**Chapter N 135**

**Wine quality improvement based on the perception of Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI) - evidence from Bulgaria**



**Abstract.** In recent years, there has been a trend towards more in-depth study of the factors that affect the willingness of wine manufacturers to use quality labels as PDO and PGI. Key issues such as the influence of climate on wine production, the authenticity of wine quality, technological innovations in wine production are subject of research for PDO indication. The possibility of classifying the chemical composition of wines, the use of PGI as a harmonized strategy for lower production costs and increased consumer interest are the other areas of research. The present study aims to test the above-mentioned groups of factors, their ability to improve the quality of wine production in Bulgaria as well as to analyze the existing practices of assessment for Bulgarian wine producers. The study will involve wine producers and experts from the National Viticulture Agency and their perceptions will be analyzed through Fuzzy AHP approach.

**Keywords.** Wine quality improvement, Authenticity, Protected Designation of origin (PDO), Protected Geographical Indication (PGI)



1. **Introduction**

Wine production in the EU as well as worldwide today aims to promote high quality wines and to meet certain quality standards. Those labels and schemes are well known in the EU and have been successfully implemented mainly in countries located in the south of the EU such as France, Italy, Spain, Portugal, Greece. The quality schemes or quality labels are referred to as Geographical indications (GIs) with two specific types: Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI). These quality schemes are described in detail in EU regulations for quality control such as Regulation 2081/1992, Regulation 2082/1992 and Regulation 1151/2012. (Dias and Mendes, 2018) GIs give value to territory thanks to certifications (including ISO, HACCP) and require strong collaboration between various institutions. Usually the policy to manage the designation of origin in EU countries is delegated to some relevant institution or consortia recognized by the Ministry of agriculture as INAO (Institut National de l’origine e de la qualité) in France or Federdoc, which is a voluntary Consortia and National Confederation for the Protection of the Italian Wines Designations, in Italy. GI serves as a vehicle of protection against different abuses by guaranteeing uniqueness and non-reproducibility, and traceability of the products. At the same time, GI is a protective tool for consumers and producers reflected in the final price, which is likely to be higher in comparison to the regular product without GI. (Kireeva, 2011) PDO and PGI are important indications for the competitiveness of wine producers based on local traditions. PDO represents a system of rules. PDO covers wine production, processing and preparation in a specific geographical area and serves as a mark for regional know-how. To obtain PDO, qualities and characteristics of wine refer to the geographical environment including natural and human factors. PGI allows the use of raw materials in wine production from another region taking into consideration that at least one stage of production, processing and preparation occurs in a specific geographical area. In this context, PGI serves also as a certification scheme or should be accepted as a collective agro-food brand because of the required more than 25 years long tradition from the execution of the entire production or part of a specific geographical area. (Sgroi and Modica, 2022)

This study aims to test the factors which improve the quality schemes in wine production in Bulgaria as well as to analyze the existing differences of perception and assessment for Bulgarian wine producers. The research question is especially relevant in the context of the declining production of wines with PDO and PGI in Bulgaria in recent years. At the same time, the efforts of Bulgarian wine producers are currently focused mainly on wines without PDO and PGI.

