UNIVERSIDAD DE SANTIAGO DE CHILE

R I V A R

Vol. 10, nº 30, 213-232, setiembre 2023 | ISSN 0719-4994
Artículo de investigación
https://doi.org/10.35588/rivar.v10i30.5842

Produce or Not Produce Certified Foods? An Exploratory Analysis from Portugal*

¿Producir o no producir alimentos certificados? Un análisis exploratorio desde Portugal

Teresa Forte, Elisabete Figueiredo, Celeste Eusébio and Manuel Luís Tibério[1]

Abstract

The certification of origin and quality of rural provenance foods paves routes of protection and promotion of the products and the territories. While the importance of certification at socioeconomic, policy, and consumption levels has been addressed in previous research, the views of other key stakeholders—the producers—remain somehow underexplored. The present study contributes to this topic by analyzing data from a survey of producers (n=104) working with urban specialty shops located in three Portuguese cities. The sample was examined considering the differences between those who produce certified food products (n=74) and those who do not (n=30). Chi-square tests were used to compare the socio-demographic features, type of products produced and selling venues. Independent samples T-tests were applied to compare the differences between producers' motivations, perceived challenges, and impacts of the production. Findings indicate that producers of certified products have distinct motivations, and value different aspects of their productions, namely to contribute to sustainable and healthier production and consumption and to the preservation of local and traditional ways of producing. They also perceive more positive economic impacts on rural places of provenance and tend to value more the Portuguese food products' image.

Keywords: rural provenance foods, food certification schemes, food producers, impacts of production.

Resumen

La certificación de origen y calidad de los alimentos de origen rural abre camino a la protección y promoción de productos y territorios. Mientras la importancia de la certificación a nivel socioeconómico, político y de consumo se ha analizado ya abundantemente, los puntos de vista de otros actores-clave —los productores— permanecen poco explorados. Este estudio intenta contribuir a este tema analizando datos de una encuesta a productores (N= 104) que trabajan com tiendas urbanas especializadas situadas en tres ciudades portuguesas. La muestra se analizó teniendo en cuenta las diferencias entre los productores de productos certificados (N= 74) y aquellos que no los producen (N= 30). Se utilizaron pruebas de Chi-cuadrado para comparar las características sociodemográficas, tipo de productos

1 Teresa Forte: Universidade de Aveiro, Aveiro, Portugal, ORCID 0000-0003-3817-7410, teresaforte@ua.pt; Elisabete Figueiredo: Universidade de Aveiro, Aveiro, Portugal, ORCID 0000-0001-7170-3369, elisa@ua.pt; Celeste Eusébio: Universidade de Aveiro, Aveiro, Portugal, ORCID 0000-0002-2220-5483, celeste.eusebio@ua.pt; Manuel Luís Tibério: Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal, ORCID 0000-0001-5489-7368, mtiberio@utad.pt

producidos y locales de venta, y pruebas T de muestras independientes para comparar las diferencias entre las motivaciones de los productores, impactos y desafíos percibidos. Los resultados indican que los productores de productos certificados tienen motivaciones distintas y valoran diferentes aspectos de sus producciones, como su contribución para una producción y consumo más sostenible y saludable, junto a la preservación de las producciones tradicionales. A su vez, perciben impactos económicos más positivos en los lugares de origen y valoran más la imagen de los productos portugueses.

Palabras clave: productos agroalimentarios de origen rural, sellos de certificación alimentaria, productores de alimentos, impactos de la producción.

Recibido: 17/11/2022 Aprobado: 10/03/2023 Publicado 24/09/2023

Introduction

A differentiative trend of food production and consumption of certified products has progressively grown over the last decades, benefiting from the combination of an agroindustry model with specific local and re-embedded alternative networks and shorter food supply chains (e.g. Renting *et al.*, 2003). The increasing trends and strategies for the certification of rural provenance foods prompted multidisciplinary research focused on how these products are contributing to the invigoration of rural-urban connections and rural territories' attractiveness and sustainable development (Bowen and De Master, 2011). The more consolidated national experiences of applying food quality labels show that they may add value to the products, raise sales, and enhance competitiveness whilst creating more resources for rural communities (Bowen and De Master, 2011; DeSoucey, 2010; Pellin *et al.*, 2016). Acting as important routes to recover and revalue practices of production and traditional knowledge (Fonte, 2008), they also contribute to prevent their obliviousness and may be regarded as potentially guaranteeing a fair income for producers, equivalent to the quality of their productions, and fostering local development especially combined with other rural activities and assets (Van der Ploeg and Roep, 2003).

An ongoing effort to attract producers to adhere to those labels, providing information and support while advocating for its importance exists, at the same time recognizing that little is known about their views and motivations towards these certification schemes. Despite the diversity of stakeholders engaged in these foods' supply chains—decision-makers, producers, distributors, retailers, and consumers—the focus of research has been mainly on the analysis of the policy strategies, as well as on the consumers' perceptions and preferences (e.g. Figueiredo *et al.*, 2022; Velčovská, 2016). Therefore, the nuclear role of producers and their motivations to engage in the production of certified food products remains underexplored.

The present study aims to contribute to this topic based on data collected through a survey of 104 producers that supply specialty food stores located in three Portuguese cities (Aveiro, Lisbon, and Porto). Specifically, it investigates the differences between producers of officially certified and not certified food products considering the type of products produced; the characteristics of producers and enterprises; their motivations and the main perceived impacts, and challenges associated to production. Although exploratory, this analysis is especially relevant in Southern European countries, such as

Portugal, in which the number and variety of certified food products tends to be higher. Within the European Union (EU), Portugal ranks fourth regarding the variety and the number of certified foods, preceded only by Italy, France and Spain. In 2021, there were 94 PDO, 86 IGP, and 2 TSG products in the country. Wine was the pioneer, followed, among others, and especially from 2007 onwards, by olive oil, cheese, cured meat related products, vegetables, fruits, and honey (Pellin *et al*., 2016).

