

Article

Promoting Sustainability through Regional Food and Wine Pairing

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Abstract: Sustainable development has been growingly recognized as important in the scope of tourism and hospitality industry practices. Gastronomic tourism associated with regional food-and wine pairing helps the emerging of higher quality services and contributes to the sustainability of tourist destinations. This study presents a pairing model based on three Real-Time Delphi (RTD) questionnaires to allow experts to select and pair regional wines with regional foods. In the first questionnaire, the experts were asked to choose, by category, the most representative regional dishes from the Algarve region (Portugal). In the second questionnaire, for each dish, experts voted on the best regional wines for the dish. In the third questionnaire, experts made quantitative and qualitative analyses for each of the three most voted wines for each dish. The resulting pairing model of regional food and wines will be communicated to tourism professionals and the general public. By promoting the consumption of these pairings, we promote an efficient, socially fair, and ecologically sustainable local economy. At the same time, we stimulate the circular economy in tourism.

Keywords: Algarve; regional food and wine; pairing model; food pairing; Real-Time Delphi; sustainability promotion; gastronomic tourism; sustainable development



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1. Introduction

Tourism has an important role in sustainable development in many countries and regions worldwide [1–3]. As many studies point out, by respecting the principles of sustainable development [1], food tourism and the tourism industry can play significant roles in developing a tourist destination (e.g., [4–10])—namely, providing new job opportunities, strengthening the cultural identity [8], contributing to the growth and welfare of its residents, and also using local resources and promoting visitor satisfaction [11], as it is linked to the culinary experience's lasting memory [12,13]. Consequently, food and wine pairing should be developed, as it potentiates the emerging of higher quality services and contributes to the sustainability of these destinations [14].

In this context, this study aimed to present a model for pairing Algarve wines with Algarve foods, considering the Algarve region as Portugal's most sun and sea tourist region. The study used a quantitative and qualitative approach, including a literature review and Delphi research, structured by three Real-Time Delphi (RTD) questionnaires. The study also included sensory tasting by a group of six experts, two chefs, one maître, one sommelier, one wine expert, and one restaurant/hotel expert. The responses to the sensory tasting were registered in real-time through the third Delphi questionnaire application and were analyzed using data science techniques such as data characterization, data visualization, and text mining.

Delphi is a popular method in the scholarly literature and was used more than 2600 times between 1975 and 2017, 175 times in scholarly articles in business and man-

agement, 43 times in leisure and tourism [15], etc. Schwark et al. [16] also used Delphi to study foods. Real et al. [17] used Delphi to present a new model for the Mediterranean diet definition and identify the major trends for using the Mediterranean diet concept by 2028 in Portugal.

The resulting pairing model of regional food and wines was communicated to tourism professionals and the general public and can be used as a pedagogical tool. With the information of these pairings and promoting their consumption, we expect to promote an efficient, socially fair, and ecologically sustainable local economy in a “sun-and-beach” touristic destination.

This paper presents within the following section a literature review related to gastronomic tourism, the importance of consumption of local products in regional sustainability, sustainability tourism, and food and wine pairing. Next, the research methodology adopted to achieve the objectives is elucidated. The Results and Discussion Section is then presented. Finally, the conclusions are addressed, along with practical implications for professionals. The paper concludes with an outline of limitations and proposals for future research.

2. Literature Review

2.1. *Gastronomy Tourism as an Enhancer of Sustainable Development*

Gastronomic tourism should be understood in the scope of the growing recognition of the culture and tourism sectors’ contribution to achieving the sustainable development goals (SDGs) of the Agenda 2030 [18]. The Agenda 2030 for Sustainable Development [19] is based on three highly interdependent main dimensions—economic, social, environmental—that “require holistic approaches to policies, given positive synergies across all dimensions” [18]. The integration of a cultural dimension in sustainable development is seen as contributing mainly “to the implementation of SDGs 4, 8, and 17” [18]. It also presents as evidence its links with creativity, innovation, networks creation, high participation of stakeholders and communities, etc. [18].

Regarding tourism, as a driver and enabler of sustainability, some international policy documents stand out, such as “Tourism and the Sustainable Development Goals—Journey to 2030—Highlights” [1] and the “Baseline Report on the Integration of Sustainable Consumption and Production Patterns into Tourism Policies” [2]. Among its recommendations, a set of priorities are underlined—namely, the “integration of sustainable tourism in national policy-making and development planning institutions, as well as policy coherence and integration across inter-linked sectors” [2]. This principle should be conducted in the scope of “business operations”, “host community support”, “supplier relations”, “customer service” and “stakeholder involvement” [1].

Gastronomy, as intangible or “living” heritage [20], is an expression of “popular” and “everyday” culture, associated with the consumption and enjoyment of good food and drinks [5]. As Visković and Komac [21] emphasized, according to many other authors, “from a heritage perspective, gastronomy is a mixture of tangible and intangible elements, that embodies the values and meanings of heritage bearers represents their cultural identity”. Underlining the importance of identity studies associated with gastronomy, Di Fiore [22] points out some significant research, such as studies about the symbolic and identity meanings of food for different social classes, the eating habits of different economic classes, profiles linked to working in the food system, as well as food heritages linked to religion, gender dynamics, different generational identities, etc.

Heritage could not be “fixed” as it is in a “continuous evolution” [23]. It enhances the need to consider the specific characteristics of each culture and its protagonists [24] as well as its values. Heritage is based on two primary values—historical and contemporary [25]. The first is associated with “heritage”. The second underlines the fact that a living heritage should be considered in a future context, based on the assumption that heritage is in a “continuous recreation” [25], being regularly reproduced and reinvented [22]. In accordance, Bienassis [26] highlights that food is an identity heritage that results from appropriation dynamics fomented by specific groups, communities, and societies.

As a segment of cultural tourism, gastronomic tourism is a new form of tourism [27]. Accordingly, we can find several terms associated with food-based tourism, such as culinary tourism, tasting tourism, gastronomy tourism, food tourism, etc. [27]. This type of tourism is associated with visits to places based on food production and consumption. Simultaneously, there is a focus on preparation processes or eating a special dish and seeing how it is prepared [21]. Gastronomic tourism can be experienced in live cooking schools, traditional gastronomic feasts and celebrations, grape harvesting, visiting regional wineries and food producers, etc. [27].

Gastronomic tourism, in the scope of a gastronomy “patrimonialization” [24], “heritagization” [6] or “heritage turn” [22] process, raises concerns due to the increasing heritage commodification or mercantilization [24], as well as the invention of heritage (“invented heritage”) [22]. The understanding, interpretation, and usage of heritage by tourism highlight the role of a localized cultural heritage as an important distinguishing factor between regions [21]. From a geographical perspective, food is a tourist symbol of a place [21], and consequently, different places have different forms of cultural identity.