1. **Review of literature**

In recent years, there has been a trend towards more in-depth study of the factors that affect the willingness of wine manufacturers to use quality labels. (Marchini et al, 2014) Key issues such as the influence of climate on wine production, technological innovations in wine production are subject of research for PDO indication. Especially in the Mediterranean countries, winemakers suffer from frequent water stress, lower acidity of wines and general loss of production as result of extreme climatic events. This requires new production solutions and innovative strategies of wine technologists. (Boyer and Touzard, 2021; Jones and Webb, 2010) The possibility to classify the chemical composition of wines, the use of PGI as a harmonized strategy for lower production costs and increased consumer interest are the other areas of research. (Lancellotti et al., 2021) Fanzone et al. (2022) mention that the main challenge is the implementation of technologies promoting the extraction of chemical compounds from grapes, of sensory impact in the wine, without substantially reducing the average vineyard yield. Some authors group the factors influencing both PDO and PGI in three main directions: particularities of local resources; environmental balance between natural resources and regional traditions; and entrepreneurial skills to organize and to innovate the production and technological processes. (Mazzocchi and Sali, 2022) PDO and PGI varieties are perceived as products of higher quality than non-PDO or non-PGI varieties. (Duvaleix et al., 2021) Bonnet and Simoni (2001) mentioned that consumers are not always aware of the difference between PDO and non-PDO varieties. Authenticity of wines represents another important aspect considered because of the closed relation with the wine brand. According to Chhabre et al. (2013) authenticity is projected by terms as “ethic”, “symbolic”, “stereotyped”, “real thing”, “traditions” and “origins”. Words, images, packaging, smell, symbols, origin as “château” or “domaine” are norms for geographical certification of origin of wine. (Pelet et al., 2020) Le et al., 2022 confirmed a strong relation between “consumer behavior” and “authenticity perceptions”. According to the authors, the judgments for authenticity for consumers or observers and producers are based on different essences. For the consumers important are the existing knowledge connection with histories, events, values, persons and places. For producers the values, intentions, goals, qualities, characteristics have higher weight. PDO and PGI as geographical indications mean not only quality but also reputation. (Raustiala and Munzer, 2007) They are indicators for good trade, appropriate agricultural policy and protected intellectual property. Furthermore, they should be considered as important drivers for benefits for producers in terms of dynamic competition, innovative development and globalization. Also (Barham, 2003) confirms that PDO and PGI have positive effects on trade flows. One of the problems that can emerge for PDO and PGI quality is related to online retail, because in this case the wine authenticity should be considered under risk. Another possible problem could be related to a crisis or pandemic situation. In these cases, the “wine loyalty” is strongly important for the quality schemes. PDO and PGI should serve as public quality standards and could help the regulation of quality claims, especially when regards trade between EU and third countries. (Biénabe, 2017) Highly requested products with PDO and PGI contribute for a greater regional cohesion and serve as promoters of “something more” such as labels, quality and traditions. (Napoli et al, 2014) Based on econometric analysis for European NUTS3 regions in France, Italy and Spain, (Cei, 2021) shows that cooperation between producers and tradition in the use of GI tools are major factors to protect quality using PDO and PGI labels.

1. **General outlook of national wine PDO and PGI policy in Bulgaria**

The National Strategy for Development of Viticulture and Enology of Bulgaria for the period 2005-2025 of the Ministry of Agriculture and Food and the National Vine and Wine Chamber envisages a national policy to protect consumers from unfair competition between producers and to control PDO and PGI wines. (Ministry of agriculture and foods, 2004) 62% of the white wines with PDO are produced in the South-East region of Bulgaria, and 35% of the red and rosé wines with PDO are produced in the North-West region. The trend is the same for PGI, more than 56% of the white wines with PDO are produced in the South-East region, and 44% of the red and rosé wines are produced in the North-West region. (Ministry of agriculture, foods and forests, 2018) The annual report on the state of Bulgarian agriculture from 2018 (the last officially published) outlines a declining harvest trend declared by registered wine producers in the country. Produced wines with PDO and PGI rank second in production by 33% after the production of wines without PDO and PGI. (National Vine and Wine Chamber, 2018) Since 2015, the share of fruit-bearing vineyards for wine production with PDO and PGI has remained low (about 25% for PDO and 35% for PGI).

Bulgaria reports for the period 2007-2016 a decline and variations in the quantities of wines produced with PDO and PGI, which are also in a low-price range (unlike the European trend). In Bulgaria, under the Wine and Spirits Act (in force since 2012 and amended in 2020), the National Vine and Wine Chamber and the Regional Vine and Wine Chambers may make proposals for determining the geographical area for wine production with PDO and PGI. The alcohol grade in PDO and PGI wines stored for more than 3 years may not differ by more than 0.8% by volume from the content obtained by chemical analysis. According to Regulation 1234/2007, applications for protection of PDO and PGI wines are submitted by one or a group of producers to the Executive Agency for Vine and Wine and its relevant committee appointed by the Minister of Agriculture. For its part, the Executive Agency for Vine and Wine is applying for legal protection of PDO and PGI wines to the European Commission. A national register of wines with PDO and PGI is drawn up for the purposes of the European single register, which since 2019 is named eAmbrosia (including databases of ex E-Bacchus, DOOR and E-Spirit-Drinks).

