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Protected Geographical Indications for EVOO in Tunisia: Towards Environmental, Social, and Economic Sustainable Development

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Abstract: In a globalized scenario characterized by cogent challenges, sustainable development represents a fundamental objective, according to the agenda of policymakers. This is particularly true with regard to farming, and those agricultural systems that are fully consistent with sustainability in society (health, employment), environment (methane emission, water resource and so on), and economy (source of wealth). Tunisia is one of the world's top olive oil-producing countries. It is also the country with the largest certified organic olive-producing areas in the world. Moreover, a larger volume of Tunisian olive oil is produced using nearly organic practices, without actually being certified. Given the growing demand for certified products, Tunisia should strengthen its market position by building on its reputation for sustainable farming, through the promotion and the creation of new geographic indications for EVOO. The objective of this paper is to evaluate the impact of GIs and how such kinds of labeling can be more effective, operational, and sustainable, to support the country's development strategy in this sector. Through an ad hoc quanti-qualitative analysis of Tunisian olive oil value chain, representative of the natural resources, the deep understanding of cultures and traditions of the country, a comprehensive and precise SWOT analysis carried out on the Tunisian olive sector has been performed. This study bears significance as it depicts a specific roadmap that should allow a better application and extension of GI's initiatives referring to the three pillars of Sustainable Development Goals of the United Nations, and by building on the position of Tunisia as an organic origin focusing on five strategic lines: organizational and institutional framework; capacity building improvement; communication and networking roles; the role of TIC and the emergence of new opportunities; financial and support products availability. The final outcome should also aim to shorten the distances between all stakeholders to achieve the goals of the 2030 Agenda in the Mediterranean basin, by removing behavioral and institutional barriers that inhibit the transformations needed to achieve more sustainable economies and societies, by means of a cross-disciplinary dialogue around olive oil chain sustainability and narrowing the gap between research and policymakers.

Keywords: geographical indications; sustainable development; extra virgin olive oil; Tunisian roadmap; rural development; SDGs



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1. Introduction

The world olive-growing area is around 11.6 million hectares corresponding to nearly 1.5 billion trees, of which 86.5% is used for olive oil production. The majority of olive-growing areas in the world (71%) are still cultivated using nearly traditional production methods. However, new plantations are substantially increasing by around 162 thousand hectares per year, the majority of which is conducted using an intensive production system [1]. This will not only have an impact on the volume of olive oil production and international prices, but also will increasingly threaten the traditional small scale production model, which has been, for a long time, the dominant typology of this sector. The Mediterranean basin is still the geographical area where almost 98% of the olive oil production is concentrated. In the last decade (2010/2011 to 2020/2021), European countries have cumulated 68% of the world production, including Spain and Italy, with 44 and 11% of the global olive oil volume, respectively. Tunisia, with 6% of the global production, is the second world producer after the EU, with an average production of 192 thousand metric tons across the last decade [2,3]. Figure 1 shows the annual production of Tunisia, which is highly dependent on climatic conditions, fluctuating between 70 and 350 thousand metric tons in 2013/2014 and 2019/2020 respectively, compared to the other traditional producing countries. Actually, olive-producing areas in Tunisia are composed by more than 94% of rain-fed olive groves conducted, whether using conventional or organic traditional producing methods [4], which explains, in large part, the annual fluctuation of the production, along with the natural alternate bearing characterizing the species itself.

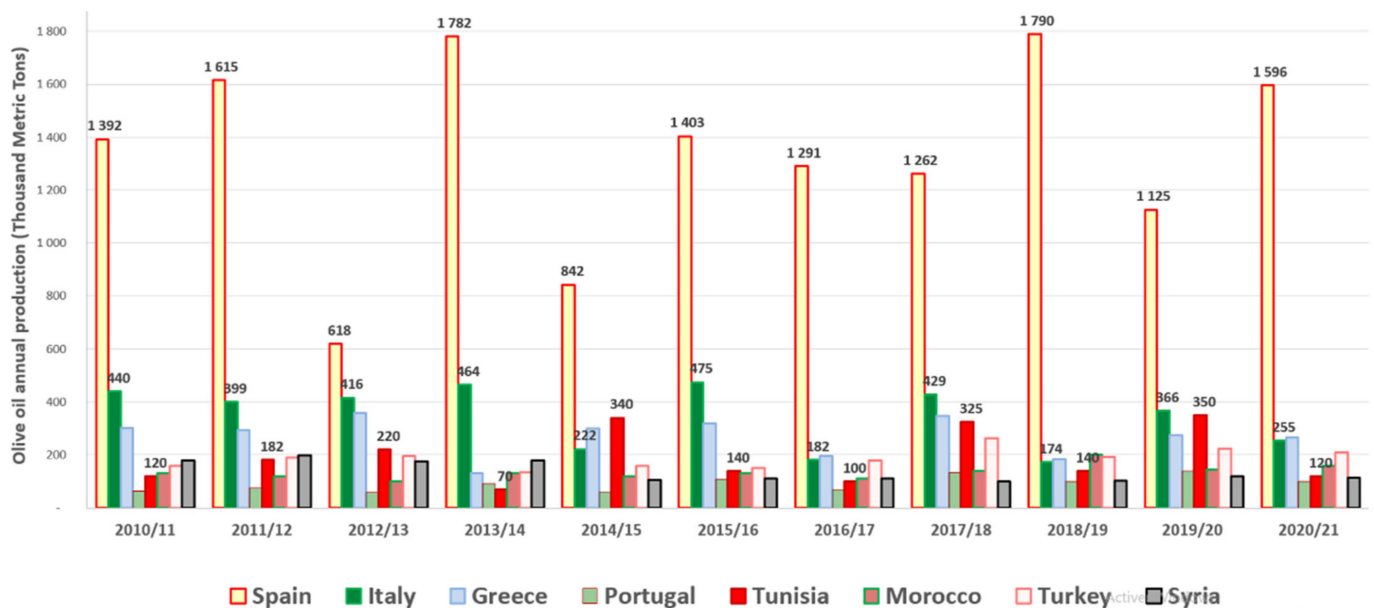


Figure 1. Olive oil annual production of the main world producing countries (2010/2011 to 2020/2021) [2,3].

In the last decade, Tunisia exported an average volume of 157 thousand metric tons of olive oil, which represents 18% of the global exportations and 52% of the non-European exported olive oil in the world (Figure 2). More than 90% of Tunisia's exports are traded in bulk, while bottled exports are increasing in an uneven way according to the international annual supply and demand.

Bulk exportations are mainly driven by the demand of the EU countries, which absorbed an average of 66% of the Tunisian olive oil exportations [5]. These are highly dependent on the contingent agreement under the zero duty quota allocated to Tunisia [6]. Italy and Spain have traditionally been the most frequent importers of olive oil from Tunisia to the EU.

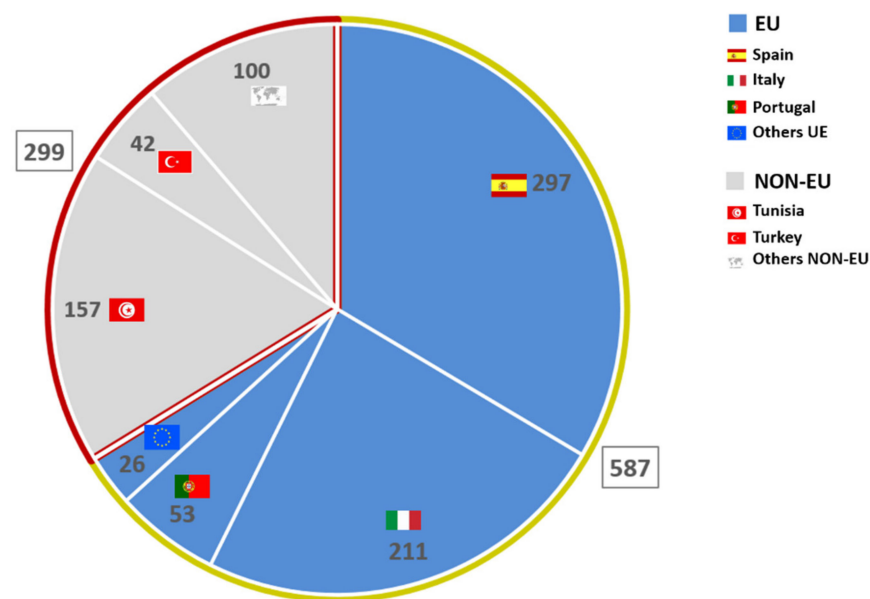


Figure 2. Ten years average global exportations of olive oil (2010/2011–2020/2021) [2,3].

As for EVOO prices, Bari (Italy), Chania (Greece) and Jaén (Spain) are the most representative olive oil markets of the European Union. They cover more than 60% of global olive oil production. Prices in these three countries, particularly in Spain, have an impact on other producing countries, and mainly on the oils that they intend to export.

In this competitive environment, characterized by declining agricultural commodity prices in general, and particularly for olive oil, part of the market trend towards traditional and/or quality products with a strong cultural link provides producers with a value-added reward as a result of the existent link to a particular geographical origin, with the opportunity to move away from commodity markets into more lucrative niche markets through differentiation. As such, territorial origin becomes a strategic tool for differentiation in agri-food markets [7].

In the context of geographical indications (GIs), those peculiarities that prove to be appealing to consumers are connected to the unique set of characteristics of specific geographic origin of each good and/or particular production methods used in each site/production area (the notion of “terroir”) [8]. The term “terroir”, as argued by Bowen and Mutersbaugh [9], reflects the connection between origin and quality, by stating that quality itself stems from the selection of specific varieties in each terroir; this is true not only for the viticultural sector, where the term “terroir” originated, but also with regard to the entire agri-food sector, by virtue of the extension of the protection granted to grape varieties to the mentioned whole sector (Loi n° 90–558 du 2 juillet 1990 relative aux appellations d’origine contrôlées des produits agricoles ou alimentaires, bruts ou transformés - Légifrance). In sociological terms, this concept evokes relationships of solidarity, which are developed around destinies, identity, competences, and around the elaboration of shared collective rules [8].