As a territorial attribute, gastronomy is associated with identity [28] and, consequently, is perceived as an economically valuable asset, especially when integrated with creative industries [28]. Space is shaped and structured by gastronomy, mainly due to changes in social and economic structures, as well as land use [21]. The Food Travel Monitor market research report states, “53% of leisure travelers choose their next destination because of food and drink” [29]. Consequently, the “gastro-economy”, i.e., “developing economy with gastronomy” [30], is recognized as an emerging phenomenon and a vital sub-sector of the tourism economies with a strong potential for regional, urban, and rural development. Gastronomy allows the growth of domestic and international tourism, the transformation of national food products into exported goods, and the branding of cities as gastronomy destinations, contributing to global economic development [30].

Many authors suggested that destinations with the best chances for developing a gastronomic tourism product/experience are those that already have the advantageous “dishes” and “ingredients” to support a tourism strategy [31] based on their uniqueness. Such resources include different or multi-ethnic gastronomy, innovative chefs, unique marine and agricultural products, unique culinary heritage [31].

This distinctiveness in the scope of the interconnection between “gastronomic identity” [7] and the development and formation of a national [22] or regional identity [8] is frequently associated with a gastronomic tourist region—a “touriscape” [32] or to “foodscape” [7]. This association considers the territorialization of gastronomy [9] in the scope of “traditional”, “authentic” [22], and “unique” [27] gastronomic tourist products or experiences. Celebrating and fostering authenticity and the relationship between production and places contests global food homogenization potentiating local culture enjoyment [31]. However, once territory is a “complex construct” in which different stakeholders (residents, visitors, investors) enhance different perspectives, motivations, knowledge, experiences, and expectations, it is challenging to understand the historic mechanisms expressed in heritage that can be used as a resource for territorial development [21].

2.2. Food and Wine Pairing in the Context of Gastronomic Tourism Regional Development

Gastronomic tourism should be associated with the new cultural and creative value chain. In this context, the pairing of food and wine should be understood based on an anchored network “with creativity and innovation”, where gastronomy extends from the production phase to the consuming phase, a process in which new ideas and inspiration emerge [33].

It is worth underlining that academic research on food and drink pairing is taking its first steps, thus calling for more empirical studies—namely, the investigation of key drivers of perceiving matches of food and wine [34]. Although over the last two decades, interest in food and drink pairing has grown in restaurants, books, magazines, blogs, and television, associated with the increasing popularity of food and wine pairing in the general press,

limited scientific studies have been published to evaluate relationships empirically. [34]. Harrington and Seo [34] highlight the fact that the research of food and wine relationships has mostly centered on wine and cheese pairings, with a few studies assessing other foods paired with wine or the resulting sensory outcomes when certain foods interact with specific wines.

However, food and wine pairing have been capturing more and more researchers' attention, presenting as evidence its strong synergic interaction [35]. According to Wang [36], throughout human history, the main reason for drinking wine with meals was the enjoyment created from this combination. Flavors in food can suppress or accentuate particular characteristics in wine, altering the experience of that wine and vice versa [36]. Good food and wine pairing will increase the flavors of both the food and the wine, and a great pairing happens when they do not overshadow each other. Wine is an "ideal complement to the food, and it raises up the taste of food to the highest level" [13]. Enology and gastronomy are closely connected, enhancing a better customer experience [13]. This synergetic dimension is also linked with the territory. As Colet [37] underlines, "if they grow in the same place, they are a good match."

Beyond the synergistic nature of pairing, Eschevins et al. [38] evince the importance of pairing principles corresponding to strategies and prerequisites to create a match. According to the mentioned authors, these principles are related to "perceptual" (balance of intensity, balance of quality, harmony, similarity, culinary practices, avoiding off-flavor, rinsing effect, decrease in sensory property, enhancement of sensory property), "conceptual" (norms, geographical identity, quality level, moment of the meal, situation specific, season), "affective" (individual preferences, surprise) and "other" (experience) categories and aim at creating pairing according to various objectives: creating a unique match experience, highlighting one of the two products, and enjoying the experience of each product in the pair [38]. In this framework, other approaches stand out in the wine and food pairing training process based on culinary and sensory perspectives. It illustrates the potential of using a hierarchical approach to pairing [39,40]. The sensorial approaches are associated with food and pairing evocating emotions [41]. Specific sensory attributes, such as odors, are linked with memories and emotions [36]. The phenomenon is known as the "Proustian moment" [42].

Due to the diversity of food-beverage pairing principles, Spence [43] suggested they can be reduced to just two approaches based on cognitive/intellectual food-beverage matching, and the other based on the perceptual consequences pairing. As a result of this simplification, those interested in presenting flavor pairings should be able to do so more easily to their customers, so they can deal with what, at times, seems to be a complex area [43]. Food and wine pairing is frequently perceived as an enhancer of creativity and innovation through identity and authenticity reinforcement, differentiation and marketing, profit and revenue generation, sustainability development model and positive social and economic impacts, and improvement of tourist experiences.

Pairing, as a tool for defining a region's gastronomic identity and reinforcing it, assumes that this identity is determined by specific territorial interconnected elements—namely, environmental (geography and climate), cultural (religions, history, level of ethnic diversity, innovations, capabilities, traditions, beliefs, and values) and economic (dependency of tourism) [44]. This interconnection leads to unique food and wine pairings across different local/regions associated with their identifiable gastronomic characteristics.

Accordingly, the concept of "geographical identity" [38] emerges. It consists of matching two products from the same area, region, or country. As Eschevins et al. [38] state, we evoke the designation of origin that reflects a region. When we have regions with gastronomic typicality, we are speaking about a local pairing, considering the products available in this region. In the culinary literature, this could be better identified considering the "terroir" pairings or traditional practices [38], presenting as evidence the food-territory-tourism triangle [21].

The geographical identity should be understood in a dynamic context, as regional identity and associated pairings are in continuous transformation or evolution [7], along with the reinforcement of creativity and innovation, gastronomies are constantly changing. They are a combination of different products, traditions, and etiquette [44].

Creativity and innovation linked to pairing show the subjectivity of the “combination” considering the specificity of the identifying characteristics of each territory. This identification, in turn, leads to networks associated with new stakeholders and new entrepreneurship forms [9]. From a supply side, this presupposes both the creativity in proposing new food products and the innovation in contemporary (gastronomy) tourism that tends to be seen more and more significant in local/regional tourism development.

The territorial nature of pairing—embodied in the concept of “terroir identity”—shows a strong relationship to the overall branding, associated with differentiation and marketing strategies as a sign of “terroir”, “typicity”, “traditionalism”, “identity” [36], in opposition with a globalized world [45]. Pairing is seen as a companies’ (restaurants, hotels, and similar) strategy of differentiation [13] and “food distinctiveness to consumers” [46]. In this context, companies should enhance efforts in including local/regional ingredients, dishes, and wine, creating unique menus and pairings potentiating its production growth.

Pairing as a marketing, promotional, or recommended strategy is also underlined once it can “encourage more food and wine consumption, especially for newcomers and outsiders” [47]. “Food and wine pairing as a marketing tool” [11] is frequently associated with concepts such as brands, co-branding, brand reputation [11], brand authenticity [48], etc. These considerations also highlight pairing as a driver of the establishment’s “reputation” [36] and as a “helpful measure to professionals in the hospitality business in sourcing and recommending wines to customers” [11,47].