Literature review

From the 90s' onwards, the rural development component of the EU Common Agricultural Policy (CAP) has advocated for the potential of differentiating quality from conventional, industrial, and massified food products on a regional or national basis (Bureau and Valceschini, 2003). As Figueiredo (2021) refers, the growing trends of food certification schemes over the last decades are also closely related to a series of food crises (e.g. Foot and Mouth Disease or BSE – Bovine Spongiform Encephalopathy) and to the changes in consumers' awareness of environmental, safety and health issues they induced. EU regulations on food quality are also associated with the principle of multifunctionality (as defined within the CAP) (Bowen and De Master, 2011) aiming to contribute to promote rural development and protect agricultural heritage and traditional productions within increasing globalized food production and consumption scenarios (Bardone and Spalvēna, 2019; Renting *et al*., 2003). Created in 1992, these regulations aimed at promoting and protecting foodstuffs with specific and traditional geographical origins, including labels such as Protected Geographical Indications (PGIs), Protected Designations of Origin (PDOs), Traditional Specialty Guaranteed (TSG), and, later, Organic (e.g. Amilien and Hegnes, 2013; Bardone and Spalvēna, 2019).

Quality schemes' symbolic and intangible appeal is paired with potential benefits to farmers' income and promotion of agricultural and rural development (e.g. Bureau and Valceschini, 2003; Bardone and Spalvēna, 2019; Bowen and De Master, 2011; DeSoucey, 2010, Fonte, 2008; Van der Ploeg and Roep, 2003). Although such strategies may reinforce the commodification of rural territories of origin through processes of *heritagization* and *patrimonialization* based on food (Bardone and Spalvēna, 2019; Figueiredo, 2021), fostering a romanticized and nostalgic vision of rural territories oblivious of producers and farmers' challenges and difficulties (Bowen and De Master, 2011; Figueiredo, 2021), they may also represent an opportunity for rural territories to (re)gain economic control and (re)value themselves, as well as for producers to find a productive place within the post-productive rural (Bowen and De Master, 2011; Figueiredo, 2021).

Despite the recognized benefits for producers and rural territories, food certification schemes are not without polemic, mainly due to their impacts on raising production costs—especially harder for small or medium-sized producers (Bureau and Valceschini, 2003)—and targeting consumers with higher incomes. On the other hand, despite their role as ambassadors of provenance, attributes and production processes being widely acknowledged (Tregear *et al*., 2007), there is a lot of debate revolving, for example, the conceptual boundaries in defining the typicality and traditional character of the products (e.g. Amilien and Heghnes, 2013; Bardone and Spalvēna, 2019); issues with the access and processes of certification alongside the unintended political and ethical issues emerging from the clash between typical ways of production and the contemporary

standards and concerns with ethical production and animal welfare (DeSoucey, 2010). Notwithstanding, labels of origin and quality are a kind of intellectual property of territories (Bardone and Spalvēna, 2019) that mirror specific regional biophysical conditions and the territorialized knowledge of producers, transmitted intergenerationally (DeSoucey, 2010; Fonte, 2008). Henceforth, the EU food certification strategies also embeds the food products with a sense of national identity, revaluing them as a fundamental part of national diets, heritage, and authenticity (Belletti and Marescotti, 2011) and as proxies of specific national patrimony and culture. This is in line with the concept of *gastronationalism* proposed by DeSoucey (2010), reflecting both the emotional connection through food to one's country and the tensions that may exist between nations over traditional foods related to different, or even irreconcilable, values, practices and ways of producing.

Being quality schemes devices of communication for and between producers, retailers, and consumers, their value also depends on how these stakeholders perceive them (Hartman *et al*., 2018). While there is a bulk of research dealing with consumers' representations and attitudes towards food quality schemes and safety (e.g. Velčovská, 2016), the producers' views have been persistently overlooked. The few studies addressing how producers decide to enroll in food certification schemes demonstrate the major relevance of the economic benefits perceived (Velčovská, 2016). These are connected with the producers' perceptions of the high value consumers attribute to those products that—as Demartini *et al.* (2017) and Ilbery and Kneafsey (2000) note—may even surpass the relevance of other producers' motivations, including business management and market and prices related motives. This pairs with the producers' belief that having a trustworthy and loyal relationship with the consumers will influence the continued purchase and the willingness to pay a higher price for those products (Ilbery and Kneafsey, 2000).

Interestingly, as examined by Hartman *et al.* (2018) and—for the Portuguese case—Rodrigo *et al.* (2015) and Tibério and Diniz (2012), certification schemes and their specificities remain relatively unknown for the majority of the public, including the consumers. As Bentivoglio *et al.* (2019) refer, this lack of information about the different certification schemes, products, and related requirements may be extended to the producers themselves and even hamper their decision to produce certified foods. Coyne *et al.* (2021) concluded that the geographical location of the farms, their size, the synergies with other producers and the financial issues may also act as motivators or barriers, paired with personal attitudes and interest regarding environment conservation, preservation of traditional ways of doing and cultural identities related to food. The latter motivations seem to be in line with the notion of the "good farmer" identity (Silvasti, 2003; Burton *et al*., 2021) shared by farmers and other food producers who are environmentally and socially concerned, often combining the pride associated with traditional food production with the avoidance of harming practices and environmental concerns (Burton *et al*., 2021). Additional problematic issues regarding producers' engagement in food certification schemes are related to the competition in a market with too many of those products and the higher investment to abide by the EU regulations, especially seen as extra challenges for small and medium producers (Bentivoglio *et al.,* 2019; Pellin *et al*., 2016). To these, Rodrigo *et al.* (2015) add the complex bureaucracy processes, the costs, and the lack of knowledge and information as critical barriers to the producers' adhesion to such schemes.

Methods

Data collection

To analyze the motivations and views of food producers regarding certification schemes a survey was conducted with the producers supplying 9 specialty food stores located in three Portuguese cities: Aveiro (2), Lisbon (2), and Porto (5). The questionnaire, including the categories used in the Likert scales to measure producers' perceptions and motivations, was elaborated based on the literature review (Bowen and De Master, 2011; Figueiredo, 2021; Fonte, 2008; Ilbery and Kneafsey, 2000; Kneafsey *et al.*, 2017). The categories of food products and types of selling venues were created based on Silva *et al.* (2021). The shops were contacted to provide a detailed list of the producers supplying them with Portuguese rural provenance (certified or not) food products, resulting in 134 contacts. All these 134 producers were contacted by phone to check on their availability to participate in the study. 104 (77.4% of the total) agreed to participate. Data was collected from July 2021 to January 2022, through phone calls to accommodate the Portuguese government restrictions motivated by the COVID-19 pandemic. Although the survey targeted other dimensions related to the aims of a wider project,[2] the present paper focuses on the differences between the producers of certified and non-certified products regarding their motivations, their perception of the impacts and challenges related to the production, and the relevance attributed to certification schemes.