The fundamental role of GIs in this scenario, therefore, is that of providing a credible certification mechanism capable of overcoming the impasse of asymmetric information [10]. In line with the goals of EU quality policy, the peculiarities of those products that embeds unique characteristics resulting from the originating site deserve a strong attention and a specific protection; the objective is, at an initial level of analysis that will be carried on in the present contribution, safeguarding socio-cultural features of the same sites and traditional know-how. Through assigning “Geographical Indication” (GI) to product names, it is possible to trigger a virtuous mechanism capable of fostering consumers’ trust and distinguish quality products, while also helping producers to conquer niche market efficiently. Those products that are under consideration or have been assigned a GI

recognition are listed in special registers, together with all relevant information to identify the geographical and production specifications for each product.

As enforced by EU regulations, the GI protection system protects the names of a series of products, by certifying the presence of peculiar qualities, thus fostering their reputation linked to the production territory. GIs comprise PDO (Protected Designation of Origin) and PGI (Protected Geographical Indication). The differences between PDO and PGI are mainly connected to the extent to which each product's raw materials must come from a certain area or how much of the production process must necessarily take place within the specific same area. As to the cited legal framework, it is vital to refer to "Regulation (EU) No 1151/2012 of the European Parliament and of the Council of 21 November 2012 on quality schemes for agricultural products and foodstuffs on the protection of Geographical Indications and Designations of Origin for agricultural products and foodstuffs" [11], replacing the Council Regulation (EC) No 510/2006, which allowed producers from third countries to finalize trade agreements with the European Union by registering their products (implementing regulation: Commission Regulation (EC) No 1898/2006 of 14 December 2006) [11]. Non-European product names are also allowed to register as GIs, provided that their country of origin has a bilateral or regional agreement with the EU, that foresees the mutual protection of the same product names. On eAmbrosia (the official database of EU GI registers), it is possible to consult GIs applied for, and officially included in, the EU registers, while both EU and non-EU GIs protected under agreements can be checked on the GIview portal. At the time of the present report, these databases do not yet include Tunisian products. However, 9 GIs from Tunisia were included in the database of the World Intellectual Property Organization, according to the Geneva act of the Lisbon agreement on appellations of origin and geographical indications, including one olive oil [12].

It is worth noting that Tunisia, being one of the historical partners of the EU, given the geographical, cultural and trade links accumulated throughout the common history of the Mediterranean basin, has always been a privileged country in the EU development regional policies. The olive oil sector is one of the most prominent examples of a South-North trading for the commodities market. Moreover, a 'Privileged Partnership' was established in 2012 between EU and Tunisia, with an ambitious action plan for its implementation. The EU strives to ensure that its sectoral policies identify every possible opportunity for supporting the country's transition and strengthening ties between Tunisians and Europeans. The support of the initiatives that would develop a new form of economic activities from EVOO GIs and around them, as well as the registration of Tunisian GIs to be protected under agreements, could be very significant in the Tunisian context, opening new horizons, especially in the rural, disadvantaged areas.

The implementation of Geographical Indications in Tunisia is regulated by the Law No. 99–57 of June 28th [13], 1999, aiming to protect and improve the specificity of agricultural and agri-food products. There are two kinds of GIs labels in Tunisia, as defined by article 2 of the aforementioned law. The denomination system is mostly equivalent to the European description. According to the Tunisian Ministry of Agriculture Water Resources and Fisheries, there are 14 registered GIs across the country, including 9 AOCs (equivalent to PDOs); 7 wines, 1 fig and 1 olive oil, as well as 5 IP (equivalent to PGIs); 1 apple, 1 pomegranate, 1 olive oil, 1 date and 1 mint. The labelled products are economically valorized in an uneven way according to the market demand. The first Tunisian GI in olive oil was implemented in 2010 in the region of Monastir—Eastern coast, which obtained the label of "IP" Indication of Origin and was published in the Official Journal of the State in 2010 [14]. Later on, in 2018, another GI label was assigned to the area of Teboursouk—North-west Tunisia, corresponding to a controlled designation of origin "AOC" [15]. Other attempts are being carried out to implement new GIs for olive oil and, to our best knowledge, not particularly for organic olive oil. The already registered GIs are increasingly gaining interest, especially with the orientation of the international market toward more quality, more authenticity, and more traceability [16,17]. However, the actual potential of the existent denominations and the creation of new GIs are still largely

under-exploited. Several projects' initiatives have been carried out to perform inventory lists of potential GI products not yet registered in Tunisia, including olive oils, and further evaluations have been performed to select the most appropriate locations that better fits the implementation of this model. However, there is still a gap of scientific literature in this regard in the local context. Some authors have studied the potential of particular localities, evaluating their suitability to produce distinctive olive oil, focusing only on the intrinsic quality descriptors of the product. Fares et al. (2016) [18], for example, demonstrated that "AlAlaa" province characterized by 'Oueslati' cultivars provides more interesting, balanced and specific physicochemical and sensory profiles that may encouraging the installation of a GI. However, the characterization of each territorial specific circumstances is a fundamental step to ensure an effective implementation of GIs, taking into account the biological and cultural diversity, as well as legal and economic considerations [19,20]. Moreover, it is worth highlighting that the adaptation of the primary transformation sector as well as bottling and marketing operators to the concept of GIs in olive oils is still to be evaluated in depth. Fendri et al. (2020) [21] studied the olive mill's typology in five potential locations in Northern Tunisia to be able to adopt such a GI approach and reported the high heterogeneity between geographical areas, in terms of equipment, size of the olive mills and qualifications. So far, all the studies published in relation with GIs in Tunisia were focused on the product specification without paying attention to the overall socioeconomic and territorial context. To the best of our knowledge, the current study is the first report that tackles, in a comprehensive way, the Tunisian experience in implementing GIs as a multi-dimensional instrument for rural and territorial development that deals with the actual barriers at the institutional, operational and behavioral levels. Moreover, there is no literature that evaluates the most appropriate approach to be followed in order to stimulate the creation, the adoption and the economic valorization of GIs for Tunisian EVOO, including the determination of the kind of GI that better fit to local context. This is not the case for organic certification that was studied using a multidimensional perspective [4,22]. Actually, organic, which is one of the four official labels available for agricultural products in Tunisia, has had a substantial improvement in its implementation and economical valorization since the organization of its legal framework between 2005 and 2009. Then, after a substantial increase of certified organic areas up to 255,000 hectares converting Tunisia to the world leader [23], the national strategy 2016–2020, aimed at increasing exports and facilitating access to new markets. The use of GIs as a second lever of the Tunisian olive oil sector, also in combination with organic, is still to be promoted. The role that GIs could play in local development has been discussed in other countries [24–27], opening new horizons to the local population toward more lucrative markets [8,9,27]. This is particularly interesting for small scale models, such as those that are dominant in the Tunisian olive oil sector. Indeed, 70% of Tunisian farmers produce less than 10 hectares [28], and around 94% of olive mills process less than 100 metric tons of olives per day [5]. It means that the stakeholders are mainly identified as small-scale producers, which is in contrast with the vocation of Tunisia as an origin of bulk exportations. Other countries have successfully extended their GIs in an efficient way, such as Italy [24], Spain [29], and France [30], etc. Similar GI experiences have been shown to be effective in a more challenging socioeconomic context, such as in India [31].

It is vital to consider that consumers are typically willing to pay more for GI products, but the size of the premium may demonstrate differences. Actually, GIs can be seen as the basis for a successful differentiation strategy. According to Porter (1985) [32], differentiation is one possible strategy to achieve a sustainable competitive advantage. In a differentiation strategy, firms seek to be unique in their market along some dimensions that are valued by customers, because of their superiority in this respect, and they are rewarded with a premium price. The economic rationale of geographical indications includes the following aspects:

1. Consumers may suffer from quality uncertainty and asymmetric information.
2. High and low qualities may be sold at the same price.

3. High qualities may be crowded out by low qualities (“lemon” problem) [7].
4. Quality is due to regional origin.
5. Protection of geographical origin may avoid market failure
6. Legal protection and associated label: geographical origin turns from a credence to a search characteristic.
7. Protection of regional-origin label reduces search costs and, thus, raises consumer welfare.
8. Intellectual property right: high-quality producers get a reputation premium and a higher income.
9. Imitators and non-original producers are kept away from the market.
10. Beneficial for remote regions, rural development, and economic cohesion.

In the context of the present contribution, it is worth citing the important role of GIs for safeguarding biodiversity, local varieties, and seeds, as well as the strong sustainable development approach [33], fully in line with the European Farm to Fork Strategy [34]. Furthermore, the promotion of GI initiatives in Tunisia could better address the issue of knowledge collectivity and identity, by creating a unique interaction through different generations and effective tools, to challenge the dominant industrialization of the global food system [9]. It is, therefore, important to consider alternative distribution schemes (zero km, farmers’ markets, and so on), whose aim is to create a virtuous relationship between producers and consumers, thus enhancing trust and mutual cooperation at territorial level. Furthermore, the peculiarities of GIs products hold a strong potential to foster the multi-functionality of farms [35] and sustainable development; as a matter of fact, the biological properties and the socio-cultural diversity embedded in these products can contribute to safeguarding biodiversity at different levels. As a consequence, coming back to localized productions, it is vital to consider both the strong relationship with their physical environment (agro-terroir), and their being increasingly the result of complex interactions among a set of natural and human factors (socio-terroir) [36,37].

Starting from the aforementioned perspectives, this paper aims at providing a comprehensive quanti-qualitative approach supported by a precise SWOT analysis on the Tunisian olive oil sector, in order to evaluate how can GIs play a role in an effective, operational and sustainable ways to support the country’s development strategy of the olive oil sector being in line with the three pillars of Sustainable Development Goals of the United Nations. A specific roadmap is designed to make the application and extension of GI’s initiatives more practicable, starting from five strategic lines: organizational and institutional framework; capacity building improvement; communication and networking roles; the role of TIC and the emergence of new opportunities; as well as financial and support products availability.

2. Materials and Methods

Undertaking a process of recognition of a designation of origin for Tunisia’s extra virgin olive oil according to European regulations is a long, complex process that requires the coordinated intervention of different actors, and for which it is appropriate to carefully evaluate the pros and cons of the initiative [12,13,15]. SWOT analysis, also known as the Tows Matrix, is an adequate strategic planning tool to evaluate the internal strengths and weaknesses of a project, a company, a system, an approach and the opportunities and the probable threats stemming from external factors, in any situation in which an organization or a person has to make a decision to achieve a given goal [38]. SWOT analysis allows you to observe “the object” to be analyzed from four different and contrasting points of view. It is, in fact, an effective method of identifying the strengths and weaknesses of a given problem and examining the opportunities and threats to be addressed. It helps to focus the activities in the areas where each producer is most competitive, and those where there are more opportunities.

