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Data-enabled Business Models and Market Linkages Enhancing Value Creation and Distribution in Mediterranean Fruit and Vegetable Supply Chains (MED-LINKS)

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EXECUTIVE SUMMARY

This deliverable provides a "Report on review and analysis of main existing business models" within Task 3.1 - "Review and analysis of existing farm-level business models within three Supply Chain Systems" in WP3 "Enhanced business models and market access strategies" of MED-LINKS project.

In this report, we present a review and then an analysis of the business models used in three different supply chain systems: short food supply chains, export-oriented supply chains, and green public procurement. The concept of business models emerged to describe three facets of value. The value proposition, is the value that a firm (or system) promises to deliver to the consumer, and it is based on strategies like the development of differentiated products or the targeting of a new market; the value creation, that refers to the ways a firm creates and delivers the promised value, including the set of activities aiming at producing and delivering products and/or services; and value capture, which involves the ways organizations are able to generate returns and profit.

The report is structured as follows. First, we present the concept of business models. Then, we outline the sociotechnical contexts within which the food supply business models operate. In the next section, we present the triple-layered business models canvas, and then we apply it – theoretically and empirically - to the three supply systems under consideration. Finally, we discuss the key insights.

The main contributions to Sustainable Development Goals (SDGs) of the activities performed and the results obtained are outlined at the end of the report.

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1. Introduction

The need to analyze current agrifood systems and understand how value is created within such complex actors' constellations leads scholars to develop different conceptualizations and theoretical perspectives. The concept of business models emerged to describe three facets of value. The value proposition, is the value that a firm (or system) promises to deliver to the consumer, and it is based on strategies like the development of differentiated products or the targeting of a new market; the value creation, that refers to the ways a firm creates and delivers the promised value, including the set of activities aiming at producing and delivering products and/or services; and value capture, which involves the ways organizations are able to generate returns and profit (Osterwalder et al., 2010; Richardson, 2008).

In this report, we present a review and then an analysis of the business models used in three different supply chain systems: short food supply chains, export-oriented supply chains, and green public procurement. Before proceeding, it is important to explain what these terms mean.

Short food supply chains are supply systems consisting of only two (a farmer and a consumer) or three actors (in cases an extra node intervenes between the producer and buyer) (Chiffoleau, 2008), with the first case to be the norm (Charatsari et al., 2017). Such systems can take various forms, including farmers' markets, on-farm sales, box delivery schemes, or direct selling to local schools (Kneafsey et al., 2013).

Export-oriented supply systems are those chains that aim at delivering food products from the place of origin to another country. They can be based on contract farming schemes, and often they are focused on products with a geographical indication, like PDO (protected designation of origin), PGI (protected geographical indication) or GI (geographical indication) (Agostino and Trivieri, 2016; 2014).

Finally, the term "green public procurement" concerns the enactment of environmental criteria in the process through which public authorities purchase products or services (Cheng et al., 2018). In the present report, the term is used to describe the procurement of agrifood products. It is a form of environmentally responsible procurement (Li and Geiser, 2005), that gains momentum the recent years also due to legislative factors (Mélon, 2020). In green public procurement supply systems, contracts signed between actors refer to the food production process and the compliance with environmentally sound behaviors, the products used during production, and may also involve the need for specific certifications (e.g., organic certification) (Lindström et al., 2020; Cerutti et al., 2016).

The report is structured as follows. First, we present the concept of business models. Then, we outline the sociotechnical contexts within which the food supply business models operate. In the next section, we present the triple-layered business models canvas, and then we apply it – theoretically and empirically - to the three supply systems under consideration. Finally, we discuss the key insights.

2. Business models: What are they?

The concept of "business model" has been variously approached by many scholars, who put their emphasis on different business characteristics, and rely on different frameworks to describe what the term "model" represents and the structure(s) it describes. Offering a descriptive definition, Cordijn et al. (2000a) state that the business models offer answers to the question "who offers what to whom, and expects what in return?" (p. 41). This question does not mean that the business models are just about transactions between different actors participating in a market or any other constellation. A business model is a blueprint explaining how organizations (must) work (Osterwalder et al., 2005), but it is not just the way of doing business. It describes the logic of creating value that an actor (or constellation of actors) adopts and follows (Petrovic et al., 2001).