Data analysis

The sample was divided according to the responses to the dichotomic question: "*Do you produce products of certified origin?*". This procedure resulted in one group of producers that produces certified foods (n= 74 – 71.2%) and another group that does not (n= 30 – 28.8%). Data was analyzed using the software SPSS, version 25 (IBM, USA). Chi-square tests were used for analyzing the differences between the two groups regarding qualitative variables (e.g. sociodemographic features, such as age, gender, economic status; the type of products produced and the main selling venues). To analyze the differences regarding the motivations to produce, the perceived impacts, and the challenges related to food production (assessed through Likert scale questions—from 1 "less important" to 5 "more important") independent sample T-tests were used.

Results and discussion

Sample profile

The sample of 104 producers was analyzed considering two groups: those who produce certified foods and those who do not. Table 1 displays the differences and similarities regarding respondents' sociodemographic profile.

2 *STRINGS - Selling the Rural IN (Urban) Gourmet Stores – establishing new liaisons between town and country through the sale and consumption of rural products* (PTDC/GES-OUT/29281/2017/ POCI-01-0145-FEDER-029281). In https://www.stringsproject.pt/ (consulted 07/09/2023).

Table 1. Sociodemographic profile of producers
Tabla 1. Perfil sociodemográfico de los productores

Sample profile*	Total		Produce products of certified origin		Chi-square test	
	N	%	Yes (N=74, 71.2%)	No (N=30, 28.8%)	Value	p-value
Characteristics of respondents						
Gender						
Male	68	65.4	**73.0%**	46.7%	**6.527**	**0.011**
Female	36	34.6	27.0%	53.3%		
Age						
< or = 40 years old	25	24.0	23.0%	26.7%		
[41 – 60 years old]	68	65.4	64.9%	66.7%	0.741	0.690
= or > 71 years old	11	10.6	12.2%	6.7%		
Marital status						
Married/cohabiting	84	80.8	81.1%	80.0%	0.016	0.899
Other	20	19.2	18.9%	20.0%		
Education level						
Higher education	62	59.6	63.5%	50.0%	1.619	0.203
Other	42	40.4	36.5%	50.0%		
Monthly household income						
< 2201€	33	39.3	30.5%	**60.0%**		
[2201-3000€]	27	32.1	33.9%	28.0%	**7.499**	**0.024**
> 3000€	24	28.6	**35.6%**	12.0%		
Characteristics of the producer						
Type of activity**						
Farming	62	59.6	**77.0%**	16.7%	**32.303**	**0.000**
Animal husbandry	14	13.5	**17.6%**	3.3%	a)	
Food processing	83	79.8	79.7%	23.1%	0.010	0.975
Type of farm/enterprise						
Individual	34	32.7	31.1%	36.7%		
Family	21	20.2	21.6%	16.7%	2.103	0.551
Cooperative	9	8.7	10.8%	3.3%		
Enterprise	40	38.5	26.0%	12.5%		

*Percentage in column. Values in bold correspond to the highest values when statistically significant differences exist. **Only the values corresponding to "yes" are presented. a) The assumptions of Chi-square test were not observed. Source: own elaboration. *Porcentaje en columna. Los valores en negrita corresponden a los valores más altos cuando existen diferencias estadísticamente diferentes. **Solo se presentan los valores correspondientes a "sí". a) No se observaron suspuestos de la prueba Chi-cuadrado. Fuente: elaboración propia.

Overall, the sample includes substantially more male than female producers, reflecting the distribution of Portuguese farmers. Compared to these, our sample is, however, younger and with higher education levels, mainly in agriculture-related areas. Most of the respondents are married or cohabiting, with a monthly household income of less than 2001€. The majority frequently combine farming, and animal husbandry with food processing activities.

Some interesting differences exist between the two groups of respondents. Producers of certified foods are more likely to be male, with higher income levels, and to be enrolled in farming and animal husbandry activities. They are also more likely to be integrated into family enterprises, which seem to facilitate the investment in the necessary changes and requirements to adhere to certification schemes (e.g. Pellin *et al.*, 2016). In our sample respondents with lower income are more likely to not produce certified products, which is in line with Rodrigo *et al.* (2015), highlighting the difficulties of smaller producers to support the costs associated with the adaptation of productions to the quality schemes regulations.

Type of products produced

When comparing both groups of respondents regarding the type of products produced (Table 2), wine and olive oil are, respectively, much more likely to be produced by producers of certified products. Despite no significant statistical differences were found regarding the other types of products, the majority (especially liquors, cakes, cookies and biscuits and, up to a lesser extent, cheese) rank higher in the group of producers not producing certified products. Amongst certified products' labels, Organic (59.3%) and PDO (28.8%) are the most frequent, contrasting with the little representation of the PGI label (1.6%).

Table 2. Type of products produced
Tabla 2. Tipo de productos producidos

Products produced*	Total		Produce products of certified origin		Chi-square test	
	N	%	Yes (N=74, 71.2%)	No (N=30, 28.8%)	Value	p-value
Wine	30	28.8	**40.5%**	0.0%	**17.093**	**0.000**
Olive oil	29	27.9	**36.5%**	6.7%	**9.439**	**0.002**
Vegetables	23	22.1	25.70%	13.30%	1.888	0.169
Liquors and other beverages	17	16.3	14.9%	20.2%	a)	
Honey, jams and preserves	16	15.4	14.9%	16.7%	a)	
Fruit	15	14.4	18.9%	3.3%	a)	
Cheese	10	9.6	8.1%	13.3%	a)	
Cured meat and other meat products	10	9.6	9.5%	10.0%	a)	
Cakes, cookies and biscuits	7	6.7	1.4%	20.0%	a)	
Vinegar	5	4.8	5.4%	1.0%	a)	
Bread and other cereal based products	2	1.9	1.4%	3.3%	a)	
Other milk products	1	1.0	0.0%	3.3%	a)	

*Percentage in column, only the values corresponding to "yes" are presented. Values in bold correspond to the highest values when statistically significant differences exist. a) The assumptions of Chi-square test were not observed. Source: own elaboration. *Porcentaje en columna; solo se presentan los valores correspondientes a "sí". a) No se observaron suspuestos de la prueba Chi-cuadrado. Fuente: elaboración propia.