This methodology, therefore, allows one to represent, in a rational and orderly way, the influence exerted by different agents of the environmental context on the implementation of projects belonging to any system. In relation to this, it is important to differentiate the

elements of influence into factors of an exogenous nature and factors of an endogenous nature. Among the endogenous factors, all those variables that are part of the system, and on which, as a rule, it is possible to intervene are considered. On the exogenous factors, on the other hand, it is not possible to intervene directly, but it is advisable to prepare control tools that analyze their evolution, in order to prevent negative events and exploit positive ones.

The use of a SWOT analysis is particularly relevant in local development policies, as a support to the diagnosis of existing problems, and as a search for adequate solutions [38,39]. Therefore, the SWOT analysis represents an indispensable analysis tool to be able to implement successful territorial development policies, able to highlight the real problems and potentialities present in an area, and therefore allow the implementing subjects to make the most opportune and convenient choices for an integrated sustainable development. In this context, the choice of this analysis model arises from the need to consider, in an integrated and coordinated way, the various aspects that are intertwined on the local scene, examining in detail each profile, in order to outline a general reference framework that offers the insights and knowledge materials necessary to propose intervention policies capable of effectively impacting local development problems.

The SWOT analysis is a qualitative study in nature and has different usages in different fields, such as marketing [40], agricultural development [41], health [42], etc. It is related mostly to semi-structured interviews with experts. Since it is possible for the experts, actors and stakeholders to offer diverse interpretations with respect to the same subject, numerous interviews (individually or in a group) and workshops have been held, with a considerable number of experts, key actors and stakeholders involved in the Tunisian olive oil sector; in particular, the certified olive oil value chain, and into different projects context that tackle the olive oil value chain from different point of views, like the creation and promotion of GI labels, the responsible investment opportunities in the olive oil sector, the economic valorization of olive genetic resources, and the enhancement of olive oil value chain through the by-products valorization (Table 1). Furthermore, this approach has been supported by a literature review of the existing studies and secondary resources that tackle the actuality of olive oil sector in Tunisia and its perspective, due to scarce data and documents related to our objective (Figure 3). This step has been crucial to develop the research questions, and for the effective and good progress of the interviews and workshops. Finally, the results of the SWOT analysis represent the main inputs and the basis of the definition of a roadmap able to promote the sector of geographic indications of Tunisian EVOO locally and abroad, and to overcome the new challenges representing the 17 SDGs.

Table 1. Expert profiles interviewed and research and development projects context.

Experts, Actors Stakeholders, in the Field	N. of Stakeholders	Designation	Type of Contact	Project	Project Period
Olive growing	17	Farmers	Interviews	FAO-INRAT. Support for the identification of existing and desired capabilities allowing young people to invest and benefit from responsible agricultural investments in Tunisia	2019–2020
	30	Farmers	Workshops	IO-BNG-CIHEAM. Tunisian plant genetic resources better conserved and valued	2016–2018
Nursery sector and olive growing	45	Plant nursery operators and farmers	Workshops	CFC/IOC/09. Economic valorization of olive genetic resources, creation of pilot nursery centers	2013–2018

Table 1. Cont.

Experts, Actors Stakeholders, in the Field	N. of Stakeholders	Designation	Type of Contact	Project	Project Period
Primary transformation	10	Olive millers and operators	Interviews	IO-DGPA-PAIG. Contribution to the elaboration of the Geographical indication of Teboursouk Olive Oil	2015–2018
	30	Olive millers	Interviews	OLIVEN. Opportunities for olive oil value chain enhancement through the by-products valorization	2018–2021
Bottling and Marketing	1				
Multilateral (olive growing, primary transformation, bottling)	5	Farmers, millers and exporters	Interviews	FAO-INRAT. Support for the identification of existing and desired capabilities allowing young people to invest and benefit from responsible agricultural investments in Tunisia	2019–2020
Institutional organizational and financial framework	13	Production organisation (GDA, SMSA, etc.) Organism of development (ODESYPARNO); Associations; Union; public and private Bank; ONH; DGPA; research institution (IO)	Interviews		

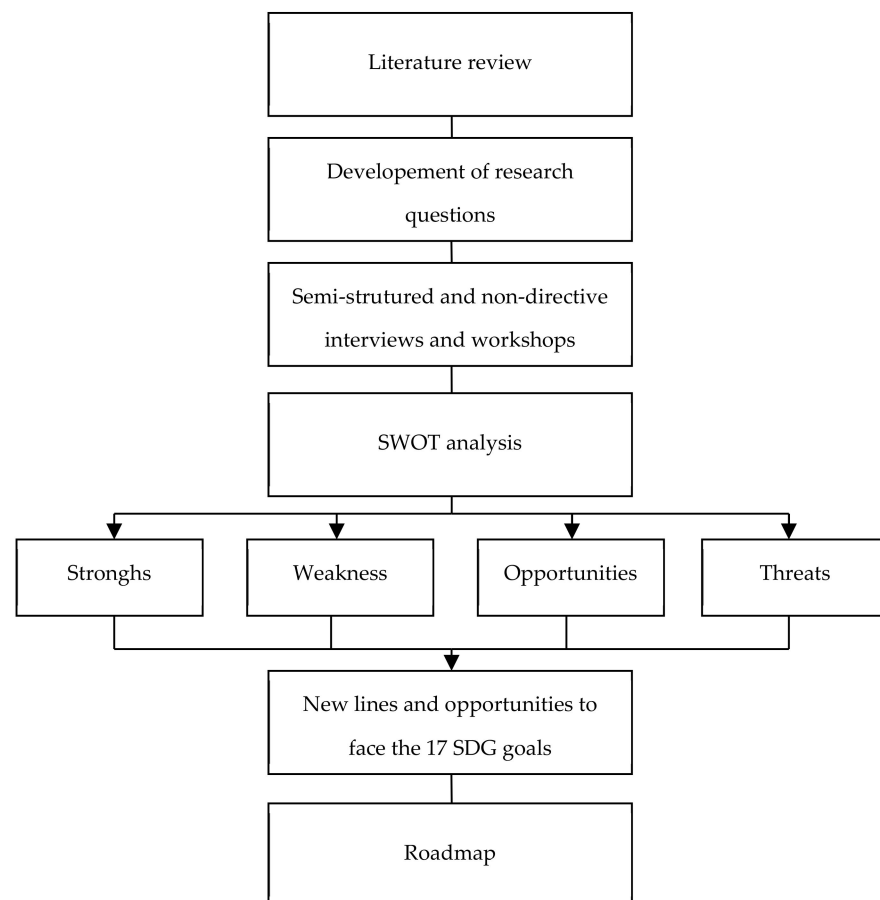


Figure 3. Research methodology structure adopted.

3. Results and Discussions

In order to strengthen the Tunisian market position of EVOO, both locally and at an international level, a new promotion strategy should be implemented, involving principally EVOO protected by geographical indications. Therefore, an in depth analysis aiming at understanding the current global climate of Tunisian olive oil sector, on one hand, and the potential of EVOO value chains protected by geographical indications, on the other hand, was carried out. Then, as mentioned before, a comprehensive SWOT analysis was carried out, and the results are presented in the next table (Table 2). The SWOT analysis continuously reviews all the stages of EVOO value chain, from the olive growing to EVOO product packaging, and the marketing steps. The results started by presenting the barriers and obstacles that the actors of the olive oil sector, in particular the local GI producers, could be facing, and later by identifying the advantages, and the opportunities that could be taken to promote the sector. Furthermore, the institutional, organizational, and financial frameworks describing the environment of the EVOO value chain protected by geographical indications have been reviewed.

Table 2. SWOT analysis results for GI olive oil chain value in Tunisia.

OLIVE GROWING: AGRICULTURAL SECTOR	
Strengths	Weaknesses
<p>Presence of important areas suitable for cultivation of the olive tree in terms of both quantity and quality of the product: Tunisia, with the second largest olive-growing area in the world [43] (105 million olive trees distributed in 189,000 ha and spread over 310 thousand farms, equal to 16% of the world olive-growing area) is the fourth largest producer of olive oil after Spain, Italy, and Greece, and the third largest exporter after Italy and Spain.</p> <p>The geographic distribution of the olive crop area between the south, the center and the north of Tunisia highlights the heterogeneity of climate context and differential performance of local varieties and ecotype. In fact, the south accounts for 50% of the olive production, compared to only 29% in the center, and 21% in the north.</p> <p>The Tunisian olive groves include 18% young plantations (1 to 20 years old), 75% plantations in production (20 to 70 years), and 7% older plantations (over 70 years old); 5% of the olive growing areas are cultivated on an irrigated system.</p> <p>Territorial extension of the crop is an important contribution in terms of employment: the Tunisian olive sector contributes to the national goals of economic growth and job creation; in fact, more than one-tenth of the Tunisian population earns all or part of their income from olive farming: 309,000 producers (60% of all farmers) derive all or part of their income from growing olive trees. The national sector contributes significantly to rural exodus slowdown and revenue income. The olive oil sector generates 50 million daily jobs every year (ONAGRI, 2021), especially during harvesting season, which is from November to March each year.</p> <p>Environmental, landscape, historical, cultural and anthropological context of olive groves. In Tunisia, it was the Carthaginians who started to plant olive trees across the country, followed by the desire of the Romanians to make Africa, particularly Tunisia, an olive-producing region. In short, the olive oil trade was a source of wealth for all of the civilizations that left their mark on the history of Tunisia.</p>	<p>Land fragmentation of the production structure (small-sized company). Tunisian farming system characterized by small-scale farms run on a small property.</p> <p>Prevailing of traditional and limited spread of mechanization and irrigation: approximately 95% of the area is rain-fed in Tunisia. The olive growing in Tunisia is marginalized in most of the regions, or it is conducted extensively, i.e., farmers do not use many inputs and in most of the cases olive trees undergo very few interventions; plowing, pruning, and irrigation in periods of intense drought.</p> <p>Delay in applying the results of scientific research.</p> <p>Delay in the transposition of technological innovations' lack of investment.</p> <p>Fluctuations in production, qualitatively and quantitatively, that are difficult to manage.</p> <p>Despite Tunisia being the depository of a rich varietal heritage, only two varieties are used in arable lands, which are Chemlali located mainly in the south, and Chétoui, which dominates in the north. The Chemlali cultivar represents 80% of the Tunisian production of olive oil and is grown in the center and south of the Tunisia country, areas with low rainfall (<250 mm per year). Intensive introduction of foreign cultivars in the intensive and super-intensive new plantations namely Koroneiki (Greece) along with Arbequina and Arbosana (Spain): loss of the mark of distinctiveness given by the local cultivars, something that does not serve our purpose of promoting a new farming system model based on GI.</p> <p>An even larger volume of Tunisian olive oil is produced using organic or nearly organic practices without actually being certified, while the world demand for organic products is increasing.</p>

Table 2. Cont.