Simultaneously, pairing represents an “innovative and profitable strategy for the hospitality and wine sectors to meet consumers’ demands”, providing opportunities to create further profit for hospitality operators [11]. Accordingly, pairing is perceived as a strategy to generate revenue, profit [11,13], and sales [49].

2.3. Pairing and Sustainable Development Models

Pairing could enhance more sustainable development models. The relationship between gastronomy and sustainable tourism is frequently underlined, particularly associated with local traditions and culture, agriculture and food/beverage, processing fields, excellent tourism portals, and being tourist-friendly [50]. From this framework, gastronomic tourism can support the development of local tourism by stimulating local culture, producing different products respecting specialties, encouraging the production of food ingredients, increasing cooperation between sectors, and adapting to the times [5]. As Putra [5] points out, it is also essential to incentivize visitors to participate in cultural life, which has been provided in the tourist area. Food and local products are used to describe and interpret culture [5].

The assumption is that sustainability could be achieved by reinforcing a more holistic and integrational perspective. Through pairing, sectoral, territorial, and intra- and inter-group integration could be enhanced. Pairing reinforces sectoral integration, between the food and wine sectors (wine enology and wine business) [47] but also in the tourism sector, etc. According to Rachão et al. [28], when the demand for local food and wine rises, the demand for raw materials rises as well and then provides more job opportunities for locals. Additionally, local resources will supply local food and wine production [28].

Territorial integration of food and wine production systems (in intra- and inter-urban and rural areas) could build socio-economic cohesion based on local or regional values. For the same reason, tourism strategies of destinations promote and encourage the development of integrated tourism products rather than simple ones [21].

Intra- and inter-group integration is based on networks [12]. Stakeholder networking is crucial for pairing to thrive. Local actors and outsiders compete for limited local resources to serve visitors and their own interests. As a result, new forms of clustering

and networking emerge [51]. Due to the described development from local to globally influenced local service, tourism products, including gastronomy products, are becoming more complex. Gastronomy tourism may reduce distances that have increased due to the globalization of agricultural food supply chains by involving local actors involved in the food system, such as farmers, producers and processors, chefs and caterers, festival organizers and managers, policymakers, authorities, and the community [21].

Respect for sustainable principles leads to avoiding potential development negative impacts in territories and communities. Local sourcing is a key tool to promote local agricultural landscape protection as well as to prevent higher prices, water and energy saving, local enterprises responsible investment, local recruitment, local supplier prosperity, host community involvement, etc. [1].

Since competitiveness should be synergetic with sustainable development, tourist destinations will compete to attract the attention of tourists with food and wine, as well as with its pairing. Successful tourist destinations provide higher levels of service and quality of “iconic” tourism products and experiences [52]. Creating “iconic” tourism products requires more knowledge from the supply and demand sides.

Pairing also boosts sustainable development, creating “a more rounded gastronomical experience” in the post-Fordist society. More responsible, respectful of places, and environmentally conscientious tourists leads to an increasing consumption concern with questions such as “where their food comes from and how it is produced, and transparency in the handling of food is becoming increasingly important” [16]. Based on Schwark et al. [16], several studies have shown that individuals prefer locally grown foods due to their freshness, familiar taste, and sustainability, as long-distance transportation is not necessary [16]. Furthermore, tourists eating and drinking local food and wine are indirectly reducing the carbon footprint, which is an environmental repercussion of food being distributed around the world using polluting modes of transportation [10].

Pairing increases “wine consumers’ satisfaction” [16,39,47,49] and qualifies “the eating experience” [12,13], usually associated with the enhancement of emotions that valorizes the consumer experience [11] and co-creative experiences [53]. The experiential nature of pairing should be seen in its interconnection between “sensory qualities of food and wine pairings and pre-, core-, and post-consumption components of the gastronomic experience” [11]. According to Kustos et al. [11], appropriate pairings elicited more positive and fewer negative emotions, demonstrating consumers’ emotional engagement, which is an important aspect of creating unforgettable experiences. Unconventional pairings provoked adventurous and surprising emotional experiences, as well as positive hedonic comments, which also suggests a possible approach for hospitality and cellar door operators to develop a favorable customer experience [11]. In the “post-consumption experience”, consumers retained vivid memories and reported higher remembered liking, memorability, and loyalty of experiences for the appropriate pairings.

In addition, tourists perceive co-creation as one or a combination of seven categories: social interaction, novelty, creativity, social sustainability, environmental awareness, enjoyment, and memorable experiences [28]. This was considered in rural (e.g., [46]) and urban spaces (e.g., [53]).

3. Materials and Methods

3.1. *The Algarve, a Tourist Destination*

The Algarve, a characteristic tourist destination of sun and sea, is one of the main tourist regions of Portugal, achieving 30.2% of total global income [54]. In the strategy of development of tourism in the Algarve, to complement the product sun and sea, and golf, as well as to mitigate seasonality, the product gastronomy and wines are valued, estimating that its economic impact represents 30% of tourist revenues. Data indicate that the demand for trips associated with gastronomy and wine has been growing at 5% to 8% per year [14].

3.2. Traditional Recipes of the Algarve

In terms of gastronomy, it is worth noting that Portugal, especially the regions south of the Tagus River, such as the Algarve, has a significant influence on Mediterranean culture. Gastronomy plays a fundamental role in this identity, which led UNESCO to include the Mediterranean diet in the representative list of the Intangible Cultural Heritage of Humanity [55].

The pre-selection of delicacies for the study were identified from a survey on the traditional recipes of the Algarve in the course of the IT-AMGABAlgarve project [56] that identified 250 recipes. The sources were the works related to traditional recipes from the Algarve of Adão and Costa [57], gastronomias.com (accessed on 26 October 2021) [58], Confraria dos Gastrónomos do Algarve [59], Cruz and Pisco [60], Vila [61], and Saramago [62]. The structure of the identified recipes consists of 66 meat recipes (26%), 46 fish (18%), 38 vegetables, cereals, and non-sweet fruits (15%), 38 cephalopods, shellfish, and shellfish aquatic and terrestrial (15%), 62 of desserts (25%).

In the recipes identified, the identity elements are found mainly in the ingredients and less in the designation of the dish. The analysis of the recipes lets us prepress its association with the Mediterranean diet [55] and its constitutive elements—such as olive oil, bread, and herbs (parsley).

3.3. Algarve Wines

Wine is intimately present in the Mediterranean diet, including in the well-known trilogy—bread, olive oil, and wine. It is composed of alcohol, polyphenols, mineral salts, trace elements, and fibers, exerting a toning and relaxing effect and stimulating blood circulation, heart, and stomach. It should be taken in moderation, preferably with meals given the alcohol content. In addition, wine is often used for cooking, marinades, and seasoning [63].