The distribution of our sample partially reflects the more common types of quality labeled products in the Portuguese context. Wine includes 12 national-based certified products (CDO), 19 PDO products, and 13 Organic. For olive oil, the majority is labelled as

Organic (overall 33 products produced) followed by PDO (with 14 products) which is coherent with the importance of both these labels in the Portuguese production of olive oil.

Relevance of certification

The relevance attributed to certification schemes and related processes (Table 3) cannot be compared between the two groups, since only three producers of non-certified products replied to this question. Notwithstanding, it is possible to examine the importance of quality labels for those producers who choose to enroll in these certification schemes. Results indicate a clear valorization of consumers-related aspects, such as the higher demand for certified products (ranked 1st), the perception that certification benefits consumer choices (ranked 3rd), the higher price of certified products paying off (ranked 6th) and being easier to sell certified products (ranked 7th), although some of these aspects also evince a focus on the economic benefits brought by quality labels. These results are in line with the conclusions of Demartini *et al.* (2017), Ilbery and Kneafsey (2000), and Velčovská (2016) regarding the producers' main desire to meet consumers' perceived needs and wants, that seems to surpass other motivations such as market and prices related ones.

Table 3. Relevance attributed to certification schemes
Tabla 3. Relevancia atribuida a los esquemas de certificación

Importance of certification*	N	Mean
Certification benefits local producers	72	4.28
Certification contributes to preserve traditional ways of production	74	4.09
Certification processes follow strict rules	74	4.18
Certification guarantees higher quality of the products	74	4.04
Certification guarantees rural products' safety	74	4.16
Certification contributes to enhance biodiversity and environmental sustainability	74	4.31
Certification processes are duly supervised	74	4.24
The higher price of certified products pays off	74	4.23
Certification contributes to the protection of regional culture and identity	74	4.18
There is a higher demand for certified products	74	4.32
It is easier to sell certified products	74	4.2
There is a higher offer of certified products	74	4.19
Certification benefits consumer's choice	74	4.30
Certification is the only way to attest a local/regional quality production	74	3.92

*Items classified in a five-point type Likert scale from 1 "less important" to 5 "more important". Source: own elaboration. *Items clasificados en una escala de cinco puntos desde 1 "menos importante" hasta 5 "más importante". Fuente: elaboración propia.

The second most valued dimension relates to the perceived benefits of certification for biodiversity and sustainability. As in the studies of Bentivoglio *et al.* (2019) and Coyne *et*

al. (2021), our results show the valorization of the connection between products' quality and the biophysical features of the territories of origin, paired with the specific ways of local food production and processing. As Table 3 shows, the contribution of quality labels for the preservation of these traditional ways of production and the protection of regional food cultures and identities is also highly valued by the respondents. This elicitation of heritage, identity, pride, belonging, special character, and symbolic capital (Figueiredo, 2021; Tregear *et al.,* 2007) resonates with important affective and emotional cues followed by consumers' food choices (e.g. Figueiredo *et al.*, 2022) probably reinforcing producers' perception about the higher demand and consumers' interest for products with these features. These producers' perceptions also reflect environmental and sociocultural concerns, as well as the acknowledgment of their individual responsibility to act upon them, clearly in line with the "good farmer" notion and identity, proposed by Silvasti (2003) and Burton *et al.* (2021).

The third higher ranked dimension relates to the perceived benefits of certification schemes for the producers, suggesting that the demand side is intertwined with the benefits from the supply part of which they are representatives. This is also linked to the perception that the higher price of certified products pays off, showing an agreement with the economic benefits derived from the adhesion to quality labels. Coherently with their choice to produce certified products, respondents also consider that certification processes are properly supervised, according to strict rules, overlooking the difficulties pointed out by Bentivoglio *et al.* (2019), Pellin *et al.* (2016) and Rodrigo *et al.* (2015). Interestingly, the consideration that certification contributes to the safety and quality of the products—an aspect highly valued by the consumers (e.g. Belletti and Marescotti, 2011)—is the least important aspect for the producers, suggesting that quality and safety are not seen as contingent or exclusively dependent on EU quality labels, but part of a long-lasting tradition and relationship with territories and ways of doing (as in Fonte, 2008), as well as of familiarity with local and regional foods (e.g. Figueiredo *et al.*, 2022). Finally, respondents also value the fact that there is a higher offer of certified products (ranked 8th), coherent with the perception that they have to compete in a market with perhaps too many food products with quality labels which is often considered—according to Bentovoglio *et al.* (2019) and Velčovská (2016)—as a barrier to enroll in such schemes.

Main selling venues

Due to the sample selection procedures described before, all the food producers surveyed sell their products (certified or not) to urban specialty stores (Table 4). This is followed by direct selling to consumers, to restaurants, and supermarkets and/or hypermarkets. Traditional products fairs and organic markets, albeit much less, are also among the selling venues, together with other producers, farmers' markets, and cooperatives.

Table 4. Selling venues
Tabla 4. Locales de venta

Selling Venues*	Total		Produce products of certified origin		Chi-square test	
	N	%	Yes (N=74, 71.2%)	No (N=30, 28.8%)	Value	p-value
Urban specialty or gourmet stores	104	100.0	100.0%	100.0%		
Directly to the consumer	78	75.0	71.6%	83.3%	1.562	0.211
Restaurants	67	64.4	66.2%	60.0%	0.360	0.549
Supermarkets or hypermarkets	63	60.6	59.5%	63.3%	0.134	0.714
Traditional products fairs	16	15.4	14.90%	16.70%	a)	
Organic markets	11	10.6	13.5%	3.3%	a)	
Another producer	9	8.7	8.1%	10.0%	a)	
Farmers markets	6	5.8	6.8%	3.3%	a)	
Cooperatives	3	2.9	2.7%	3.3%	a)	

*Percentage in column, only the values corresponding to "yes" are presented. Values in bold correspond to the highest values when statistically significant differences exist. a) The assumptions of Chi-square test were not observed. Source: own elaboration. *Porcentaje en columna, solo se presentan los valores correspondientes a "sí". Los valores en negrita corresponden a los valores más altos cuando existen diferencias estadísticamente diferentes. a) No se observaron suspuestos de la prueba Chi-cuadrado. Fuente: elaboración propia.

As shown, there were no significant differences between the producers of certified and non-certified foods, and therefore one cannot infer up to what extent the regional and interregional production systems, the type of markets targeted and the perceived demands and requests from consumers and retailers play a role in choosing to produce certified food products. Nevertheless, results suggest a dynamic and diversified participation of the producers in the supply chain, rarely sourcing for just one venue.