OLIVE GROWING: AGRICULTURAL SECTOR	
Strengths	Weaknesses
<p>Tunisia is the depository of a rich, varietal heritage. In fact, Tunisia produces more than 120 olive varieties, from olive oil to table olive varieties, including two principal ones that represent almost all olive groves in Tunisia, namely Chetoui and Chemlali, and seven other secondary varieties, along with numerous local types disseminated close to their areas of origin. Then, there is the existence of real potential to create new EVOO products protected by geographical indications.</p> <p>Tunisia produces three times more certified organic olive oil than Spain each year.</p> <p>Mastery of the protection of the national olive heritage through the organization of annual national campaigns to treat olive trees against the main pests. These campaigns are coordinated by the cited ONH, the General Directorate of Agricultural Production and the Olive Tree Institute.</p> <p>The increase in the selling prices of olive oil in recent years has strengthened the profitability of this crop and has encouraged some operators to integrate it into the system of irrigated cultivation, particularly in central regions of Tunisia, and to promote a new and profitable small-scale farming system, based principally on EVOO protected by GI.</p>	<p>A substantial reduction in qualified labor forces.</p> <p>The weak technical package in the suitable areas with the potential to produce quality products, due to small scale farming system that characterize these areas.</p> <p>The weak mastery of traceability tools that could be a necessary condition to promote value chain-protected by GI.</p>
PRIMARY TRANSFORMATION: THE OLIVES MILLING PHASE	
Strengths	Weaknesses
<p>Concentration of the olive mills in the most producing areas, with a greater guarantee of timely processing and quality: the powerful industrial infrastructure includes more than 1670 olive mills [43].</p> <p>Extraction plant modernization trend: during the last decade, the processing sector has witnessed the creation and modernization of mills, along with a gradual elimination of traditional mills. As a result, the trituration capacity has increased from 8000 t/day in 1986 to more than 72,000 t/day in 2020.</p> <p>High product differentiation capacity both by type (POD, PGI, organic, high quality, etc.) and on taste characteristics in suitable areas with potential to produce differentiated olive oil.</p>	<p>Poor geographic distribution of olive oil mills in suitable areas to produce differentiated olive oil (continental areas), that could represent a threat to local GI producers.</p> <p>High number of economically inefficient oil mills with processing plants that are not optimal: traditional olive mills represent 28% of the number of olive mills) and account for about 7.5% of the theoretical daily milling capacity.</p> <p>Dimensions that do not allow "critical mass": excessive fragmentation.</p> <p>Low milling capacity in the most suitable zones to produce olive oil that could have a clear mark of distinctiveness.</p> <p>Not very incisive role of trade associations in concentration of the offer and product enhancement.</p> <p>The price volatility of olive oil and the higher investments could justify the desire expressed by a majority of mill operators to make their investments immediately profitable, encouraging them to make the most out of their equipment, still giving more importance to the quantities of olives crushed than to the quality of the olive oil produced, not symbolizing the spirit to create a value chain involving GI.</p>

Table 2. Cont.

PRIMARY TRANSFORMATION: THE OLIVES MILLING PHASE	
Strengths	Weaknesses
	<p>The instructions for transporting and storing olives (use of plastic crates for example), for the maintenance of crushing equipment and the storage of olives and olive oil, are generally not respected, especially in suitable areas able to produce differentiated olive oil. Such behavior considerably limits the possibilities of improving the proportion of olive oils with substantial quality within the total production, and generates a considerable loss of income.</p> <p>In the suitable areas with a higher capacity to differentiate the olive oil involving GI, organic, or other kinds of certifications, the olive oil mills are characterized by the weak mastery of quality olive oil production instructions.</p> <p>Limited contractual capacity between value chain actors adopting the GI model.</p>
BOTTLING AND MARKETING	
Strengths	Weaknesses
<p>A powerful industrial infrastructure counting with more than 40 modern bottling plants.</p> <p>Concentration of large operators in the most traditional producing areas and in the capital.</p> <p>Tunisia has an olive oil storage capacity of 365,000 tons, among which 150,000 or 41% are held by the National Office of Oil and spread over the regional centers of Tunis, Sfax, Sousse, Sidi Bouzid, Kairouan, and Zarzis.</p> <p>Propensity to export: Tunisian olive oil is exported to all five continents. The first export agreements were concluded with the European Union during the 1980s. Since then, this market has become the traditional customer for Tunisian olive oil, with more than 80% of exports: in addition to classic destinations such as Italy and France, Spain and Portugal have become new European destinations, as has the United States, which is now a classic market for Tunisia, since 52% of olive oil that is consumed is of Tunisian origin. South America, sub-Saharan Africa, and North Africa, as well as the Middle East and the Gulf countries, Asia, and Australia have also been conquered by Tunisian olive oil in recent years. More than 200 private traders alongside the National Oil Office produce an average of 132,000 tons of exports on a production of 165,000 tons (approximately 67%).</p> <p>Recently, exports of organic and bottled olive oil have increased. They now account for about 21 and 10 percent of total olive oil exports, respectively.</p> <p>Emergence of start-up, e-commerce, artificial intelligence (IA), blockchain, and other new marketing tools in the olive oil sector to promote Tunisian products; this glimmer of hope appears to be emerging in the actual context of EVOO value chain protected by GI.</p> <p>The initiatives to promote the Tunisian olive oils by presenting it in the international competition are becoming more and more numerous.</p>	<p>Weak allocated funds to promote the bottled EVOO in general, and particularly the EVOO protected by GI, abroad.</p> <p>The manifest lack of prospective studies and strategic diagnostics of new markets, which results in the absence of long-term marketing strategies for the development of bottled olive oil value chain, mainly differentiated EVOO by adopting the GI model, based on consumer demand and consumer behavior.</p> <p>Exports are very often in bulk: even if the Tunisian olive oil is known by the Italian and Spanish importers, it remains completely unknown to final consumers.</p> <p>The absence of horizontal and vertical integration between the different nodes of the value chain in the sector, which does not support the implementation of a global quality program, and limits the possibilities of compressing the cost of production of olive oil differentiated by quality.</p> <p>The lack of olive oil storage stocks mechanisms to encourage and finance private storage. This is vital to guarantee a minimum level of oil availability that covers quantitative and qualitative commitments within the deadlines required by the European market, especially during low production campaigns.</p> <p>The geographical distribution of olive oil exporters is heterogeneous; it is concentrated in the coastal region and the capital, while it is almost absent in continental regions, that limit the activities of GI producers. This is explained by a less developed infrastructure in the interior regions, but also by the habit of the exportation companies to be located near naval ports.</p> <p>The lack of conditioning units is a major problem that needs to be solved, especially for the regions that are far from the coastal areas.</p> <p>The olive oil exporters are often seen as “opportunistic”, because they are selling olive oil and do not think about long-term strategies that can ensure the sustainability of the sector.</p>

Table 2. Cont.

BOTTLING AND MARKETING	
Strengths	Weaknesses
	<p>Except some private initiatives, private companies do not have the financial resources to promote private brands abroad, and to install their long-term marketing strategy, a necessary condition to sustainably promote the EVOO value chain taken into account by the GI model.</p> <p>The lack of national private company to produce glass bottles with higher quality able to fit the demand of foreign market well, and to be competitive facing international companies.</p>
Institutional, organizational, and financial framework	
<p>The presence of choked institutional infrastructure, varied respect to their objectives, the existence of programs and funds to promote the olive oil sector in general, and that exercise through the different stage of the value chain and in the different domain such as scientific research, industrial and agronomic technical packages, marketing, etc.</p> <p>Higher potentiality to organize small farmers, and all actors of the value chain.</p> <p>A considerable capacity of vertical integration between the different links characterized the value chain (olive growing, trituration stage, trade, and marketing, etc.).</p> <p>In suitable areas with high potential to produce a differentiated olive oil, the sector is still being structured, presenting various opportunities of investments.</p> <p>Various training and coaching programs, and support programs to improve the mastery of traceability tools and quality labels perception existed, and could be improved further.</p> <p>Various support activities aim to improve ONG and grassroots organizations' governance.</p>	<p>The lack of a program and funds aims to support prospection and diagnostic activities, therefore improving product differentiation capacity.</p> <p>Poor organization of the different actors of the value chain, especially in zones with potential and high product differentiation capacity.</p> <p>Weak label governance and weak financial capacity to support the label governance (PDO, PGI, organic, etc.).</p> <p>Low level of actor membership into grassroots organizations and ONGs.</p> <p>Lack of transparency and accountability in the governance of grassroots organizations and ONGs.</p> <p>The new investment code does not provide clear articles to promote high-quality products with distinctiveness marks.</p> <p>Rather complicated markets and financial framework for young entrepreneurs to integrate.</p> <p>Poor training and coaching programs that aim to define and satisfy the consumer demand and needs (at national and international level) in terms of quality differentiation.</p>
OLIVE GROWING: AGRICULTURAL SECTOR PRIMARY TRANSFORMATION: THE OLIVES MILLING PHASE BOTTLING AND MARKETING	
Opportunities	Threats
<p>The olive sector is supported by several governmental institutions, which are:</p> <ul style="list-style-type: none"> • The Ministry of Agriculture • Ministry of Industry and Technology • Ministry of Commerce and Handicrafts • The Technical Center for Organic Agriculture (CTAB) • Agricultural Investment Promotion Agency (APIA) • The Export Promotion Center (CEPEX) • The Technical Center for Packaging (PACKTEC), etc. <p>The National Oil Office no longer has a monopoly on the collection and exportation of olive oil following the implementation of the law n°94-37 of 24 February 1994. In fact, since 1995, following the accession of Tunisia to the World Trade Organization and the association agreements with the European Union, the aim has been to produce competitive goods in the international market. In this new context of competitive advantage, all efforts were directed towards the liberalization of exports and the establishment of an export promotion program, accompanied by significant privileges and benefits for exporters (grants and loans from the CEPEX for transportation, market research, participation in exhibitions, publishing promotional materials etc.) and support structures (technical centers and inter-groups).</p>	<p>Despite the fact that Tunisia is the fourth biggest producer of olive oil worldwide and the third biggest exporter, especially to Italy and Spain, a geographical indication for Tunisian olive oil does not exist.</p> <p>Unit prices of olive oil are largely unfavorable to Tunisia, compared to its main competitors, because the Tunisian olive oil is still exported in bulk, rather than in individual bottles, and the added value of this oil is therefore outside the country.</p> <p>Tunisian olive oil is still considered as a commodity, and it is promoted solely on the basis of its physical characteristics, while the symbolic attributes are generated on developed countries.</p> <p>The Tunisian olive oil is losing its value on the international market, because it is generally mixed with the European olive oil and sold as their own national production.</p> <p>A government strategy has been urged by the Tunisian research sector, which should include a national and international marketing campaign with both public and private stakeholders; the National Office of Oils (ONH), Tunisia's Exports Promotion Center (CEPEX), the Olive Tree Institute (Institut de l'Olivier), in addition to all the private sector stakeholders, the producers, manufacturers and the exporting companies.</p>

Table 2. Cont.