In the specific case of the Algarve—the first region in the country to Mediterraneanize its eating habits, with the adoption of the cereals, wine, and olive oil trilogy—wine consumption would already be deeply rooted in our habits, influenced by merchant wine-consuming peoples: Phoenicians, Greeks, Carthaginians, and Romans. The winemaking techniques used in the Algarve would not be very different from those in neighboring Andalusia. Aromatic herbs were added to taste the wine and for its antiseptic function. According to the ancients, the addition of salt made it possible to accentuate the taste and color of the wine, clarifying it. Gypsum had the function that tartaric acid has today, essential for the conservation of wine, especially in hot climates, where grapes have reduced acidity levels [63].

The Algarve Demarcated Region was created in 1980. It is located in the extreme south of Portugal, covering the district of Faro. Its entire area corresponds to the production area of “Algarve Regional Wine” and “Algarve” fortified wine (IGP). The four regions with “Protected Designation of Origin” (DOP) are DOP Lagos, DOP Lagoa, DOP Portimão, and DOP Tavira, which are all located along the Atlantic/Mediterranean coast [64,65].

A survey of Algarve wines during the IT-AMGABAlgarve project [56] identified 163 wine references, of which 157 are classified as Algarve Regional Wine (IGP) and six are classified as Protected Designation of Origin (DOP). The source was the 2nd edition of the *Algarve Wine Guide*, from Região Turismo do Algarve [66]. The categorization of the identified wines is formed by 40 white wines (25%), 85 red wines (52%), 32 rosé and “palhete” wines (20%), 4 fortified and late harvest wines (3%), and 1 sparkling wine (1%). In mature wines, the identity elements are found mainly in the characteristics of the grape varieties (see Figure 1). Attending to the special wines, the identity elements are found mainly in the characteristics of the grape varieties (see Table 1).

Taking into account the main ingredient of each delicacy, identify, by family, the most representative of the Algarve gastronomy:

Selection of delicacies - Poultry(Dark meat)

List of the 10 most selected delicacies by experts

Response	Score
Partridge with clams in the Cataplana:	3
Fried partridge with rockrose and thyme:	2
Phaesant bread stew:	1
Stewed partridge or steamed partridge:	1
Partridge soup:	0

Select all the options that apply

Please, select an answer

- Phaesant bread stew
- Partridge soup
- Partridge with clams in the Cataplana
- Stewed partridge or steamed partridge
- Fried partridge with rockrose and thyme

Previous

Next

Figure 1. Questionnaire 1 “Selection of typical Algarve delicacies”.

Table 1. Types of wine selected for the study and its grape varieties.

Wine Type	Grape Varieties
White	Verdelho
White	Antão vaz
White	Viognier
White	Malvasia fina
White	Moscatel
White	Sauvignon blanc
White	Alvarinho
White	Chardonnay
White	Arinto
White	Siria (Crato branco, Roupeiro)
Rosé	Castelão
Rosé	Negra mole
Rosé	Moscatel roxo
Rosé	Touriga nacional
Rosé	Negra mole
Red	Alicante bouschet
Red	Castelão
Red	Aragonês
Red	Negra mole
Red	Petit Verdot
Red	Touriga nacional
Red	Cabernet sauvignon
Red	Sousão
Red	Syrah
Liquer (sweet)	Moscatel
Liquer (dry)	Siria (Crato branco, Roupeiro)
Late harvest	Moscatel + Viognier
Sparkling wine	Arinto + Chardonnay

The pre-selection for the study involved 28 different wines (17%) of a total of 163. In order to reduce the sample, maintaining its diversity of the specific characteristics of each of 20 different grape varieties, only 24 mature wines of a single variety were considered. Ten white wines (34%), nine red wines (31%), and five rosé wines (17%) were pre-selected for the study, considering that the specialists are knowledgeable about the characteristics of each one of the grape varieties. However, four special wines (liqueur, late harvest, and sparkling) were also pre-selected for the study, extending the range of choices to the diversity of delicacies, in particular desserts. As with food, wine is intrinsically associated with the Mediterranean food pattern, is attributed to health benefits, especially red wine, if consumed in moderation, and is considered a pleasant complement to the meal [67].

3.4. The SDGs of the Pairing Model

The tourism industry is strongly associated with leisure and the demand to contribute to the sustainable development of tourist destinations. As previously presented by UN-ESCO/DCE [18] in the literature review, integrating a cultural dimension in sustainable development contributes mainly to implementing SDGs 4, 8, and 17. The pairing model aims to promote the sustainability of the Algarve tourist destination, associating new technologies with quality of service, considering the sustainable promotion of circular economy and the consumption of endogenous resources of the Algarve. The art of pairing consists of combining the best wines with certain delicacies. The central concept behind this combination is that certain elements found in food and wine, such as texture and flavor, react in different forms when mixed. Finding the right mix will make eating a more enjoyable experience. The peak of marriage is when it is possible to highlight or create new sensations, both in wine tasting and delicacies that pairs with them.

This model contributes to an efficient, socially just, and ecologically sustainable economy. In line with 9 of the 17 SDGs (2, 3, 4, 8, 9, 11, 12, 15, and 17), the present pairing model assumes itself as a relevant interest, also in the sphere of sustainability, highlighting objective 8, “Decent work and economic growth—Promote inclusive and sustainable economic growth, full and productive employment and decent work for all” [68]. Creating jobs creates opportunities, creating a platform for social mobility and thus developing a tool for dignity. SDGs promote sustained economic growth, higher levels of productivity, and technological innovation, as encouraging entrepreneurship and job creation is essential.

3.5. Research Design

This study presents a model for pairing regional wines with regional foods from Algarve. It applied a quantitative and qualitative approach using literature review, and Delphi research complemented the sensory tasting carried out by a group of six experts, two chefs, one maître, one sommelier, one wine expert, and one restaurant/hotel expert, aged between 35 and 46, all male gender. To strengthen the research process with the requirement of knowledge standardization, it was considered that all participants should take a course on the subject. The course “Wines from the Algarve pairing with Regional Dishes” was used. The course was held in an e-learning format, lasting 6 h. The consolidation and leveling of knowledge were validated with the completion of a test with a positive result, carried out online, by each participant. For the pairing experiment, 21 selected recipes and the 3 most popular wines to pair with each of the selected delicacies were tasted by the same group of 6 experts to develop pairing criteria. The responses to the sensory tasting were registered in real-time by applying the third Delphi questionnaire. In each tasting of one delicacy, three wines previously selected by the same experts in the previous questionnaire were tasted. The experts made their assessments without talking to each other. At the end of each tasting, they were asked if they agreed with the results. If any of the experts wanted to change their answer, they could do so.

The Delphi method is appropriate for this study’s objectives. It is a widely used method in scholarly literature. It has been used more than 2600 times between 1975 and 2017, 175 times in scholarly articles in business and management, and 43 times in

leisure and tourism [15]. The experts' answers to the 3rd questionnaire (quantitative and qualitative) were then analyzed using data science techniques, such as data characterization, data visualization, and text mining, to build the food and wine pairing model. The analysis was carried out using Python. The full pairing results were analyzed by visualizing the average rating by wine, wine ranking, and wine type. Since experts were using the same scale, we opted not to apply any normalization technique.