Motivations to produce

The motivations for food production are varied and, in many cases, quite distinct for those who produce certified foods and for those who do not (Table 5). However, the main motivation for both groups is the interest in stimulating the production of specific products, which relates to the contribution to developing national productions and dissemination of traditional products. Other common motivations to both groups relate to economic aspects (e.g. creating employment, having economic stability, and contributing to rural communities' economy), the continuity of family activities, innovating in the production processes, offering alternatives to industrial foodstuffs, and identifying a market niche. The least valued motivations (contribution to reduce rural-urban asymmetries, to have tax benefits, and benefit from State incentives to the production) are equally found in both groups.

The differences between those producers adhering to food quality labels and those who do not are, therefore, mainly related to environmental and sustainability issues, that, at a more individual and social-oriented level, are particularly held by producers of certified food products. To be in contact with nature and to have a higher quality of life may be seen as personal motivations to produce those products, while the concerns and the

desire to contribute to food and environmental sustainability, a healthier food offer and the dissemination of organic productions are clearly related to environmental and social-oriented values. In the same vein, the preservation of traditional practices and processes of production may be placed amongst producers' social-oriented concerns and values.

Table 5. Motivations to produce
Tabla 5. Motivaciones para producir

Motivations to produce food products*	Total		Produce products of certified origin		T-test	
	N	Mean	Yes (N=74, 71.2%) Mean	No (N=30, 28.8%) Mean	Value	p-value
Environmental motivations						
To be in contact with nature	104	3.73	3.95	3.20	3.657	0.000
To contribute to food sustainability	104	3.68	3,82	3.33	2.275	0.025
Contribute to disseminate organic productions	104	3.67	3.93	3.03	4.162	0.000
To contribute to environmental sustainability	104	3.63	3.77	3.27	2.339	0.021
Preservation of traditional products and ways of doing						
To stimulate the production of a given product	104	3.80	3.80	3.80	-0.013	0.989
To contribute to develop national production	104	3.37	3.43	3.20	1.125	0.263
Contribute to disseminate traditional productions	104	3.33	3.32	3.33	-0.040	0.968
To preserve traditional practices and processes	104	3.26	3.31	3.13	0.823	0.413
Consumers health motivations						
To contribute to a healthier food offer	104	3.68	3.89	3.17	3.581	0.001
To offer an alternative to industrial products	104	3.35	3.49	3.00	2.200	0.030
Enterprise or self-motivations						
To have higher quality of life	104	3.66	3.80	3.33	2.353	0.021
To continue family activity	104	3.60	3.68	3.40	0.925	0.357
To innovate in production processes	104	3.54	3.59	3.40	0.941	0.349
Identification of a market niche	104	3.52	3.64	3.23	1.737	0.085
To have economic stability	104	3.43	3.43	3.43	-0.004	0.997
Tax benefits	104	2.47	2.50	2.40	0.423	0.673
State incentives	104	2.38	2.39	2.37	0.110	0.913
Socioeconomic motivations						
To create employment	104	3.54	3.59	3.40	0.912	0.364
To contribute to rural communities' economy	104	3.39	3.45	3.27	0.923	0.358
To contribute to reduce rural-urban asymmetries	104	3.23	3.27	3.13	0.681	0.497

*Items classified in a five-point type Likert scale from 1 "less important" to 5 "more important".
Source: own elaboration. *Items clasificados en una escala de cinco puntos desde 1 "menos importante" hasta 5 "más importante". Fuente: elaboración propia.

These findings align with the conclusions of Coyne *et al.* (2021) on the personal attitudes of producers and their interest in environmental preservation and sustainability promotion. They are also coherent with the most valued aspects of certification schemes by this group of producers—the contribution to enhance biodiversity and sustainability (Table 3). Both are inscribed in the already discussed "good farmer" identity, placing farmers and food producers with environmental and social-oriented values and concerns under a common identity with similar responsibilities (Silvasti, 2003; Burton *et al.*, 2021). The "good farmer" identity, as our findings reveal, seems therefore to match producers of certified products, highlighting their characteristics, values, and own intrinsic features, namely the strong connection to the biophysical and environmental conditions of the territories of origin. Furthermore, to associate quality labels with environmental preservation, sustainability promotion, and safeguarding of traditional ways of production meet the main aims and narratives regarding EU certification schemes. This suggests a successful communication of those aims to the producers contradicting, at least partially, the findings of Rodrigo *et al.* (2015) and Tibério and Diniz (2012). Despite producers being often targeted with the potential economic return and fair competition of quality schemes (e.g. Bardone and Spalvēna, 2019; Van der Ploeg and Roep, 2003), our results show that the motivations are much more varied than merely economical which is coherent with the evolution of farmer identities in correlation with contemporary concerns and values.

Impacts of the production

The respondents' perceptions of the impacts of food production are aligned with the motivations to enroll (or not) in food certification schemes. The differences between the two groups of producers regarding these impacts are quite significant (Table 6). Producers of certified foods are more likely to perceive those impacts as more relevant in the following dimensions: i) environmental and ecological-oriented practices and values, including the promotion of healthier and more sustainable food practices, together with a more responsible consumption attuned to seasonal products' consumption and the preservation of local natural resources while reducing the ecological and food footprint and food waste; (ii) contribution to enhancing the image of Portuguese food productions as well as the diversification of the traditional and regional products' production; (iii) creation of jobs in the rural communities, and (iv) strengthen the rural-urban connections through food.

The differences in the perception of these impacts between producers of certified and non-certified products speak favorably about the level of commitment and engagement of the producers involved in food quality schemes, again in line with some dimensions of "the good farmer" values. Being their value dependent on the main stakeholder's awareness, knowledge, and perceptions towards them (e.g. Hartman *et al.*, 2018), one may say that the four dimensions above described indicate that the impact of rural provenance food, particularly in the Portuguese context, might be largely positive.