OLIVE GROWING: AGRICULTURAL SECTOR PRIMARY TRANSFORMATION: THE OLIVES MILLING PHASE BOTTLING AND MARKETING	
Opportunities	Threats
<p>A designation of origin recognized by the EU, the principal destination of exported Tunisian EVOO, can be a tool for rural development, by preserving local resources and by granting local producers a decent income, with access to new markets and niche or keeping markets remunerative.</p> <p>A new strategic orientation, defined in the new investment code, aims to promote the territorial and sustainable development of the vulnerable Tunisian areas, which are suitable, and have the potential to produce product with recognized origin designation.</p> <p>Various local areas which are more vulnerable with high potential to differentiate product in term of quality and strategic sector such as olive oil receiving and continue to receive attention of international organism such as world bank, FAO, GIZ, ONUDI, etc.</p> <p>The existence of local and active collaborative platform “cluster olive oil of the North west” that integrate the different actors of the value chain aims to better promote the sector in this region, which could represent an opportunity for young people to integrate the sector.</p> <p>The possibility to take advantage and build the successes of product with recognized origin designation through the presence of local grassroots organizations’ and NGOs.</p> <p>Many projects and programs aim to promote the presence of start-ups led by young people in the agriculture and agri-food sectors.</p> <p>In order to enhance the achievement of this strategic objective, the Tunisian Government authorized private exporters, in 2005, to export organic olive oil and olive oil bottled under a Tunisian brand within the framework of the quota granted to Tunisia by the European Union. They have also created a fund to promote packaged olive oil. This fund provides aid to any company or group of companies or any consortium or professional association operating in the field of the production of packaged olive oil or its export, except for international trade companies. It intervenes to support actions of general interest aimed at raising awareness of Tunisian olive oil, with a view to promoting its marketing and enhancing its exports. This fund also intervenes to support specific actions aimed at consolidating the capacities of an interested company or a group of companies, at their request, with a view to promoting their exports, particularly through their valorization. The assistance of this fund is granted in the form of bonuses, which amount to 70% of the cost of general interest actions and 50% of the cost of specific actions, with a maximum of 70 thousand dinars (35 thousand euros) per year and per company. These premiums cannot be combined with the premiums and assistance granted by other funds. The management of this fund is entrusted to an advisory council working with the minister in charge of industry called the “Conseil tunisien de l’huile d’olive conditionnée”.</p>	<p>Creating a national label to be promoted on foreign markets can be very expensive and dissuasive for olive growers or exporters, particularly due to the import of the necessary material from UE, like the glass bottle.</p> <p>The existence of competitive logistics to promote products with recognized origin designation in UE against a poor national logistic one.</p> <p>Mistrust of Tunisians actors, investors, entrepreneurs, etc. towards the initiatives and support activities, subsidies led by national authorities.</p> <p>The promotion of olive oil value chain aims to differentiate products in term of quality is generally related to personnel and individual initiative and not a national strategy.</p> <p>The challenge is the sustainability of grassroots organization and ONG, due to the low level of actor membership and lack of transparency and accountability in the governance of grassroots organizations and ONGs.</p>

3.1. Better PDO or PGI or Organic Certification for Tunisian Extra Virgin Olive Oil?

The challenges that witnessed the olive oil trading market in recent years made it even more difficult to maintain the competitiveness of small size producers; either farmers or olive millers. Taking into account the results of SWOT analysis and product labelling,

in fact products protected by GIs could be an effective way to promote olive oils with a demonstrated mark of distinctiveness and to create an effective socio-economic dynamics, especially in continental areas, which are the most vulnerable areas in Tunisia, but present a potential to produce such kinds of particular olive oils. Since Cei et al. (2017) [24] view who assessed the Italian experience with Geographical indications and its impact on rural development of Italian regions, that the GI representing instrument to foster rural and territorial development and overall have a positive effect on agricultural value-added providing evidence of the European policy on rural development. Furthermore, in line with Riccheri et al. (2019) [44], the principal motivation to protect product specifications has been economic, to define a market niche linked to traditional and local production methods, and to obtain a price premium for the protected product. This will encourage more attention to the quality, the traceability, and the identity of the products. However, the impact of GI likely varies across countries and between products, and as argued by Cerchia (2011) [25], it is worth noting that the socio-economic dynamics of GIs are highly context specific. Therefore, the question which needs to be asked is how best to obtain the greatest benefits from the GIs, in Tunisian context? What is the most suitable for the Tunisian case at this stage, to adopt PDO or PGI strategy?

The concentration of modern infrastructure, investments and access to markets in coastal areas will make it difficult to upgrade the practices, equipment and human resources. It is then worth concluding that, at a first stage, it is important to promote exchanges between coastal main producing/transforming areas and continental areas that are just starting to modernize their means of production. Thus, it can be more efficient for the Tunisian context to promote geographical indications that involve both geographical areas in the same scheme of development. For this reason, it may be more reasonable to encourage the implementation of PGIs instead of PDOs with relatively large areas of production, in order to increase opportunities of valorization and ensure their success counting with both the initiative of local stakeholders and other operators with more capabilities. The operators could invest in the producing areas or, at least, carry out part of the process there. This could help to create a win-win situation, where new opportunities of inclusion are provided to less advantaged rural populations and give the traditional operators new innovative marketing tools responding to the coming challenges that the sector will face.

Many GIs products contribute to national identity and to cultural and gastronomic heritage, as argued by Agostino et al. (2014) [27], and further have an impact on country exports and appeal. However, a more comprehensive business model can be adopted around the GIs with a long-term vision, taking into consideration the sustainability of the economic activity, the environment, and the availability of resources [45]. As commented by Riccheri et al. (2019) [44], few GI products were explicitly set up with the motivation to protect the local environment and to preserve the local resources. It is also worth mentioning that several changes in consumer ethics and marketing philosophy may emerge in a post-pandemic context most likely toward more responsible and prosocial consumption [46]. This hypothesis can be the source of a stable economic benefits from PGIs trade if the adequate information, continue to be provided, to consumers to make the good choice during their buying decision process, as well as, if an effective verification and controls of producers carried out to eliminate unfair practices [47].

Consequently, it is important to capitalize on the organic labelling, as to be the leading brand of the Tunisian olive oil, in order to increase the added value and distinctiveness. According to Ben Abdallah et al. [4], olive-producing areas in Tunisia are composed by 81.8% of traditional conventional systems, using nearly organic practices, 13.6% of traditional certified organic systems, while only being 4.6% of intensive and super-intensive systems. This will also need additional efforts of the local producers to adhere to certification scheme, in order to be in line with local and EU legislation and traceability requirements. The combination of PGI and organic certifications could be an important asset to provide more valuable arguments in the market. Therefore, the promotion of PGIs

as a sustainable economic model for Tunisian olive oil producing sector could be of great relevance, taking into account all the particular characteristics mentioned above. Moreover, the territorial developing approach can be increasingly important in the future to respond to several challenging issues of societies, especially in countries like Tunisia. Agriculture could then be an example for other goods and services to preserve the sustainability of the production systems and the cultural heritage [48,49]. Such a step would consolidate cooperation between medium size and small size stakeholders, taking advantages from the know-how of all operators, protect the identity of the product in the areas with poor access to the same know-how, and provide a sustainable scheme for territorial development in Tunisia. Moreover, the implementation of an efficient control scheme will need to provide training and education of the stakeholders from disadvantaged areas by accessing modern technology and infrastructure. Actually, the fact that an olive oil is certified as PGI does not mean systematically an insurance of a better quality if analytical and bio-analytical tools are used to control the traceability [50]. As mentioned before, trust and good knowledge of the product specifications are important drivers for consumers, since they reduce complexity and uncertainty when it comes to making a purchasing decision [16,50]. It is expected that information, technological and know-how change through this horizontal model will help to ensure more visibility to the regions and promote their access to the international markets on the long term. According to Hajdukiewics (2014) [47], historically, GIs in general have been used in international trade to gain position and profitability by conveying a certain quality or reputation based on specific geographic contexts and origin of each product. At the same time, this will help to diversify the market by introducing new authentic products as a result of the specific climate and varietal assortment in particular areas of Tunisia [51]. In order to take the maximum advantage from the new business model, PGI producers must constantly develop their skills in terms of production and mainly in marketing, beside meeting certain pre-conditions. Furthermore, the easy change and matching roles between actors horizontally and vertically through the EVOO value chain, and between areas, taking into account the new business model, will ensure the distribution of value-added among supply chain actors, as argued by Giannoccaro, et al. [52]. After establishing the basis of a sustainable partnership within the olive oil sector in Tunisia through PGI creation, other labelled products may emerge under more localized conditions, including the introduction of amendments to the product specifications when an appropriate level of maturity is reached. The specification amendment in already registered GI products is actually a common procedure in other countries [53], which allow the sustainability of the economic activity linked to each product.