Value is a core concept for the business model term. Actors create, exchange, and interpret value within networks or systems of actors. The way they choose to approach value describes their business models (Gordijn et al., 2000b). In other words, the business model is a "story" depicting who the customers of a business unit are, what they are valuing, and how the business unit attempts to supply them with what they want and/or need (Magretta, 2002). As Baden-Fuller and Morgan (2010) explain, business models, serve some main functions. First, they taxonomize the organizational structure of an organization, thus letting conclusions on how the value can easily be created to emerge. Second, they are what their name implies: models; in plain words, prototypes explaining how business is done. Third, they are recipes helping organizations to achieve the right results in the right way. They encompass architectures (Iacob et al., 2014) and templates (Amit and Zott, 2001) used to create value and manners through which transactions that permit value generation are made (Zott and Amit, 2010).

Hence, to uncover what the potential of a business model is and to assess its effectiveness, it is crucial to understand what value means. Despite what was suggested by conventional marketing literature before the 2000s, value is not an attribute of the products exchanged between actors. It also rests in actors' and/or organizations' practices and value co-creating behaviors. Let us take an example. Two neighboring farmers cultivate tomatoes in their small farms (2 hectares each). Both of them apply best practices to produce (referring to the use of pesticides, fertilizers, etc.), harvest their products when they are at their best maturity stage, and use the same packages to store them. The first one sells the products to a wholesaler, who, then, distributes them in local supermarkets. The second sells her tomatoes on-farm, to families living in the region. Consumers can visit the farm and buy the products. Although both of these producers use the same cultivation methods, and despite the fact that their profit margins may continue to be the same, the ways value emerges is different. In the case of the first farmer, the value emanates from the exchange of products and money. In the second case, the farmer can create linkages with local consumers, develop a loyal customer base, and receive feedback from buyers on their specific preferences. In addition, the value experienced by consumers might be quite different in the two cases. Those consumers who buy tomatoes directly from the farm may enjoy a value emerging from the opportunity to interact with the farmer, and to understand how a farm is like.

In other words, the ways value is created – and, consequently, the business models applied by different organizations – affect the ways value emerges. Hence, the term "business model" has to do with a set of decisions made by any business unit about the strategies used, the markets addressed, and the value proposition they offer to (potential) customers (Morris et al., 2005). It concerns a value creation mechanism (Markides, 2008), that is the logic under which the key resources and competencies are combined to produce products or services that have value for potential customers (Johnson et al., 2008).

Nevertheless, it is crucial to mention that business models are not fixed and stable. Since actors' practices take place within changing socio-technical environments, business models also change - either incrementally or radically – to reflect such changes and adapt to the new conditions (Charatsari et al., 2020; Bourreau et al., 2012). The lack of ability to alter the business model in use might reduce an organizations' ability to produce value, thus jeopardizing its viability (Schulte, 2013). To better depict the interrelation between business models and external environments, one needs to understand the specific ecosystems within which actors and organizations operate and do business and their properties. In the next section, we present these environments for the three supply systems under consideration.

3. Embedding supply chain business models within sociotechnical contexts

Supply chain systems are defined as networks within which goods flow from their source of origin to the final destination through a combined and coordinated way. Along with products, within a supply chain, there is also a flow of information and financial assets (Janvier-James, 2012). Albeit portrayed as linear configurations, supply chains are networked environments, in which participate actors having different competencies, owing to varying (in terms of both quantity and quality) resources, and carrying their unique work and collaboration cultures. Producers, collaborating organizations, competitors, suppliers, and customers are all involved in complex ecosystems (Lataifa, 2014), i.e. constellations of interconnected entities that depend on each other to survive and thrive (Iansiti and Levien, 2004). Within these ecosystems, which are based on the integration of resources, actors co-create and exchange value, while simultaneously changing the wider framework with their practices (Lioutas et al., 2021). Simply put, different organizations are variously involved in supply chains, exchanging both tangible (like raw material, technology, capital) and intangible resources (knowledge, services, relational resources), co-creating value that extends across and beyond the system (Lioutas et al., 2018). These organizations are social units, which are using human, financial, and technological capital to meet specific objectives. The ways these objectives are pursued (and the success of the procedures followed by organizations to meet their aims) depend to a great extent on the particular conditions that dominate in the wider social and technological environment within which supply chain systems operate, and the interrelations between actors and among actors and that context.