Table 6. Perceived impacts of the food production
Tabla 6. Impactos percibidos de la producción de alimentos

Perception of impacts of production*	Total		Produce products of certified origin		T-test	
	N	Mean	Yes (N=74, 71.2%) Mean	No (N=30, 28.8%) Mean	Value	p-value
Impacts in the quality and traditional character of the products						
In the diversification of the production of local products	104	3.69	3.77	3.50	1.388	0.168
In the enhancement of the image of Portuguese production	104	3.38	**3.51**	3.07	**2.102**	**0.038**
In the diversification of the production of regional/ traditional products	104	3.32	**3.47**	2.93	**2.621**	**0.010**
Impacts related to the enterprise						
In the increasing investment in the production of regional/ traditional products	104	3.62	3.70	3.40	1.437	0.154
In the revitalization of family food productions	104	3.60	3.76	3.20	2.674	0.009
In the increasing investment in the production of local products	104	3.38	3.46	3.17	1.299	0.197
Impacts related to demand						
In the increasing in the demand for local products	104	3.57	3.69	3.27	1.833	0.070
In the increasing of the demand for regional/ traditional products	104	3.54	3.65	3.27	1.694	0.093
In more responsible consumption	104	3.36	**3.58**	2.80	**3.262**	**0.002**
In the incentive to seasonal products consumption	104	3.15	**3.34**	2.70	**2.490**	**0.014**
Impacts related to rural economies and societies						
In the creation of jobs in the communities of origin of the products	104	3.53	**3.69**	3.13	**2.415**	**0.018**
In the attractiveness of the communities of origin of the products	104	3.43	3.54	3.17	1.602	0.112
In the recognition/ promotion of the communities of origin of the products	104	3.39	3.50	3.13	1.537	0.127
In the development of the communities of origin of the products	104	3.29	3.38	3.07	1.404	0.163
In the strengthening of relations between the city and the countryside	104	3.25	**3.42**	2.83	**2.557**	**0.012**
In the increasing of tourism influxes in the communities of origin of the products	104	3.07	3.12	2.93	0.743	0.459
Impacts on the environment and health						
In the promotion of healthier eating habits	104	3.42	**3.62**	2.93	**3.101**	**0.002**
Impacts on the environment and sustainability						
In preserving local natural resources	104	3.37	**3.59**	2.80	**3.295**	**0.001**
In the reduction of ecological and food footprint	104	3.19	**3.45**	2.57	**3.660**	**0.000**
In reducing food waste	104	3.18	**3.32**	2.83	**2.054**	**0.043**

*Items classified in a five-point type Likert scale from 1 "less important" to 5 "more important".
Source: own elaboration. *Items clasificados en una escala de cinco puntos desde 1 "menos importante" hasta 5 "más importante". Fuente: elaboración propia.

What is somehow intriguing is that these perceptions are more attuned to the mission and values disseminated by the EU certification strategies than to the implementation of certification mechanisms of several products (e.g. Pellin *et al*., 2016) and with the usual shortcomings and limitations found in the literature (e.g. Rodrigo *et al*., 2015), as discussed above. Despite the perception of impacts being largely subjective, one should consider these perceptions as beliefs to be capitalized by adequate and supportive policies. Our participants seem to be not only aware of the certification schemes, as they seem positively convinced of their value, which contrasts with other studies highlighting the lack of knowledge on those labels and related requirements (e.g. Bentivoglio *et al*., 2019).

On the other hand, our findings, especially the ones related to the diversification of local products' production, the increasing investment in regional/traditional products, the revitalization of family food productions, and the demand for local and regional products, were also found in Demartini *et al*. (2017). Also, the perception amongst the respondents that rural provenance food production can contribute to add value to local communities, either by making them more attractive and recognized, as through the creation of jobs, preservation of local resources, and promotion of rural-urban connections, is in line with the analysis of Bowen and De Master (2011) and Van der Ploeg and Roep (2003) regarding the relevance of certified foodstuffs for local communities development. The emphasis on the contribution to enhancing the image of Portuguese food products, especially evident—as discussed—amongst the producers adhering to quality labels, is also in line with the findings of Belletti and Marescotti (2011) on the relevance of those products in preserving and promoting national identities, diets and heritages, which are also important aspects—although not exclusive —of what DeSoucey (2010) calls the *gastronationalism*. Therefore, the perceived economic and environmental impacts of these productions seem to be paired with a more symbolic and identity-based contribution aligned with the growing attention and valuation of *heritagization* and *patrimonialization* of territories of provenance and traditional foods (e.g. Figueiredo, 2021).

Challenges related to food production and commercialization

In line with the general positive impacts perceived, respondents do not seem to particularly value the challenges related to food production and commercialization. This suggests either that they do not face these particular challenges or that they tend to underestimate the negative impacts over the positive ones. These findings, particularly for the case of the producers of certified foodstuffs, seem to be at odds with the ongoing consolidation of quality labels in the Portuguese context for most of the products which, as discussed, is shown to still have some shortcomings and gaps (e.g. Pellin *et al*., 2016; Rodrigo *et al*., 2015). For both groups of producers, the highest ranked items (although none above 3.60) relate to the difficulties in predicting the demand, uncertainties in the stability and volume of the production, and the lack of financial and policy tools to protect and support small and medium-sized producers (Table 7).

Table 7. Perceived challenges related to production and commercialization
Tabla 7. Desafíos percibidos relacionados con la producción y la comercialización

Challenges related to production and commercialization*	Total		Produce products of certified origin		T-test	
	N	Mean	Yes (N=74, 71.2%) Mean	No (N=30, 28.8%) Mean	Value	p-value
Challenges related to demand						
To predict the demand	104	3.53	3.50	3.60	-0.413	0.681
Lack of economic resources of the population to acquire non-industrial products	104	2.88	2.80	3.07	-1.210	0.229
Lack of public awareness of non-industrial production	104	2.82	2.84	2.77	0.315	0.754
Challenges related to state support						
Lack of financial incentives to small and medium farmers	104	3.51	3.47	3.60	-0.619	0.537
Insufficient policies to protect small and medium-sized producers	104	3.48	3.46	3.53	-0.342	0.733
Challenges related to production						
Uncertainty related to the satbility and volume of production	104	3.17	3.15	3.23	-0.369	0.713
Weather conditions	104	3.14	3.32	2.70	2.359	0.020
Legal requirements to production	104	3.07	3.14	2.90	1.022	0.309
Production costs	103	2.89	2.82	3.07	-0.964	0.338
Certification costs	100	2.88	2.92	2.78	0.516	0.607
To find raw materials of quality	104	2.69	2.61	2.90	-1.193	0.236
Preservation of the products	103	2.67	2.73	2.53	0.829	0.409
To guarantee the traditional character of the products	103	2.65	2.63	2.70	-0.301	0.764
Lack of workers	104	2.63	2.61	2.67	-0.208	0.836
Storage of the products	104	2.60	2.54	2.73	-0.807	0.422
Transportation of the products	103	2.52	2.47	2.66	-0.779	0.438
Workers' wages	104	2.50	2.51	2.47	0.186	0.853
Challenges related to economy						
Competitiveness within national market	104	3.02	3.05	2.93	0.511	0.611
To have satisfactory profit margins	104	3.00	3.03	2.93	0.413	0.680
Negotiation of the price of the products	104	3.00	3.00	3.00	0.000	1.000
Competition with other producers	103	2.86	2.78	3.07	-1.178	0.241