3.6. RTD Questionnaire Application

The Real-Time Delphi (RTD) method [69] consists of a single round process, with permanent updating, whose online questionnaire is the communication tool between the elements of the expert panel, allowing to reduce the application time compared with the traditional Delphi method. In this context, concerning the online questionnaire and according to Afonso et al. [70], it was necessary to develop an adaptation of the LimeSurvey open-source online questionnaire management system to be able to create three RTD questionnaires needed to support the creation of a food-wine pairing model: Questionnaire 1—Selection of typical Algarve delicacies; Questionnaire 2—Selection of Algarve wines for pairing; Questionnaire 3—Marriage between wines and delicacies from the Algarve.

Powel [71] states that the scientific merit for the credibility of the research is based on the quality of the expert panel and the broad consensus reached. Since the combination of delicacies and wines is an awakening of sensations that requires professionalism in the service provided to increase gastronomic satisfaction [39]. The perception of detail is only reached by experts [72]. For this reason, the Delphi technique is a widely used and accepted method for collecting data from respondents within their domain of expertise.

Harrington [39] refers that there is no clear view or explanation of cause and effect in the literature in the choice of pairings between delicacies and wines and points to the existence of redundant and confusing terminology. Due to its maturity and considering the origins of the Delphi method, Skulmoski [73] states that it can be applied to different areas of research, even in unexplored fields, to show the flexibility of the method used in the experiments of other researchers, where it is confirmed that the themes, the number of rounds and the sample size are varied.

The process started with one training session on “Algarve wines and pairings with regional delicacies”, through an e-learning platform, intending to harmonize the information of specialists on the subject. Another session followed this session to select the most popular delicacies (1st RTD questionnaire) and wines to pair with the delicacies previously selected (2nd RTD questionnaire) and seven tasting sessions, each with three delicacies and nine wines (3rd RTD questionnaire). The responses to the 3 RTD questionnaires occurred on the LimeSurvey platform. The tasting sessions were led by an expert who is also a research group member. After the results stabilized at the end of each tasting, the experts were always asked if they agreed with the result or if they intended to change their opinions. Whenever there were no further changes, the process continued for a new tasting.

The most popular delicacies were selected from an online inventory by six experts. Categories of delicacies identified the based served recipes for creating a pairing model. Then, the 21 recipes selected and the 3 most popular wines to pair with each of the selected delicacies were tasted by the same group of 6 experts to develop pairing criteria to be integrated into a computerized pairing model. The responses to the sensory tasting were registered in real-time by applying a third Delphi questionnaire, which includes quantitative and qualitative information.

3.6.1. Application of the First Questionnaire

In questionnaire 1, “Selection of typical Algarve delicacies”, the experts answered the question, “Considering the main ingredient of each delicacy, identify, by family, the most representative of Algarve gastronomy.” In order to facilitate consensus and reflect the added value of applying the RTD method, the list of the 10 most selected delicacies by the experts is available to each expert. The experts used this first questionnaire to select recipes

with greater popularity. The answer to this question was mandatory, and it was necessary to answer at least one item, with no maximum limit of options in each category. However, one in five of the most consensual delicacies were selected for the following questionnaire, with a maximum of two per category. The selection criterion adopted means that only one could be selected in a category with five delicacies. Figure 1 shows the result of the development of questionnaire one and its application.

3.6.2. Application of the Second Questionnaire

The previous questionnaire considered the selection by consensus of 11 dishes from 250 traditional Algarve cuisine recipes, thus ensuring that the delicacies found in this 2nd questionnaire of the study were the most popular among the group of respondents. As a result, this 2nd questionnaire aimed to generate consensus on selecting the most popular and appropriate 28 wines to pair with the 11 delicacies previously selected.

As this was a dynamic process whose objective was to generate consensus, each expert could check in real time how closely their answer matched the rest of the panel. It was possible to change their opinion whenever they want. The question was presented sequentially, attending that each sequence corresponds to a previously selected delicacy, considering the choice of three wines references per delicacy (63). The same wine reference may be repeated for several delicacies if the panel of experts reaches a consensus. In order to facilitate consensus and reflect the added value of applying the RTD method, the list of the ten most consensual wines among the experts is visible to each specialist for each of the delicacies. Figure 2 shows the result of the development of questionnaire two and its application.

3.6.3. Application of the Third Questionnaire

The 3rd and last questionnaire sought to generate consensus on the relationship between the delicacies and the previously selected wines embodied in the RTD model. The questionnaire was prepared in such a way that experts indicate the degree of harmony of each wine with the recommended delicacy through the following question: Considering the relationships obtained in the previous questionnaires, indicate on a scale from 1 to 10, the degree of marriage that you consider appropriate for each one of them.

It was considered proper to obtain quantitative and qualitative data. To obtain the degree of pairing from the experts, a question was used accepting values between 1 and 10, formatted with the possibility of using one decimal place, was used to obtain quantitative data. A free text format was used to obtain complementary qualitative data, with an optional answer, to justify the option taken. To facilitate consensus and reflect the added value of applying the RTD method, the average degree of marriage in all phases of the questionnaire is visible to each specialist (quantitative information) as well as the comments of all experts who agreed to comment on their options (qualitative information).

In this questionnaire, the based served recipes for creating a pairing model were identified by categories of delicacies. Then, the 21 recipes selected and the 3 most popular wines to pair with each of the selected delicacies were tasted by the same group of 6 experts to develop pairing criteria to be integrated into a computerized pairing model. The responses to the sensory tasting were registered in real time by applying this third Delphi questionnaire (see Figure 3).

Selection of Algarve wines to pair with typical Algarve delicacies

You can indicate the amount of wine you want for each delicacy proposed. The 3 most recommended wines for each delicacy will be selected. In order to obtain a possible consensus, your answers can be changed as often as you like, and it is not necessary to complete the questionnaire at once. For technical information about the delicacies and wines, click on the respective designation.

Poultry (Dark Meat)

Taking into account the delicacy of Partridge with clams in the cataplana, select the wine(s) that you consider most suitable for pairing

Response	Score
Convento do Paraíso Red Cabernet sauvignon:	5
Onda Nova Red Alicante bouschet:	5
Helwigus Red Aragonês:	3
Convento do Paraíso Red Sousão:	2
QUÉ Espumante - Reserva Bruto Sparkling Arinto + Chardonnay:	0
JAAP White Chardonnay:	0
Malaca Red Castelão:	0
Herdade Barranco do Vale Rosé Negra mole:	0
Herdade dos Pimentéis Rosé Touriga nacional:	0
Villa Alvor Rosé Moscatel roxo:	0