The following Table 3 provides a concise analysis of the different aspects embedded in the creation of a PGI for Tunisian olive oil, according to the SDGs.

Table 3. PGIs for Tunisian olive oil and SDGs.



SDG Goal	Creating New PGIs Geographical Indications for Tunisian EVOO Which Enhances the Traditional Organic Production, and Promoting the Existed Ones Can Be a Tool to Resolve Old Problems, Creating New Opportunities to Face the 17 SDG Goals PROBLEM (P), SOLUTION (S) and OPPORTUNITY (O)	
	No poverty	<p>P: The mapping* of the incidence of poverty in the country indicates that there is a high concentration of poverty in the Center-West and North-West of Tunisia. Poor people are particularly concentrated in the inner regions of central and northern Tunisia. Poverty rates are over 32% in the central-western and north-western regions of the country.</p> <p>S: Agri-food sector development for poverty reduction: Tunisia has been recognized in recent years as one of the regions in the world where the highest production of olive oil is concentrated. It is possible to contribute to the enhancement of the Tunisian oil sector through strategies capable of raising quality standards and developing products with high added value; such as an organic EVOO with a new PGI label, maintaining the added value inside the country, can significantly contribute to fight poverty in the same country.</p> <p>* Tunisia poverty map, September 2020</p>
	Zero hunger	<p>P: In Tunisia, numerous factors have been highlighted which contribute to limiting the access of fragile citizens to a healthy and balanced diet. Among the factors highlighted by the World Food Program (WFP), the main causes are attributable to a stagnant economy, high unemployment rates, regional disparities and dependence on food imports. The portion of the Tunisian population most exposed to the risk of poverty, made up mainly of women and children, lives in rural areas, in the Central West and North West regions.</p> <p>S: poverty and hunger are two interrelated factors. The enhancement of an agro-food product that is characterized by high demand in the world market, using a mark of origin coined in Europe and its credibility in the approval and verification process of the European Union, implementing strategies that maintain the added value of produced in the country of origin, it is a strategy to ensure a fair income for families in rural areas, where the incidence rate of poverty is higher, reducing hunger, understood as malnutrition.</p>
	Good health and well-being	<p>O: Agriculture systems have effects on the environment and human health. The traditional farming practices, mainly organic farming, excluding synthesis products, contribute to increase the availability of safe foods for citizen. Foods have a major effect on health and wellbeing, and a new PGI label for Tunisian EVOO* that certify the organic farming practices, can be a tool to help food choices made by consumers towards safe foods able to improve health status and well-being of people.</p> <p>* The health and nutritional benefits of extra virgin olive oil are confirmed by a rich scientific literature in the medical field. The functional molecules present in EVOO are unsaturated fatty acids and antioxidant substances, such as polyphenols, vitamins, and carotene</p>

Table 3. Cont.

SDG Goal	Creating New PGIs Geographical Indications for Tunisian EVOO Which Enhances the Traditional Organic Production, and Promoting the Existed Ones Can Be a Tool to Resolve Old Problems, Creating New Opportunities to Face the 17 SDG Goals PROBLEM (P), SOLUTION (S) and OPPORTUNITY (O)	
	Quality education	<p>P: The proportion of graduates from agricultural colleges and training centers at the asset level is very low, which translates into a low rate of supervision at the level of these farms and affects the technical and economic performance. The know-how of most assets based on inherited traditions does not give much importance to the economic considerations of optimizing the exploitation of the olive potential.</p> <p>S: The indications of origin of the products require compliance with a production specification for a third party to validate the process and the product, granting the opportunity to use the mark of origin that certifies the superior quality and the relative price premium. In order to guarantee the largest application of the production disciplinary and the highest certify production of certified PGI EVOO, the development of training programs, able to improve the farmers' competencies and knowledges, are essential to improve, along the entire supply chain, from farm to fork, quality, efficiency and competitiveness of processes, from the application of the best agricultural and technological practices, to the logistical and organizational models, to the traceability and certification systems necessary to meet the demands of large international distribution companies. This can enhance quality education in the agricultural and marketing disciplines.</p>
	Gender equality	<p>P: Agriculture, therefore, occupies an important place in the economy of the region, with women actively participating in agriculture. However, its development remains weak due to land degradation and water scarcity. Due to urban migration of men, women-headed households are more likely to be found among agricultural households. The fact that 35% of women in Tunisia live in rural areas means that agriculture remains the first employment sector for rural women. The mapping of the incidence of poverty in the country indicates that low-income rural households headed by women are especially at risk of poverty, and often, women work longer hours to attain the same level of welfare as men do.</p> <p>S: The interconnection among 4 and 5 goals can explain the reason why the organic EVOO with a new PGI label can ameliorate working conditions and enhance training and involvement of female workers, together with standard of living.</p>
	Clean water and sanitation	<p>P: One of the greatest global challenges is the limited and insufficient security of water resources.</p> <p>S: Protected Geographical Indications (PGI) guarantee "qualitative" characteristics of the product that depend on both environmental, climatic, landscape, production and cultural elements, and on peculiar traditional production practices historically rooted in a specific territorial area, such as organic olive growing practices in Tunisia. Olive growing is the most widespread agricultural activity in the arid Tunisian regions, due to its tolerance to drought and prolonged sunlight. The Tunisian organic EVOO protected by a PGI brand is a tool that can help reduce desertification and soil degradation, protecting water resources and enhancing the landscape.</p>

Table 3. Cont.




SDG Goal	Creating New PGIs Geographical Indications for Tunisian EVOO Which Enhances the Traditional Organic Production, and Promoting the Existed Ones Can Be a Tool to Resolve Old Problems, Creating New Opportunities to Face the 17 SDG Goals PROBLEM (P), SOLUTION (S) and OPPORTUNITY (O)	
	Affordable and clean energy	<p>O: A new mark of origin that emphasizes organic olive growing practices as an element of differentiation, associated with marketing strategies that allow the added value to remain within the Tunisian territory, ensuring a fair profit for all the players in the supply chain, which will allow the reinvestment of part of profits in new technologies for the energy enhancement of the by-products of the olive oil supply chain, in a circular economy perspective, in which waste becomes resources.</p>
	Decent work and economic growth	<p>P: As often occurs in the agricultural sector, for temporary workers, the larger part in the olive oil sector employed from September to February, in the agriculture node, wages are significantly lower than those for full-time workers. Workers receive in-kind benefits, but they typically lack access to social protection benefits associated with formal employment (e.g., healthcare). Moreover, according to recent research conducted by the International Labour Organisation (ILO), a high level of unemployment (and in particular youth unemployment) is generated by both the skills mismatch and by the incapacity of the national economy to generate enough jobs to absorb the new entrants into the labor market, especially for citizens who, despite a high level of education, have not found a job placement proportionate to the level of skills, mainly in rural areas where economic development is not yet complete. The main cause of this phenomenon lies in the low demand for qualified personnel and the low attitude of SME entrepreneurs to pay high salaries, which turns into a greater demand for unskilled personnel.</p> <p>S: In consideration of the importance of olive oil production in Tunisia, the development of high-value-added products, including more bottled and organic olive oils, certified by Designation of Origin, can enhance the competitiveness and recognition of its oils at home and abroad, thus consistently improving working conditions and economic growth in the same country. The new PGI label for Tunisian EVOO can, effectively, generate an innovative production and marketing approach in enterprises and it may be a good opportunity for the country to take advantage of the changed structure of the labor force (more high-skilled workers, and with a fair wage, even for temporary work).</p>
	Industry, innovation, and infrastructure	<p>O: The availability and quality of human capital (people with high education levels) and infrastructures (innovations of industrial structures along the entire value chain) can represent the best growth strategy of the sector at the regional level, being complementary factors, which, in an integrated approach, can mutually reinforce each other.</p>

Table 3. Cont.

SDG Goal	Creating New PGIs Geographical Indications for Tunisian EVOO Which Enhances the Traditional Organic Production, and Promoting the Existed Ones Can Be a Tool to Resolve Old Problems, Creating New Opportunities to Face the 17 SDG Goals PROBLEM (P), SOLUTION (S) and OPPORTUNITY (O)	
	Reduced inequalities	<p>P: This goal is strictly related to gender equality and no poverty and can be pursued through the present project by effectively boosting the participation of different stakeholders belonging to the value chain at stake. The goal also addresses inequalities among countries. Unit prices of olive oil are largely unfavorable to Tunisia, despite a favorable place on the international market when compared to its main competitors. This is also the case of Spain, with values ranging from 25 to 35%. This is mainly since the Tunisian olive oil is still exported in bulk rather than in individual bottles. So, Tunisia does not fully benefit from the real value of its olive production. In fact, most of the quantity exported is in bulk, which means that the sector has a great deal of added value that can still exploit recovery of the extra value, now giving way to nations that import Tunisian oil in bulk and pack it.</p> <p>S: Reduced inequalities also among countries requires an innovation in the olive value chain in Tunisia, mobilizing farmers to create professional agricultural organizations and economic interest groups, with the aim of elaborating branding strategies based on the product differentiation through signaling quality, such as the new PGI label for Tunisian EVOO, that can be a tool for rural development, by preserving local resources and by granting local producers equal income with access with the more remunerative product to new markets maintaining markets.</p>
	Sustainable cities and communities	<p>P: A massive migration from less advantaged rural areas to small and large cities has been recorded since the 1990s, with serious repercussions on Tunisian demographic dynamics that have accentuated the education and income gap between citizens in the nation.</p> <p>S: The sustainability of urban areas is intimately interconnected with the improvement of the protection of cultural and natural heritage at a global level, and can be pursued through planning and development strategies agreed at the regional and national level, such as to support economic, social and environmental links between the urban, peri-urban and rural areas, making rural villages more attractive to tourists, and to create sustainable tourism. Thanks to the new PGI label for Tunisian EVOO, and to all the elements related to it, such as the landscape, can become a key element for the development of rural areas, also presenting a growing interest, in what concerns tourism and culture, generating additional income for the commercialization of the product itself, the olive oil.</p>
	Responsible consumption and production	<p>O: In connection with policies, also at the European level, i.e., the Farm2Fork strategy, particularly connected to the organic production method, the project effectively has beneficial effects on consumers' attitudes and behavior. As for production, the same method is strongly related to responsibility.</p>

Table 3. Cont.