1. **Data and methodology**

Wine quality improvement is a subject of various studies outlining a wide range of factors which influence the assessment by producers for PDO and PGI wines. (Pérez-Elortondo et al., 2018) Further research can only enrich existing knowledge with new recommendations. Such is the case of Bulgaria, whose example we will consider.

Following (Calabrese et al., 2013) we apply their methodology based on the classical AHP analysis of (Saaty, 1990) and extended to allow for fuzzy assessments (Chang, 1996). The AHP starts with a construction of a "hierarchy", a tree structure with several levels - "goal" (the top level), "criteria", "subcriteria" etc. For each item in the hierarchy experts assess how it relates to the item of the level above. In the fuzzy AHP variant, the assessments experts make consist of triads of values ("low", "middle" and "high"). Further the fuzzy triads are converted to "crisp" values to construct the AHP matrix. The goal is to obtain weights of the different items, so that the decision making process can be enhanced, although AHP does not fully replace expert decision making.

Technically, first the fuzzy comparison matrices are converted to crisp comparison matrices by center of gravity defuzzification (see Calabrese et al., 2013, for details). Then the consistency index and consistency ratio are calculated to analyze the consistency of each comparison matrix. Next, the local priority weight of each criterion is determined.

The hierarchy elaborated for our analysis consists of three layers, experts come from the wine industry of Bulgaria. We explore two hierarchies, with PDO and PGI as "goals", however, since PDO and PGI have some mixt perception, we analyze the sub-criteria only regarding their upper level, the criteria.

1. **Results and discussions**

Four criteria for PDO and PGI were selected as “bioclimatic changes”, “uniqueness of wines ”, “methods for detecting fraud and guaranteeing wine authenticity” and “marketing tool for wine producers”, and different sub- criteria were selected for each criterion. The choice of individual criteria reflects recent publications and research studies for GIs. Table 1 presents the results from the fuzzy AHP for both hierarchies, with PDO and PGI as a "goal", respectively. Consistency tests show all the matrices are consistent, with CI values well below 0.1, therefore the assessments can be accepted.

Table 1. PDO and PGI in the wine industry - decision hierarchies

| **PDO** | **PGI** |
| --- | --- |
| v Bioclimatic changes (0.18):Rise of temperature (0.32)Exceptional hailstorms and flooding (0.32)Intense drought (0.36) | v Bioclimatic changes (0.24):Rise of temperature (0.32)Exceptional hailstorms and flooding (0.32)Intense drought (0.36) |
| v Uniqueness of wines (0.23):Different concentration of elements (Ca, Mn, Co, Zn…) among wines (0.52)“Creativity” of oenologist to change terroir (0.48) | v Uniqueness of wines (0.19):Different concentration of elements (Ca, Mn, Co, Zn…) among wines (0.52)“Creativity” of oenologist to change terroir (0.48) |
| v Methods for detecting fraud and guaranteeing wine authenticity (0.32):Broad variability of quality within the same PDO which confuses the consumers (0.24)No long and solid tradition of quality standard to last for the loyal consumer (0.30)Enhancing effectiveness of the quality wine protection system (0.46) | v Methods for detecting fraud and guaranteeing wine authenticity (0.29):Broad variability of quality within the same PDO which confuses the consumers (0.24)No long and solid tradition of quality standard to last for the loyal consumer (0.30)Enhancing effectiveness of the quality wine protection system (0.46) |
| v Marketing tool for wine producers (0.28):Reducing consumer’s information search costs (0.22)Raising willingness of consumers to pay (0.22)Export potential (0.32)Extending loyalty of high educated customers (0.24) | v Marketing tool for wine producers (0.28):Reducing consumer’s information search costs (0.22)Raising willingness of consumers to pay (0.22)Export potential (0.32)Extending loyalty of high educated customers (0.24) |

Source: the authors

The results show two important aspects for Bulgarian wine-making producers, namely the question of authenticity of GI wine and the manner in which it is promoted. Bulgarian producers emphasize the importance of PDO and PGI primarily as a vehicle against fraud (local decision weights of "methods for detecting fraud and guaranteeing wine authenticity" are 0.32 for PDO and 0.29 for PGI), with the marketing aspects on second place (0.28 for both PDO and PGI). In Bulgaria, the indications for PDO and PGI (Article 83) must appear on labels when offered on the EU market or when exported to third countries. At the same time, the law allows (Article 85) the designations PDO and PGI not to be indicated when "Guaranteed and controlled designation of origin" is written. The latter creates ambiguity in interpretation and the possibility of confusion, fraud or origin manipulation.