Select all the options that apply

- Onda Nova | White | Verdelho
- Esquerdino | White | Antão vaz
- Marquês dos Vales – Grace | White | Viognier
- Marchalégua - Vinhas velhas | White | Malvasia fina
- Lacóbriga | White | Moscatel
- Villa Alvor | White | Sauvignon blanc
- João Clara | White | Alvarinho
- JAAP | White | Chardonnay
- Cabrita | White | Arinto
- Paxá - Vinhas velhas | White | Siria (Crato branco, Roupeiro)
- Helwigus | Rosé | Castelão
- Conde de Lippe - Seleção | Rosé | Negra mole
- Villa Alvor | Rosé | Moscatel roxo
- Herdade dos Pimentéis | Rosé | Touriga nacional
- Herdade Barranco do Vale | Rosé | Negra mole
- Onda Nova | Red | Alicante bouschet
- Malaca | Red | Castelão
- Helwigus | Red | Aragonês
- Morgado do Quintão - Clarete | Red | Negra mole
- Monte do Alem - Petit verdot | Red | Petit verdot
- Quinta da Tôr | Red | Touriga nacional
- Convento do Paraíso | Red | Cabernet sauvignon
- Convento do Paraíso | Red | Sousão
- Quinta do Francês - Terraços | Red | Syrah
- Algarmoscatel | Sweet liqueur | Moscatel
- Algar seco | Dry liqueur | Siria (Crato branco, Roupeiro)
- KO | Late harvest | Moscatel + Viognier
- QUÉ Espumante - Reserva Bruto | Sparkling | Arinto + Chardonnay

Previous

Next

Figure 2. Questionnaire 2 “Selection of Algarve wines to pair with typical Algarve delicacies”.

Pairing between wines and delicacies from the Algarve

Considering the relationships obtained in the previous questionnaires, which are presented below, indicate on a scale from 1 to 10, the degree of pairing that you consider appropriate for each one of them.

In order to obtain a possible consensus, your answers can be changed as often as you like, and it is not necessary to complete the questionnaire at once.

For technical information about the delicacies and wines, click on the respective designation.

Poultry (Dark meat)
Partridge with clams in the Cataplana

	Drag cursor to set the degree of pairing	Brief comment on the defined degree of pairing	Comments from all experts
Convento do Paraíso Red Cabernet sauvignon Pairing average degree of all participants 7.56		Convento do Paraíso is best suited to this dish, with no doubt, it was my choice	(2/9) 8: Convento do Paraíso is best suited to this dish, with no doubt, it was my choice ----- (3/9) 8: There is a balance, the wine acidity helps on cleaning the dish's fat
Onda Nova Red Alicante bouschet Pairing average degree of all participants 7.45		It also fits well but it wouldn't be my choice	(1/9) 9: The evolution of wine made it more sane and, as such, I considered it the most suitable for this marriage. Very balanced. ----- (2/9) 9: Good balance
Helwigus Red Aragonês Pairing average degree of all participants 5.29		Thirdly this wine is tired, it's not a good match with the dish	(2/9) 7: Good balance but has a short duration in the mouth ----- (3/9) 6: This wine is already in an advanced state of evolution, showing little capacity on balancing the strong perceptions given by the dish

Previous
Next

Figure 3. Questionnaire 3 “Pairing between wines and delicacies from the Algarve”.

Similar to most expert-based wine rating experiments, as depicted in Figure 4, pairings' ratings varied by expert. Usually, these differences are corrected using a normalization or standardization process [74,75]. However, since experts had to reach a consensus about ratings and rankings of the wines for each food with the RTD method, we opted not to apply any rating normalization technique.

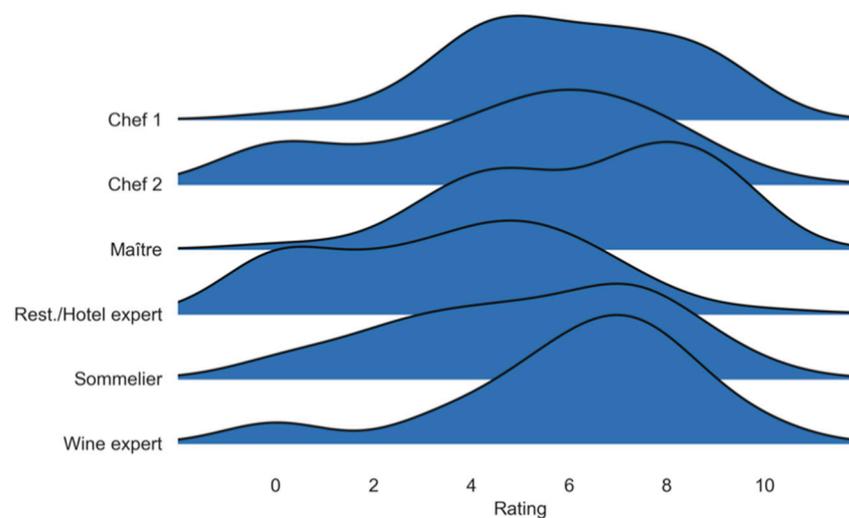


Figure 4. Experts' rating distribution.