SDG Goal	Creating New PGIs Geographical Indications for Tunisian EVOO Which Enhances the Traditional Organic Production, and Promoting the Existed Ones Can Be a Tool to Resolve Old Problems, Creating New Opportunities to Face the 17 SDG Goals PROBLEM (P), SOLUTION (S) and OPPORTUNITY (O)	
	Climate action	O: In view of the fact that the vast majority of olive oil production in Tunisia is obtained in arid conditions using organic or nearly organic practices, these same practices are highly beneficial and contribute to climate adaptation and mitigation measures.
	Life below water	O: Can the oceans, seas and marine resources benefit from the creation of a new geographical origin label for Tunisian olive oil, characterized by being organic? Intervention on agricultural and technological practices aimed at raising the quality of the product, protecting, at the same time, the non-renewable resources involved in the production processes, could have positive effects on the reduction of greenhouse gas emissions, and therefore on the possibility, in the long term, to mitigate climate change, reducing the damage suffered by marine ecosystems.
	Life on land	O: The olive tree is a key crop in the Mediterranean basin, not only because it is part of a multifunctional economic system, but also because it is a crop that can help combat desertification by reducing soil degradation. If the production of a Tunisian extra virgin olive oil with a certified mark of origin is also oriented towards organic production models, it will be possible to guarantee advantages, both in terms of soil quality and biodiversity.
	Peace, justice and strong institutions	O: The 2011 revolution in Tunisia led the EU to make commitments to Tunisian citizens to foster greater democracy, freedom and social justice, given the geographical, cultural and commercial ties that bind the nations of the Mediterranean basin. In 2012, a “privileged partnership” was established to guarantee and strengthen the ties between Tunisia and Europe. The new brand of geographical origin certified and recognized in Europe for Tunisian olive oil can, in fact, represent tangible proof of institutional action aimed at improving access for Tunisian olive oil exports to the EU, constituting a tangible tool to promote peace, justice and sustainable development. This strategy could integrate well with European actions aimed at significantly supporting the country’s trade balance, also considering that an olive oil Tunisian olive provides direct and indirect employment to over one million people and accounts for a fifth of the country’s total agricultural employment.

Table 3. Cont.

SDG Goal	Creating New PGIs Geographical Indications for Tunisian EVOO Which Enhances the Traditional Organic Production, and Promoting the Existed Ones Can Be a Tool to Resolve Old Problems, Creating New Opportunities to Face the 17 SDG Goals PROBLEM (P), SOLUTION (S) and OPPORTUNITY (O)
	<p>P: This sector suffers also from the individualistic behavior of the exporters/producers, which leads to a lack of cohesion between the operators. The olive oil exporters are often seen as “opportunistic” because they are selling olive oil with no long-term vision that can ensure the sustainability of the sector.</p> <p>As mentioned above, the proposed methodology entails the creation of effective and strong partnerships in the Mediterranean basin, fundamental to obtaining concrete outcomes and favoring political participation and social cohesion.</p> <p>O: PGI label for Tunisian EVOO can foster direct investment from abroad (FDI) as a fundamental tool to support domestic investment and boost capacity building, through putting in field resources such as capital, technology, skills, management and marketing know-how. The host economy benefits from these resources and capabilities and, at the same time, the investing transnational corporations (TNCs) gain advantage from the same investment in a mutual positive perspective.</p> <p>Capacity building is essential, as well, in a South–South and triangular regional, and international cooperation, to promote knowledge sharing and access to science, technology and innovation on mutually agreed terms, particularly through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism.</p>

3.2. Roadmap to Achieve More Sustainable PGI for EVOO Value Chain in Tunisia

As mentioned above, the olive oil sector in Tunisia represents a strategic sector and exportations constitute an obvious source of foreign currency income that enhances Tunisian economic balance. However, its contribution could be much broader and improved. In fact, a significant part or almost all of Tunisian olive oil was exported in bulk, and the exported bottled olive oil does not exceed the 10%, in average, of total olive oil export, so far to FOPROHOC objectives (i.e., 20% of total olive oil exports) [2]. Based on the SWOT analysis results, amongst other things, this could be due to:

- The competition is very tough on the international market;
- The price production of olive oil is getting more and more higher;
- Due to the lack of high-end packaging manufacturing in Tunisia, the majority of exporters import packaging, hence impacting the very high price of bottled oil;
- The destinations of the conditioned products are very distant and generate high freight costs;
- A weak national strategy to promote the Tunisian olive oil abroad and do not fit the different actors needs of the sector;
- A weak negotiating capacity with UE legal part to improve Tunisian contingent rate, etc.;
- The absence of Tunisian olive oil protected by geographical indications in international markets;
- Weak attempts to differentiate the olive oil and to limit specific requirements to protect their geographical indication.

Conversely, the Tunisian organic olive oil is booming and has reached a maturity level that allowed it to achieve a better positioning internationally and to conquer new markets,

promoting Tunisia as an economic and tourist good destination, where the organic method reflects cultural aspects. In 2015, The Tunisia organic olive oil reached 95% of total exported bottled olive oil. To the best of our knowledge, the organic olive oil is the only Tunisian certified bottled olive oil marketed abroad.

Therefore, taking into account the significant potential of organic olive oil, associated to protected geographical indications, it could represent a new concept model in Tunisia to develop more efficiently the sector of olive oil and to organize it, hence to promote the Tunisian producing regions, such as the North West of Tunisia, by gaining more attention and more added values. In fact, the product differentiation principle ensures to actors a strong bargaining power and, consequently, a higher margin, awarding higher attractiveness to this segment.

To reach this objective, a reliable roadmap to produce and promote olive oil value chain protected by geographical indications, taking into account the local potential of organic products, is crucial. This roadmap should be structured and focused in five strategic axes:

- Organizational and institutional framework;
- Improve capacity building;
- Communication and networking roles;
- The role of TIC in taking new opportunities and information availability;
- Financial products and supports availability to promote distinguishable olive oil value chain.

3.2.1. Organizational and Institutional Framework

Taking into account the strategic position of the olive oil sector in the national economy and related socio-economic added value, Tunisia has opted for a strategy aiming to promote the sector oriented to give more attention to bottled olive oil exports toward their habitual market like EU, and by identifying new emerging markets like the USA, Japan, China, etc. This strategy has been supported by the presence of a complicated institutional and organizational framework counting on several public and para-public entities, as well as various professional, inter-professional and trade union organizations that interfere directly or indirectly [43,54]. For example, we can cite:

- Ministry of agriculture,
- Ministry of industry and technology,
- Trade ministry
- National oil office (ONH)
- Olive Institute
- The technical center for organic agriculture (CTAB)
- Agricultural investment promotion agency (APIA)
- Industry and innovation promotion agency (APII)
- The export promotion center (CEPEX)
- The technical center for packaging (PACKTEC),
- Other governmental and non-governmental organisms, etc.

In addition, an ecosystem has been placed to support olive oil exports. In fact, various programs have been created; the most important ones are the export market access fund (FAMEX) supported by trade ministry and financed by the World Bank, the export promotion fund (FOPRODEX) and the fund for the promotion of packaged olive oil (FOPROHOC), which represent financial support mechanisms to the actors [54]. The mentioned three programs aim to promote bottled olive oil export and the identification of the new emerging markets and to support actors to implement appropriate marketing strategies.

However, it is quite clear that the results were so far to expectations, due principally, on one hand, to the fact that the roles, missions and responsibilities of the different entities representing the institutional and organizational framework are often lacking in precision, overlap and lack overall the consistency and coordination between them. On other hand, the promotion actions and support activities proposed do not fit exactly the value chain actors' needs involving PGI.

Consequently, it is important to sustain the Tunisian institutional and organizational framework by:

- Defining the role of different stakeholders involved in the olive oil sector as in the promotion of bottled olive oil export, their missions, and responsibilities.
- Mapping the different stakeholders in function to different phase of product's life cycle, as well as it is important to define the technical and financial products and services purposes present in each level and who proposes it.
- Create a policy dialogue about the potential added value that presents various vulnerable and marginalized zones, such as the North-West of Tunisia, to improve policy-makers' awareness.
- Implement effective and inclusive multi-stakeholders and multi-institutional platforms to provide value chain actors, especially in marginalized zones, with the opportunity and the space to communicate their needs and priorities and give them the chance to engage directly with policymakers.
- Support initiatives, in the context of a participative approach, aiming to differentiate the quality of extra virgin olive oil products by recognizing the geographical authenticity and to valorize it by developing the technical specifications and the legal framework of the appropriate label.
- Designing a new diplomatic framework to accomplish with national policy goals.
- Improve the legal and institutional frameworks to enhance international market access and the market development strategy based on customers' preferences knowledge.
- Create the necessary framework to assess and control the operational requirement processes to promote the bottled olive oil export.

Furthermore, recognizing the strategic role of the olive oil sector and the potential added value associated to each product in the context of gourmet products markets, especially resulting from wealth of the vulnerable zone, such as the North-West of Tunisia, the promotion of differentiated quality of the olive oil by involving geographical indication for example, and the improvement of territorial and socio-economic impacts has been the goal of different projects. These projects have been carried out by international organisms of technical and financial supports like FAO, GIZ, World Bank, ONUDI, etc. into bilateral and multilateral cooperation. However, it is important to mention that, on one hand, the results, lessons and consequences of these various projects are not documented and brought to the attention of different actors of the local olive oil value chains. On the other hand, we can easily observe the lack of harmonization and coordination between almost of these different interventions. Therefore, it is necessary to harmonize these interventions, as well as these interventions and national strategies to promote the olive oil with high added value [55]. Furthermore, it is primordial to centralize the information relating to the opportunities resulting from these projects, and to capitalize the experience and lessons revealed, which can be only a shortfall in terms of information and opportunities.