To understand the interrelation between supply chain systems and the wider socio-technical context, it is important to first sketch this context. As Möller et al. (2020) explain, these systems are interrelated with other, co-existing systems (not necessarily having the same aims or activities), thus forming wider business fields, consisting of institutions (rules, norms, regulations, unwritten codes of conduct),

structures and technologies. Hence, the ways other, co-existing systems operate may heavily influence the modus operandi of supply chains. However, interrelated and co-existing systems are also embedded within macro-structures, which Möller et al. (2020, p. 385) term socio-economic-technological systems, i.e., systems "deeply ingrained in political and legal institutional arrangements, technological regimes, economic structures, and culture involving people's values and behavioral orientations."

To describe these complex interrelations and interdependencies among levels, Geels (2002) developed the concept of a multi-level perspective. In his view, which today is used by many scholars endeavoring to depict how technological – and the consequent social – change affects and is affected by different business fields (e.g., Wu et al., 2021; Goulet, 2021; Rogge et al., 2020), heterogeneous social and material elements form sociotechnical configurations, which are reproduced through the activities of social groups. To offer an example, the meanings of agrifood products – let us say, organic vegetables – are developed when different groups of people (consumers, media, farmers, farm advisors) interact. Hence, the production of organic vegetables depends on these actors. Moreover, the connection between the entities involved in the system is not always obvious. For instance, when people buy organics, they are connecting the social groups mentioned above, giving meaning to organic production, and, thus, to those international organizations dealing with organic farming.

Importantly, actors and organizations involved in systemic interactions, develop cognitive and organizational routines, that let co-ordination mechanisms emerge. The convergence of similar routines leads to the creation of a sociotechnical regime, that is a set of rules determining the practices used, the characteristics of products and procedures, the ways of doing things and defining problems, the knowledge base of the system, and, of course, the institutions that prevail and the infrastructures that provide the foundation upon which the system is built. Regimes lead to specific trajectories because actors tend to think, understand and interpret the stimuli in similar ways.

Socio-technical regimes lead to dynamic stability in the sense that change occurs but in a rather incremental fashion. By creating specific sociotechnical trajectories, contribute to the development of socio-technical landscapes: external structures beyond the direct influence of regimes that involve macro-economic and macro-political factors and deep cultural patterns, which are more resistant to change than regimes (Geels and Schot, 2007).

Although both regimes and landscapes are hard to change, novel products, services, or ideas are created in niches. The term is used by Geels (2002) to describe sub-structures of the system that emerge within existing regimes and serve as innovation incubators. Because such units have specific knowledge and capabilities, and since they experience problems associated with existing regimes, they innovate, serving as seeds of change (Figure 1). The niches initiate changes, that may press regimes, finally leading to changes in the socio-technical landscape.

Following Geels's (2002) line of thinking, the regime consists of the organizations that form the wider financial network (banks, insurance companies), the suppliers (of raw materials, energy, technology, etc.), the customers (either businesses or households), the research community (universities, research centers, and research consortia), societal groups (like consumer associations, groups of interest, activist

organizations, etc.), and public authorities (e.g., national and international governmental organizations, the European Union).

Going back to the three supply chain systems under consideration, producers using short food supply systems, export-oriented supply chains, and green public procurement can be conceived of as different niches, that interact with regime actors and, in some cases, landscapes. For instance, short food supply chains emerged during the 1960s in Japan and then diffused around the world (Charatsari et al., 2017). They represent a niche within a regime made up of industrialized agrifood systems (Renting et al., 2003). Their success, however, led to some regime changes. For instance, consumers began to express interest in alternative modes of food distribution, thus supporting farmers who follow short supply chain processes. Innovating within niches (for example, introducing digital solutions to short food supply chains) can further press the regimes and has the potential to change the landscape.