The use of PDO and PGI wines as a powerful marketing tool is not surprising, especially since it is embedded in the regulations of the country. The National Program for Support of the Vine and Wine Sector in Bulgaria for the period 2019-2023 of the Ministry of Agriculture, Food and Forestry states that according to Regulation 1308/2013 PDO and PGI should be used as a means of informing and promoting Bulgarian quality wines in third countries. To this purpose, it is planned to ensure an increase of export of at least 10% to third countries by 2023 through open projects for financial assistance determined by the State Fund "Agriculture". These projects are intended primarily for producers with higher revenues and a higher percentage of exports in the last two years.

1. **Conclusions and future perspectives**

This research study shows some challenges and opportunities related to PDO and PGI wines in Bulgaria and their quality improvement. Undoubtedly, it is difficult for the uninformed wine producer to understand the regulations and to determine the differences between PDO and PGI wines and non-PDO and non-PGI wines. Moreover, the Bulgarian law overlaps definitions of guaranteed and controlled designation of origin. The collection of surveys or the publication of data on PDO and PGI wines is quite obsolete. It also does not include detailed price information, as is the case in countries such as Italy, where ISMEA (Istituto di Servizi per il Mercato Agricolo Alimentare) publishes information by year and by regions for PDO and PGI wines, including unit average prices. The measures of the Bulgarian Ministry of Agriculture, Food and Forestry are primarily aimed at marketing and promoting PDO and PGI wines to third countries compared to European and world practice for quality control or encouraging producers for PDO and PGI wine production. One positive note is the attention drawn to the potential threat of manipulation and falsification of the authenticity of PDO and PGI wines. In this regard, it is necessary to clarify the “uniqueness” of the chemical composition of wines, the issuance of certificates, the activities of the regional tasting commissions by area of ​​origin and the work of the reference laboratories for PDO and PGI wines. The bioclimatic trends and the conservation of resources in viticulture and wine-making must become a priority for both producers of GI wines and for the relevant institutions such as the Ministry of Agriculture and Food and National Vine and Wine Chamber. Future research study should analyze the lack of surveys on consumer preferences for PDO and PGI wines in Bulgaria.

**References**

Barham E (2003) Translating terroir: the global challenge of French AOC labeling. Journal of Rural Studies 19:1:127-138, [http://doi.org/10.1016/s0743-0167(02)00052-9](http://doi.org/10.1016/s0743-0167%2802%2900052-9)

Biénabe E, Marie-Vivien D (2017) Institutionalizing Geographical indications in Southern Countries: lessons learned from Basmati and Rooibos. World Development 98:58-67. <http://doir.org/10.1016/j.worlddev.2015.04.004>

Bonnet C, Simioni M (2001) Assessing consumer response to protected Designation of Origin labelling: a mixed multinomial logit approach. European review of Agricultural Economics 28:4:433-449. <http://doi.org/10.1093/erae/28.4.433>

Boyer J, Touzard J-M (2021) To what extent do an innovation system and cleaner technological regime affect the decision-making process of climate change adaption? Evidence from wine producers in three wine clusters in France. Journal of Cleaner production 315. <http://doi.org/10.1016/j.jclepro.2021.128218>

Calabrese A, Costa R, Menichini T (2013) Using Fuzzy AHP to manage Intellectual Capital Assets: An application to the ICT service industry. Expert Systems with Applications 40: 3747-3755. http://doi.org/10.1016/j.eswa.2012.12.081

Cei L, Stefani G, Defrancesco E (2021) How do local factors shape the regional adoption of geographical indications in Europe? Evidence from France, Italy and Spain. Food policy 105. <http://doi.org/10.1016/j.foodpol.2021.102170>

Chang D (1996) Applications of the extent analysis method on fuzzy AHP. European Journal of Operational Research 95:3: 649-655. https://doi.org/10.1016/0377-2217(95)00300-2

Chhabra D, Lee W, Zhao Sh (2013) Epitomizing the “other” in ethnic entertainment experiences. Leisure 37:4: 361-378. <http://doi.org/10.1080/149277113.2014.906171>