Challenges related to other agents in the food chain						
To have stable and trustworthy relations with retailers	103	2.80	2.75	2.90	-0.685	0.495
Dissemination of the value and quality of the product	104	2.75	2.73	2.80	-0.303	0.763
Communication with other elements of the food chain	104	2.75	2.68	2.93	-1.031	0.305
To find adequate retailers	103	2.74	2.68	2.87	-0.837	0.405
To have stable and trustworthy relations with intermediaries	100	2.54	2.51	2.60	-0.354	0.724
To find adequate intermediaries	100	2.47	2.40	2.63	-1.010	0.315

*Items classified in a five-point type Likert scale from 1 "less important" to 5 "more important". Source: own elaboration. *Items clasificados en una escala de cinco puntos desde 1 "menos importante" hasta 5 "más importante". Fuente: elaboración propia.

Weather conditions, legal requirements, and competitiveness with other producers within the national market, as well as production and certification costs, are, although not particularly highly ranked, the challenges pointed out next, reflecting contextual, policy, or financial-based obstacles. The little value attributed to these challenges contradicts the findings of Bentivoglio *et al.* (2019) regarding the high investment needed to abide by EU regulations, particularly in rural and more isolated areas with low generational turnover. It is also at odds with the conclusions of Rodrigo *et al.* (2015), for the Portuguese case, and Velčovská (2016) for the Czech case which highlight the difficulties perceived by producers regarding the certification schemes' requirements and formalities.

Conclusions

The role and impact of food certification schemes on rural territories' attractiveness, socio-economic valorization, and sustainable development has been increasingly addressed over recent years, also focusing on the perceptions of consumers towards those schemes and their role as determinants of consumption practices and choices. The perceptions of other relevant stakeholders, especially the producers, about those schemes and related processes have been, however, overlooked. The present study intended to fill this gap by analyzing, in an exploratory manner, what distinguishes food producers who choose to adhere to certification schemes from those who do not, considering their sociodemographic features, the type of food products produced, the selling venues, together with the motivations and perceptions regarding the impacts and challenges associated to food production.

A survey was conducted with producers sourcing for a limited number of urban specialty shops, thus corresponding to a specific segment with particular characteristics and with specific connections to urban contexts, often in parallel with selling to other venues, including directly to the consumer, restaurants, and super and hypermarkets. Wine and olive are not only the more common types of products produced but also the more associated with certification schemes (mainly PDO and Organic labels). Our findings show that, in general, producers have a positive perception of certification schemes, as well as of the impacts of their production activities. What drives them to adhere

to certification schemes is, firstly, their focus on consumer needs and desires and the perception that there is a higher demand for those products. These perceptions are somewhat at odds with previous research showing the lack of awareness of the general public about certification schemes, especially in the Portuguese context. In the same vein, our respondents show more varied motivations than just the economic and financial ones, which are more often privileged at the EU level when communicating certification schemes and its benefits to producers.

Our results reveal that the producers of certified foods are particularly motivated to contribute to a more sustainable and healthier food production, associating it with a higher quality of life, in contact with nature. This pairs with a greater concern regarding the preservation of traditional practices and processes of production. Respondents' motivations are aligned with the perceived impacts associated with food production, namely the contribution to environmental preservation, sustainability, healthier food offers, and preservation of specific ways of preparation and cultivation practices, at the same time highlighting the enhancement of the Portuguese traditional foods' image and diversification. These findings corroborate the values embedded in what was called "the good farmer" identity (Silvasti, 2003), suggesting that Portuguese producers of certified foods seem to be more environmentally and socially concerned than their counterparts not producing certified foods. Notwithstanding, challenges related to food production are not especially valued by any of the groups of respondents, evincing an underestimation of negative impacts in the face of the benefits perceived. Particularly, the scarce relevance attributed to challenges related to the certification schemes' requirements, in our sample, is an interesting result, contradicting previous studies on the difficulties faced by certified food producers.

Although of exploratory nature, our analysis contributes to shed light on a scarcely researched group of stakeholders within food certification studies—the producers. The comparison between the producers engaged in food certification schemes with the ones who do not, together with the identification of the features more likely to be associated with each group, provides relevant empirical information on key elements that may determine food producers' greater or lesser adhesion to food quality schemes. Despite these contributions, our study presents some limitations that require further investigation. The study was based on a small and specific sample that seemed to differ from the average Portuguese food producers—as our respondents are younger, more educated, and with higher income levels—and that was chosen based on the connections to specific selling venues—the urban specialty shops. Further research is needed considering a wider and more heterogeneous sample of producers, possibly from different countries and producing diverse types of food products to better understand the different degrees of adhesion to certification schemes, motivations, and impacts' perceptions, as well as the influence of the sociodemographic variables in all these dimensions. Having been segmented according to selling to particular urban specialty shops, this study contributes to describe the suppliers of those particular venues whose steady growth may also generate further diversification. Further research considering the producers that source for other types of selling venues, also segmented by type of certified foods and certification labels, would contribute to shedding light on other types of perceived and faced impacts and challenges.

*****This paper was elaborated within the research project *STRINGS - Selling the Rural IN (Urban) Gourmet Stores – establishing new liaisons between town and country through the sale and consumption of rural products*, funded by national funds through FCT/MCTES (PTDC/GES-OUT/29281/2017) and co-funded by FEDER, within the PT2020 Partnership Agreement and Compete 2020 (POCI-01-0145-FEDER-029281).