3.2.2. Improve the Required Capacity Building

Facing the protectionist policy applied by the EU, the potential export improvement towards EU lies on bottled olive oil markets enhancing, practically the certified and differentiated extra virgin olive oil such as the organic one. To achieve this objective, it is worth noting that mid- and long-term capacity building activities related to technical and marketing issues are necessary, in favor of the different actors involved in bottled and certified olive oil value chains, especially in marginalized zones. In fact, these vulnerable and marginalized zones have been interested by an olive oil sector that was not well structured, and with a high potential wealth suitable to differentiate the olive oil. Furthermore, it is important to point out that the national and sub regional institutions and stakeholders need assistance and capacity building in terms of international markets access, use appropriate marketing practices and marketing strategies implementation, and to meet international food security standards. Therefore, for this purpose, a series of recommendations could be adopted to define an excellent building capacity plan:

- Enhancing different actors' skills involved in new PGI olive oil value chain, at various levels, to be able to manage and produce olives and olive oils with higher added value in term of socio-economic, environmental and nutritional dimensions.
- Improve actors' awareness to respect the specific and operational requirements to produce a distinguishable olive oil able to be competitive in new emerging markets known by their higher added value, such as Australia, Japan, the USA, etc.
- Develop actors' marketing skills to be able to promote differentiated olive oil and to increase significantly the market share of bottled extra virgin olive oil in habitual markets and to penetrate new markets. This marketing skills improvement could be related to packaging, pricing, communication, and product positioning strategies.
- Develop skills and capacities of national institutions involved in the olive oil sector to diagnostic, prospect and open new markets able to absorb the certified and differentiated extra virgin olive oil products and, therefore, to generate added value.
- Develop skills to define and support appropriate traceability mechanisms in order to better promote the Tunisian quality of olive oil.
- It is worth noting that the national authorities should be informed and up-to-date with respect to general international norms in term of food security and the specific ones attributed to targeted markets, and the internal regulation associated to olive oil sector and the legislations for geographical indications protection. This is necessary to be able to adapt the exported quality of olive oils, and the specific national legal framework aims to certify olive oil with markets requirements.
- Improve the extension services' skills to accompany and control the actors involved in PGI olive oil value chains to respect the specific requirements to produce the suitable quality.
- To initiate an integrated and participatory research-training-extension approach based on the establishment of an interactive platform where farmers, millers, and the different actors can express freely their problems and propose priority actions to be carried out and discuss innovative solutions for a more sustainable certified olive oil value chain.
- Offer training sessions to different actors to strengthen their capacities and awareness with respect to the environmental, social and economic dimensions of new PGI extra virgin olive oil value chain.

3.2.3. Communication and Networking Roles

To develop a sustainable agri-food value chain, in particular the olive oil, we need to avoid being isolated to our environment, and in this case, networking is essential. In fact, joining a network or building one (i.e., business network), allows the members to be informed, to meet people that share the same objectives, perceptions and problems, to be up-to-date, and sometimes to discuss a distressing lifestyle in order to reassure [55]. It is a new mindset that should be considered essential in order to adapt to the new rules of territorial development and micro-economic growth.

- Improve capacity and actors' awareness to engage with exporters, to develop their business networking and export trade intelligence.
- Revealing additional opportunities within the new PGI extra virgin olive oil value chain by shedding light on networking advantages and exchange between small actors and/or small companies.
- Stimulate actors (farmers, millers, exporters) to create an inter-professional organism or association to manage with all olive oil value chain phases and to minimize side effects, by providing immediate response and making significant efforts to control the local environmental impacts.
- Improve actors' capacities to define and develop a successful network which could be extended to enclose national authorities such as the Tunisian chamber of commerce, national trade unions, customs, APIA, etc.

- Facilitate networking events that bring together small actors, in particularly young agri-entrepreneurs, to facilitate their access to financial products, incentives and services, and allow them to have access to all necessary information (territorial development opportunities and advantages, PGI-organic socio-economic impact and the associated added value, the business and trade opportunities, the new market niches, etc.).
- Develop events (fairs, specific exhibitions, national and local seminars, etc.) to foster collaboration and networking by regional promoters, entrepreneurs, stakeholders and actors who share common perceptions towards the development of sustainable local PGI extra virgin olive oil value chain.
- Develop a mechanism to foster and support collaboration South-North of the Mediterranean to better promote the certified extra virgin olive oil with high added value in terms of economic, environmental, and nutritional dimensions.

3.2.4. The Role of TIC in Taking New Opportunities and Information Availability

The current unsustainable olive oil production, the price volatility, the growing of olive oil global demand in the world, consumer preferences heterogeneity and their behavior change towards a sustainable environment and a more sustainable lifestyle [56], make it necessary for the olive oil sector and their involved actors to face the adoption of new economic models to take into account the new world exigencies and requirements. A good designed economic model can give actors a better understand of situation and any related problems. To this purpose, the uses of ICTs represent a glimmer of hope that seems to be looming on the horizon. The appropriate use of ICT could, in particular, optimize the obtaining, exchange and processing of the information relevant to even investment opportunities in the olive oil sector, as well as the acquisition and renewal of know-how [55,57]. To this end, a series of recommendations should be taken into consideration.

Raise actors and stakeholders' awareness involved in bottled and certified extra virgin olive oil value chain with respect to the appropriate use of ICT tools through the implementation of a sustainable and efficient communication strategy, taking into account the profile of different actors.

- Strengthen actors' and promoters' skills in ICT use to overcome market isolation and improve their competitiveness in physical and virtual markets (familiarize with the new marketing tools, marketplace, e-commerce, augmented reality, etc.).
- Digitalize all information and administrative process (administrative information, legal information, the different financial sources, the prices evolution, the production tendency, new market characteristics, etc.).
- Use ICT tools appropriately and understand the opportunities presented to overcome the challenges that actors and stakeholders face to boost the PGI extra virgin olive oil value chain (competitive intelligence, market opportunities and restrictions, change and consumer behavior, etc.).
- Establish a platform that brings all programs, activities and projects carried out to promote differentiated Tunisian extra virgin olive oils and improve the real context.
- Communicate about agronomic, industrial, market, and entrepreneurial opportunities in certified and bottled EVOO value chain, and present the ready innovations with high added value, based in ICT technologies, to adopt.
- Create a multidisciplinary and multi-actor platform to communicate operational and technical services proposed by various administrations and financial structures and market opportunities' requirements in the context of certified and bottled EVOO. In fact, this virtual platform could be representing "one stop contact point" where the promoter can find all the necessary information valid to implement bottled extra virgin olive oil export actions.

3.2.5. Financial Products and Supports Availability to Promote Distinctiveness Olive Oil Value Chain

As mentioned before, the olive oil sector represents one of the principal pillars of the Tunisian economy. It is a strategic sector due to socio-economic, nutritional and environmental dimensions, thus associated to comprehensive financial and fiscal incentives framework to promote the sector in general and the bottled olive oil export, in particular. Furthermore, Tunisia presents a solid banking infrastructure, including public and private banks, and microfinance institutions [54,57]. However, the lack of suitable financial products and incentives able to stimulate the actors and promoters to invest in the sector, mainly in differentiated olive value chains, represents one of the principles limits [57]. Therefore, it is vital to take into consideration the next suggestions:

- Assess the performance and the efficiency of financial products and supports that already exist to promote bottled olive oil export and olive oil quality differentiation, and to measure the acceptability of these products and services from the actors and/or promoters.
- Carry on an analysis of actors' and promoters' demand of financial products and kind of supports which need to better promote PGI extra virgin olive oil value chains and to be more competitive with respect to their international direct competitors.
- Propose a new kind of support or adapt the existing ones to actors' needs taking into account for example price support, to define and implement appropriate marketing strategy, tax exemption to import high quality packaging to conserve olive oil quality, tax exemption to export differentiated and bottled and PGI extra virgin olive oil, support to packaging services, to participate in international olive oil competitions, etc.
- Propose tri-partite banking credits and facilities to bring together promoter-industrial-farmers for the good management of the value chain and quality control, and for the adequate territorial development.
- Support prospection programs to differentiate sustainable olive oil related to geographical, varietal, and environmental wealth.
- Define feasible financial products, incentives and services at short-, mid- and long-term, and to provide technical assistance, training, study tours, and others as building capacity supports in olive oil techniques and quality differentiation, and the good marketing tools.

4. General Conclusions

The fact that the majority of Tunisian olive oil is exported in bulk causes a lot of tension on the national economic balance; it accelerates the disparity between regions involving social, economic, and environmental challenges at both regional and national levels. Therefore, the goal of a geographical indication for Tunisia's extra virgin olive oils is to raise the level of competitiveness of the supply chain aimed at improving: (a) the profitability of olive farms; (b) the commercial role of vulnerable actors and incentives towards new organizational forms; (c) the distinctiveness of the quality through product qualification and differentiation interventions; (d) the protection of the final product with an efficient control system; (e) the support of aggregation and coordination within the supply chain, vertically as well as horizontally, involving regulatory and economic factors, capable of inducing a more effective association [58].

In the same perspective, the main objective of the present paper is to assess, in a comprehensive way, the environment of olive oil sector in Tunisia, in particular with regards to GIs, by identifying the advantages and barriers of the value chain and, therefore, take the opportunities that are capable to bring out the territory. It is also crucial to define a roadmap able to make effective and operational GI initiatives taking into account the different dimensions of Sustainable Development Goals of the United Nations.

The principal output of the present paper highlights that PGI is more suitable for the Tunisian olive sector than PDO, at least at the current stage. Actually, PGI allows one to encourage connections between coastal and continental areas, counting with the initiative of

local stakeholders from disadvantaged areas and operators with more capabilities coming from coastal provinces. Moreover, taking into account the position of Tunisian organic olive oil in the world, the combination of PGI and organic certifications could be an important asset to provide more valuable arguments in the markets, and therefore could be more relevant in the Tunisian context. Hence, PGI-organic extra virgin olive oil can help to create new niches able to sustainably improve the competitiveness of SME, based more on their authenticity than the volume of production [59].

However, it is worth concluding that a roadmap must be implemented in order to reach our objective and to make these initiatives more reliable. The roadmap presented in this study aims at: (a) promoting more effectively extra virgin olive oil protected by geographical indications, taking into account the local potential of organic products by providing the necessary capacity building; (b) shortening the distances between areas and between all stakeholders to achieve the different initiatives taking into consideration the goals of the 2030 Agenda in the Mediterranean basin; (c) removing behavioral and institutional barriers that inhibit the transformations needed to achieve more sustainable economies and societies; (d) creating a cross-disciplinary dialogue around the sustainability of PGI extra virgin olive oil value chain and narrowing the gap between research, policymakers, and the other stakeholders; (e) presenting the financial and support products able to help to achieve our goal according to the expectations of the actors, particularly young entrepreneurs; and (f) strengthening actors and young promoters' skills using TIC solutions to overcome market isolation, and to optimize the acquisition of the information, its exchange and processing, in order to take opportunities for a responsible investment in the olive oil sector.

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