Dias C, Mendes L (2018) protected Designation of origin (PDO), Protected Geographical indication (PGI) and Traditional Speciality Guaranteed (TSG): a bibliometric analysis. Food Research International 103: 492- 508. <http://dx.doi.org/10.1016/j.foodres.2017.09.059>

Duvaleix S, Emlinger C, Gaigné C, Latouche K (2021) Geographical indications and trade:firm-level evidence from the French cheese industry. Food Policy 102. <http://doi.org/10.106/j.foodpol.2021.102118>

Fanzone M, Coronado I, Sari S, Catania A, GiliCortiella M, Assof M, Jofré V, Ubeda Ch, Peña-Neira A (2022) Microwave-assisted maceration and stems addition in Bonarda grapes: effects on wine chemical composition over two vintages. Food Research International 156. <http://doi.org/10.1016/j.foodres.2022.111169>

Jones G V, Webb L B (2010) Climate change, viticulture, and wine: challenges and opportunities. Journal of Wine Research 21:103-106. http://doi.org.10.1080/09571264.2010.530091

Kireeva I (2011) How to register geographical indications in the European Community. World Patent Information 33: 72-77. <http://doi.org/10.1016/j.wpi.2010.08.001>

Lancellotti L, Sighinolfi S, Ulrici A, Maletti L, Durante C, Marchetti A, Tassi L (2021) Tracing geographical origin of Lambrusco PDO wines using isotope ratios of oxygen, boron, strontium, lead and their elemental concentration. Current research in Food Science 4: 807-814. <http://doi.org/10.1016/j.crfs.2021.11.001>

Le T H, Arcodia Ch, Novais M A, Kralj A (2022) How consumers perceive authenticity in restaurants: a study of online review. International Journal of Hospitality Management 100. <http://doi.org/10.1016/j.ijhm.2021.103102>

Marchini A, Riganelli Ch, Diotallevi F, Paffarini Ch (2014) Factors of collective reputation of the Italian PDO wines: an analysis on central Italy. Wine Economics and Policy 3:127-137. <http://dx.doi.org/10.1016/j.wep.2014.12.003>

Mazzocchi C, Sali G (2022) Supporting mountain agriculture through “mountain product” label: a choice experiment approach. Environment, Development and Sustainability 24:701-723

Ministry of agriculture and foods (2004) National strategy for viticulture and wines in Bulgaria 2005-2025. Sofia, p 1-17

Ministry of agriculture, foods and forests (2018) National supporting policy for viticulture and wine-making sector in Bulgaria 2019-2023. Sofia, p 1-52

Napoli J, Dickinson S J, Beverland M B, Ferrelly F (2014) Measuring consumer-based brand authenticity. Journal of Business Research 67:6:1090-1098. <http://doi.org/10.1016/j.jbusres.2013.06.001>

National Vine and Wine Chamber (2018) Annual report of agriculture development in Bulgaria. Sofia, p 13-319

Pelet J-É, Durrieu F, Lick E (2020) Label design of wines sold online; effects of perceived authenticity on purchase intentions. Journal of Retailing and Consumer Services 55. <http://doi.org/10.1016/j.jretconser.2020.102087>

Pérez-Elortondo F J, Symoneaux R, Etaio I, Coulon-Leroy C, Maître I, Zannoni M (2018) Current status and perspectives of the official sensory control methods in protected designation of origin food products and wines. Food control 88: 159-168. <http://doi.org/10.1016/j.foodcont.2018.01.010>

Raustiala K, Munzer SR (2007) The global struggle over geographical indications. European Journal of International Law 18:2:337-365. <http://doi.org/10.1093/ejil/chm016>

Saaty T (1990) How to make a decision: the analytic hierarchy process. European Journal of Operational Research 48:1: 9-26. https://doi.org/10.1016/0377-2217(90)90057-I

Sgroi F, Mondica F (2022) Localized agri-food systems: the case of pecorino Siciliano PDO a food product of the tradition of Mediterranean gastronomy. International Journal of Gastronomy and Food Science. [http://doi.org/10/1016/j.ijgfs.2022.10047](http://doi.org/10/1016/j.ijgfs.2022.100471)