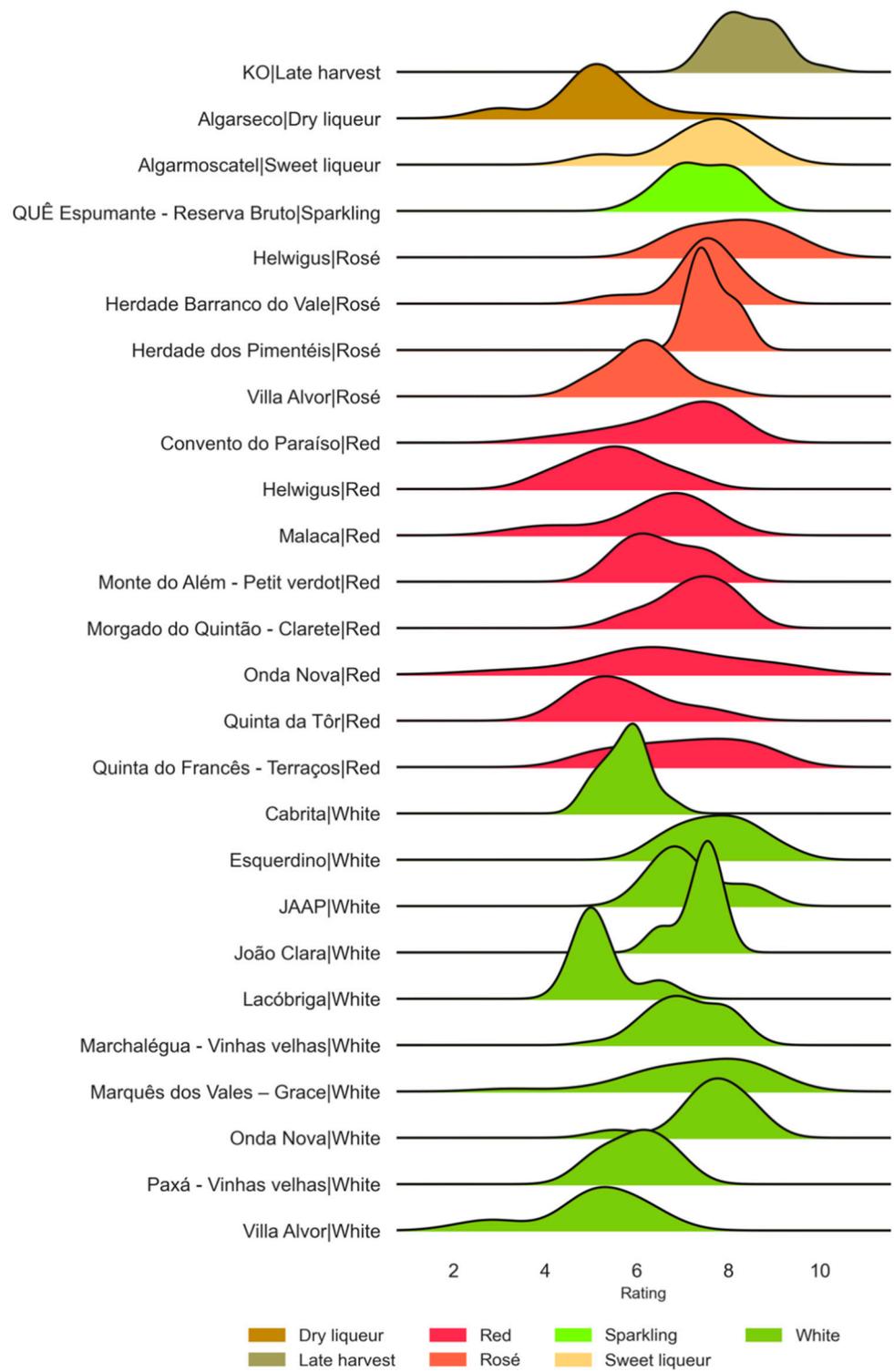


Figure 6. Rating distribution by wine.

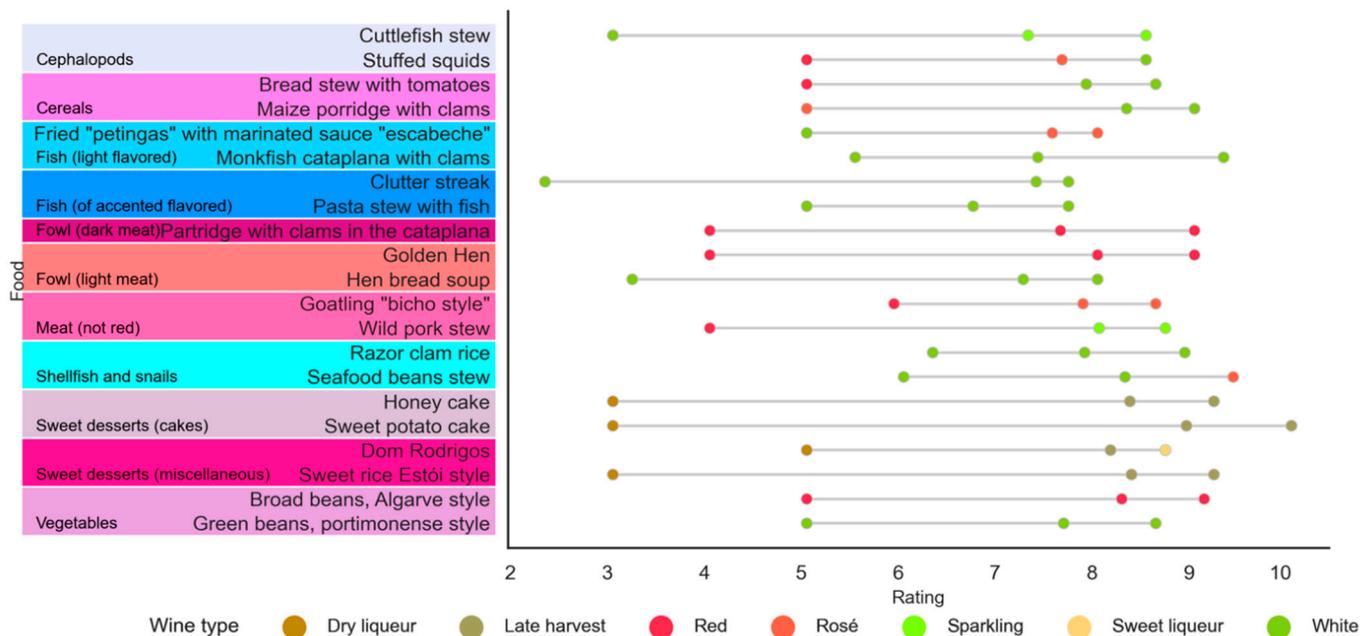


Figure 7. Pairings' range (minimum and maximum ratings) and average rating.

Nevertheless, there were high differences in how experts assessed the quality of the pairing of each dish with the three wines. In some cases, the average rating of the best wine is far from the maximum rating (e.g., Monkfish cataplana). Each expert diversified sensory assessment could explain these differences in pairing ratings, shaped by their background, training, and professional experience [76] or cultural perspective [39].

Not so expected, and infrequent, is when the best wine is not of the same type as the wine that obtained the maximum rating (Stuffed squids and Dom Rodrigues). This differentiation shows that in these cases, the consensus was not unanimous.

Another interesting consideration highlighted by Figure 7 is the high range of ratings of wines of the same type for the same dish (e.g., Clutter streak or Broad beans, Algarve style). Aside from each expert personal preference, these differences in wines ratings could also reveal the heterogeneity of wines quality.

The pairing model, shown in Figure 8, shows the average rating by wine (size of the data point), the ranking position of the wine (outline width), and the wine type (data point color) simultaneously. The grouping of food by category and wines by types fosters the comparison of results between food categories and wine types. This visualization promotes two types of readings. Horizontal reading allows the comparison between the average ratings and the ranks of the three wines evaluated for each dish. Vertical reading allows the identification of how many dishes each wine was evaluated with, the average rating in each of the evaluations, and the ranking positions obtained by each wine.

As reflections from horizontal reading indicate, (1) not all dishes had the same pairing quality. It is possible to see that for some dishes, the average rating of the best-ranked wine was smaller than the vast majority of pairings' ratings (e.g., Fried "petingas" with marinated sauce "escabeche"); (2) while in some dishes, all wines had similar average ratings (e.g., Goatling "bicho" style), others (e.g., Clutter streak) and very dissimilar average ratings; (3) although there were some exceptions (Fried "petingas" with marinated sauce "escabeche" or Goatling "bicho" style) where Rosé wine was classified as the best choice, the "cultural pairing" indicating that red wines are better for meat and white wines for fish [76] seemed to be still in effect.

