creation of value-added product. Our techno-economic analysis has shown that it is possible to create social oil mill, which works under the principles of the circular economy, and the benefits of wine waste for obtain highly valuable product. It can be concluded that in Serbia the development of circular economy requires additional investment in the direction of strengthening the agricultural and processing SMEs sector in rural areas.

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REFERENCES

- Accenture strategy, Circular Advantage (2014), from <https://www.accenture.com/t>
- Andelković, M, Radovanović, B., Milenković Andelković, A., Radovanović, V, Zarubica, A., Stojković, N.& Nikolić, V. (2015). The determination of bioactive ingredients of grape pomace (Vranac variety) for potential use in food and pharmaceutical industries. *Advanced Technologies*, 4(2), 32-36.
- Arvanitoyannis, I., Ladas, D. & Mavromatis, A. (2006). Potential uses and applications of treated wine waste: a review. *International Journal of Food Science and Technology* (41), 475-487.
- Chamber of Commerce of Serbia, Center of circular economy, from www.pks.rs
- Codex Alimentarius Commission Codex standard for named vegetable oils. Codex stan 210-(1999).
- Development Agency of Serbia (2012). <http://www.jrm.rs/index.php/>
- Enterprises in the Republic of Serbia (2017)., from <http://www.stat.gov.rs/publication/>
- Gerhold, J. (2016). Chamber of Commerce Foundation, Washington, U.S., <https://www.recyclingtoday.com/article/the-circular-economy-a-framework-for-doing-business-in-the-21st-century/>
- Food and Agriculture Organization of the United Nations- FAO (2016). Agribusiness handbook., <http://www.fao.org/3/a-i7>
- lora, S., Maciel, G.M., Zielinski, A., da Silva, M. Pontes, P. & Haminiuk, Ch. (2015). Evaluation of the bioactive compounds and the antioxidant capacity of grape pomace. *International Journal of Food Science and Technology* (50), 62-69.

- Ivanović-Djukić, M., Lepojević, V. & Stefanović, S. (2018). Contribution of entrepreneurship to economic growth: A comparative analysis of South-east transition and developed European countries. *International Review of Entrepreneurship*, 16(2), 1-10.
- Kurki, A., Bachmann, J. & Hill, H. (2008). *Oilseed Processing for Small Scale Producers*. ATTRA Sustainable Agriculture, <http://www.attra.ncat.org>
- Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia, from <http://www.minpolj.gov.rs>
- Ministry of Economy of the Republic of Serbia, from https://privreda.gov.rs/wp-content/uploads/2019/01/MSPP_2017.
- Moreno, A.M. & Casillas, J.C. (2007), High-growth SMEs versus non-high-growth SMEs: A discriminant analysis. *Entrepreneurship & Regional Development*, 19(1), 69–88.
- Qi, J., Zhao, J., Li W., Peng, X., Wu, B. & Wang, H. *Development of circular economy in China*, Springer, 2016, from <https://www.springer.com/us/book/9789811024641>
- Radovanović, V., Đekić, S. & Radovanović, B. (2011). Economic potential of applying grape seed extract as a natural antioxidant, *Journal on Processing and Energy in Agriculture*, 15, 263-267.
- Regional Development Agency Jug, from www.jrm.rs/
- Republic Institute for Statistics of Serbia, from www.stat.gov.rs
- Official Gazette, No. 55/05 i 101/07, from www.zurnbis.rs/zakoni/nacionalna
- Osterwalder, A. & Pigneur (2010). *Business model generation: A handbook for visionaries, game changers and challengers*, Wiley, <https://www.wiley.com/en-us/Business+Model+Generation%>
- Trainor, P. (2006). *Study of Techniques in Separation of Grape Seed for Mass Production of Cold Pressed Grape Seed Oil*. Australia: ISS Institute Overseas Fellowship., from <https://grapeseedoil.com/product/>