References

Amilien, V. and Hegnes, A.W. (2013). "The Dimensions of 'Traditional Food' in Reflexive Modernity: Norway as a Case Study." *Journal of the Science of Food and Agriculture* 93(14): 3455-3463. DOI https://doi.org/10.1002/jsfa.6318

Bardone, E. and Spalvēna, A. (2019). "European Union Food Quality Schemes and the Transformation of Traditional Foods into European Products in Latvia and Estonia." *Appetite* 135: 43-53. DOI https://doi.org/10.1016/j.appet.2018.12.029

Belletti, G. and Marescotti, A. (2021). *Evaluating Geographical Indications. Guide to Tailor Evaluations for the Development and Improvement of Geographical Indications*. Rome, FAO.

Bentivoglio, S.; Savini, S.; Finco, A.; Bucci, G. and Boselli, E. (2019). "Quality and Origin of Mountain Food Products: New European Label as a Strategy for Sustainable Development". *Journal of Mountain Science* 16: 428- 440.
DOI https://doi.org/10.1007/s11629-018-4962-x

Bowen, S. and De Master, K. (2011). "New Rural Livelihoods or Museums of Production? Quality Food Initiatives in Practice." *Journal of Rural Studies* 27(1): 73-82.
DOI https://doi.org/10.1016/j.jrurstud.2010.08.002

Bureau, J. and Valceschini, E. (2003). "European Food-Labeling Policy: Successes and Limitations." *Journal of Food Distribution Research* 34(3): 71-76.

Burton, R.; Fourney, J.; Stock, P. and Sutherland, L. (2021). *The Good Farmers: Culture and Identity in Food and Agriculture*. London, Routledge.

Coyne, L.; Kendall, H.; Handsa, R.; Reed, M. S. and Williams, D.J.L. (2021). "Identifying Economic and Societal Drivers of Engagement in Agri-Environemtnal Schemes for English Dairy Producers." *Land Use Policy* 101: 105174.
DOI https://doi.org/10.1016/j.landusepol.2020.105174

Demartini, G.; Gaviglio, A. and Pirani, A. (2017). "Farmers' Motivation and Perceived Effects of Participating in Short Food Supply Chain: Evidence from a North Italian Survey." *Agricultural Economics* 63(5): 204-216.
DOI https://doi.org/10.17221/323/2015-AGRICECON

DeSoucey, M. (2010). "Gastronationalism: Food Traditions and Authencity Politics in the European Union." *American Sociological Review* 75(3): 432-455.
DOI https://doi.org/10.1177/0003122410372226

Figueiredo, E. (2021). "Rural Provenance Food as Cultural Heritage: A Way of Promoting Territorial Development." In Oliveira, E.; Amaro, A. and Melro, A. (Eds.). *Handbook of Research on Cultural Heritage and Its Impact on Territory Innovation and Development*. Pennsylvania, IGI Global: 114-137.

Figueiredo, E.; Forte, T.; Eusébio, C.; Silva, A. and Couto, J. (2022). "Rural Ties and Consumption of Rural Provenance Food Products – Evidence from the Customers of Urban Specialty Stores in Portugal." *Foods* 11: 547.
DOI https://doi.org/10.3390/foods11040547

Fonte, M. (2008). "Knowledge, Food and Place. A way of producing, a way of Knowing." *Sociologia Ruralis* 48(3): 200-222. DOI https://doi.org/10.1111/j.1467-9523.2008.00462.x

Hartman, M.; Yeh, C.; Amilien, V. and Aničić, Z. (2018). *Strengthening European Food Chain Sustainability by Quality and Procurement*. Policy Deliverable 8.1 Technical Report Strenght2Food. Brussels, European Commission.

Ilbery, B. and Kneafsey, M. (2000). "Producer Constructions of Quality in Regional Specialty Food Production: A Case Study from South West England." *Journal of Rural Studies* 16(2): 217- 230. DOI https://doi.org/10.1016/S0743-0167(99)00041-8

Kneafsey, M.; Venn, L. and Bos, E. (2017). "Consuming Rural Connections: Tracing Leeks Back to their Roots." In Miele, M.; Higgins, V.; Bjørkhaug, H. and Truninger, M. (Eds.). *Transforming the Rural: Global Processes and Local Futures*. Bingley, Emerald: 197-220.

Pellin, V.; Ribeiro, J. and Mantovaneli, O. (2016). "Contribuições dos produtos tradicionais para o território: a experiência do queijo Serra da Estrela em Portugal." *Revista Territórios & Fronteiras* 9(1): 264-284. DOI https://doi.org/10.22228/rt-f.v9i1.430

Renting, H.; Marsden, T.K. and Banks, J. (2003). "Understanding Alternative Food Networks: Exploring the Role of Short Food Supply Chains in Rural Development." *Environment and Planning A: Enonomy and Space* 35(3): 393-411.
DOI https://doi.org/10.1068/a3510

Rodrigo, I.; Cristovão, A.; Tibério, M.L.; Baptista, A.; Maggione, L. and Pires, P. (2015). "The Portuguese Agrifood Traditional Products: Main Constraints and Challenges." *Revista de Economia e Sociologia Rural* 53(1): 23-32.
DOI https://doi.org/10.1590/1234-56781806-94790053s01002

Silva, A.; Figueiredo, E.; Truninger, M.; Eusébio, C. and Forte, T. (2021). "A Typology of Urban Specialty Shops Selling Rural Provenance Food Products – A Contribution from Portugal." *British Food Journal*, 123: 3902-3917.

Silvasti, T. (2003). "The Cultural Model of 'the Good Farmer' and the Environmental Question in Finland." *Agriculture and Human Values* 20: 143-150.
DOI https://doi.org/10.1023/A:1024021811419

Tregear A.; Arfini, F.; Belletti, A. and Marescotti, A. (2007). "Regional Foods and Rural Development: The Role of Product Qualification." *Journal of Rural Studies* 23: 12-22. DOI https://doi.org/10.1016/j.jrurstud.2006.09.010

Tibério, M. and Diniz, F. (2012). "Agri-Food Traditional Products: from Certification to the Market – Portuguese Recent Evolution." *Regional Science Inquiry Journal* 4(2): 57-86.

Van der Ploeg, J.D. and Roep, D. (2003). "Multifunctionality and Rural Development: The Actual Situation in Europe." In van Huylenbroeck, G. and Durand, G. (Eds.). *Multifunctional Agriculture. A New Paradigm for European Agriculture and Rural Development*. Aldershot, Ashgate: 37-54.

Velčovská, S. (2016). "Food Quality Labels from the Producers' Perspective." *Journal of Central European Agriculture* 17(3): 815-834. DOI https://doi.org/10.5513/JCEA01/17.3.1779