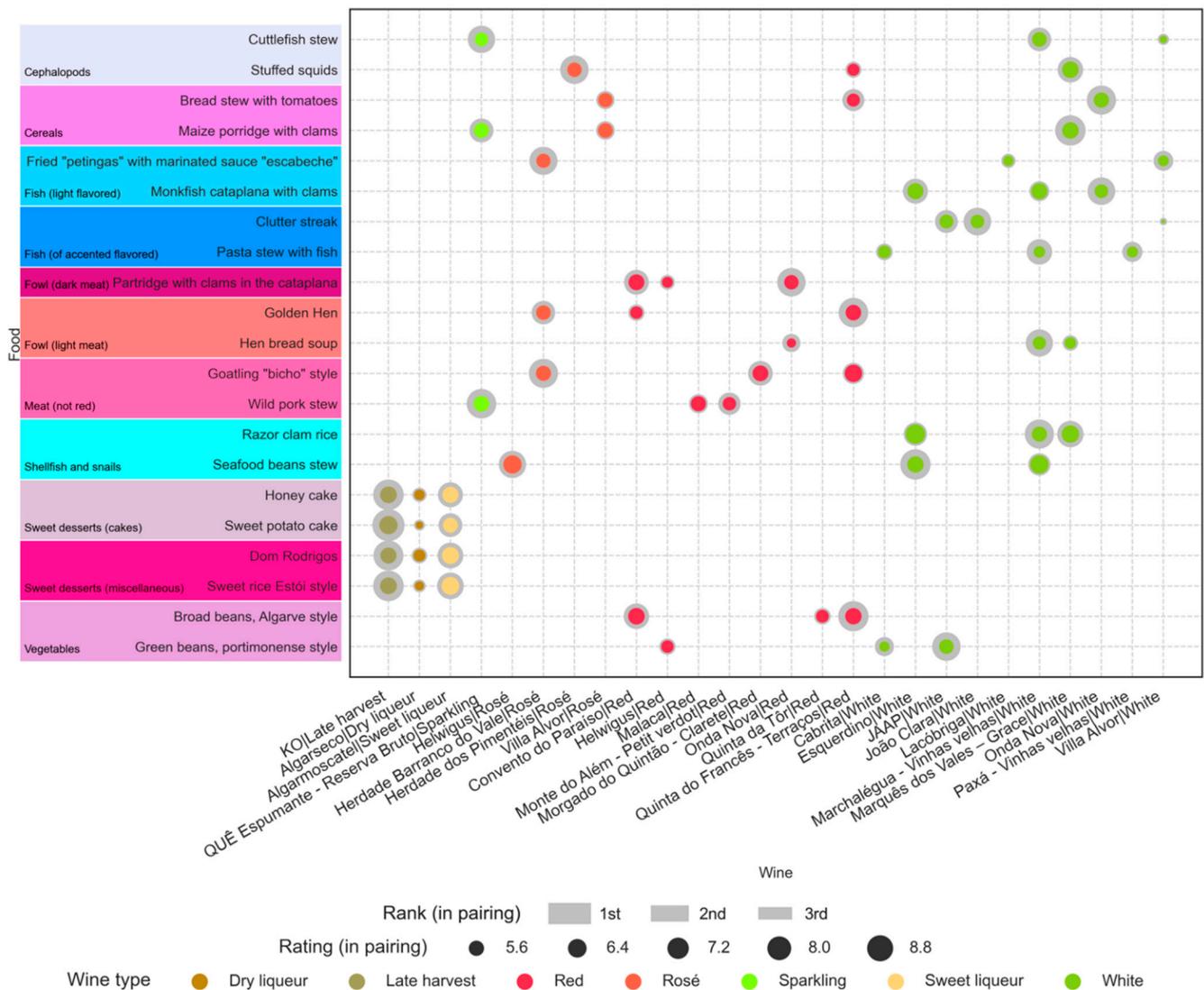


Figure 8. Full model results.

As considerations from vertical reading reveal, (1) while some wines were used in multiple pairings (Marchalégua—Vinhas velhas | White in six dishes or Quinta do Francês—Terracos | Red), others were solely employed in one only pairing (e.g., Helwigus | Rosé or Lacóbriga | White). This difference in the number of pairings makes the comparison between wines' quality difficult, in particular, with wines only assessed in one pairing; (2) while some wines showed good ratings in all pairings (e.g., KO | Late harvest or Esquerdino | White), others showed low ratings in all pairings (e.g., Algarseco | Dry liqueur). This consistency of low or high ratings can be helpful in two ways. Consistent low ratings alert consumers and experts of the wine's low quality or difficult pairing, while high ratings indicate consumers and experts that the wine has good quality; (3) some wines had good average ratings with different types of food. Though not consistently the best wines in terms of pairing with the dish, these are versatile wines that have are a good match on most occasions. For example, Marchalégua—Vinhas velhas | White or Herdade Barranco do Vale | Rosé; (4) in general, Algarve red and rosé wines tended to have lower ratings than white wines. This tendency may indicate that the quality of these types of wines in the Algarve still has some margin to progress.

Figure 9 shows an aggregated perspective of the food pairing by depicting the average ratings by wine type for each food category instead of a dish. This type of visualization

facilitates the selection of wine type to the food category. In it, it is possible to see that (1) Algarve white and rosé wines had high versatility, combined with good ratings, respectively, with seven and six dishes; (2) although Algarve red wines showed some versatility in pairing with different dishes, they had lower average ratings than white and rosé wines; and (3) sparkling wine combined only with three types of dishes: cephalopods, cereals, and meat (not red). However, ratings in these pairings were good. As such, Algarve Sparkling wine should also be a good recommendation for these types of dishes.



Figure 9. Aggregated model results.

5. Conclusions

The application of RTD in three questionnaires for experts to pair Algarve regional wines with regional foods proved to be an excellent method to create a regional food pairing model. The resulting model in its detailed and aggregated form will be communicated to tourism professionals and the general public. The promotion of this model will foster the consumption of these pairings, which are regional products. By allowing tourists to experience local quality products, the promotion of this pairing model contributes to a better touristic experience and stimulates the circular economy in tourism. Since these are regional products, they are produced and commercialized by regional companies and individuals. This proximity between the place of production and consumption generates a more efficient, environmentally friendly, socially fair, and sustainable local economy.

This study makes important academic contributions as follows:

1. It confirms that experts' personal preferences diverge in food pairing but shows DRT is an excellent method to help experts reach a consensus;
2. It introduces a visualization method that enables the analysis of food pairing in different dimensions in a short amount of space;
3. It defines a framework that other researchers can employ to build similar models in other regions;
4. It presents a pairing model that can be used as a pedagogical tool.

This study also makes important industry contributions as follows:

1. It provides regional practitioners, i.e., food and wine experts, the best pairing combinations of regional dishes and wines. Restaurants, for example, can use this information to promote regional gastronomic experiences to tourists as well as to locals;

2. It enables wine producers to understand which type of wines are adequate for the different dishes and which require extra effort in quality improvement (e.g., red wines still have some margin to progress);
3. It shows that it is possible to find an Algarve wine that is adequate for all the typical dishes.

Similar to all studies, our study also has limitations. The number of dishes per category was not equal. One category (Fowl–dark meat) was composed of one dish only. Futures studies should try to have at least two dishes per category to avoid considerations about wine suitability to a category based on a sole dish pairing. A similar limitation was that some wines were only paired with one dish. As such, the assessment of the general quality of the wine was based on one only pairing. Of course, the wine was paired with only one dish because questionnaires 1 and 2 so dictated. However, that should be avoided. If necessary the number of wines paired with each dish in the third questionnaire should be increased (for example, from three to six).

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