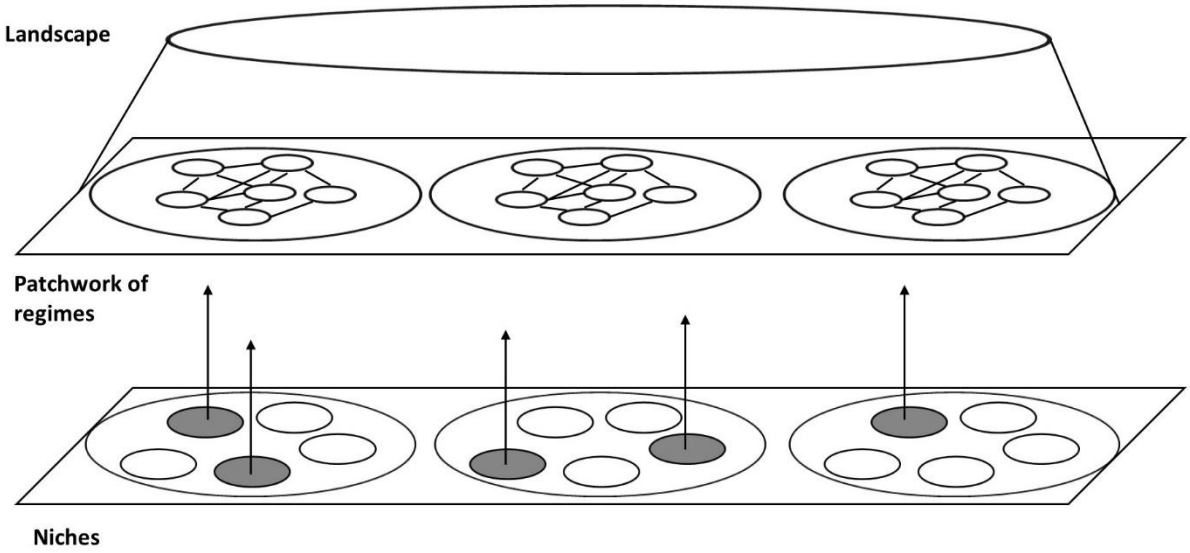

Figure 1 - Niches, sociotechnical regimes, and landscapes (adapted from Geels, 2002)

An example of landscape change is green public procurement. While consumers' interest in environmental protection and healthy food increased, governments and intergovernmental organizations realized that there is a need to develop relevant policies (Testa et al., 2016). The need to promote responsible consumption (Wang et al., 2021) and the fact that about one-fifth of the gross domestic product in the European Union concerns public procurement (European Union, 2016), led to the development of relevant legislative directions and policies.

Even in export-oriented supply chains, which are more regime-centered systems compared to short supply chains and green public procurement, the innovations initiated by some actors (like the production

under specific conditions in some regions) led to the regime (like the support of specific products from financial institutes) and landscape changes (such as the development of appropriate certification schemes that emphasize the origin of the products). Nevertheless, organizations involved in supply chains, like farms, have different positions within value systems and varying relationships with stakeholders (Al-Debei and Avison, 2010), and, hence, are variously affected by the external environment and, on the other hand, have not the same ability to initiate regime changes.

4. Business model canvas

A business model canvas is a representation of the components through which an organization aims to create value. A canvas is used to depict the model used by an organization, to foster the understanding of the pros and cons in the way of doing business, and to facilitate the analysis of the critical success factors for a model. However, since organizations cannot deliver value alone, canvases present the interrelations among organizations and, when needed, between organizations and individuals that lead to the co-production of value. In their seminal article, Osterwalder, and Pigneur (2010), constructed a canvas that divided a business model into nine elements or building blocks:

1. Customer segments, refer to the clusters of consumers that the organization is targeting.
2. Value propositions, that are the "bundles of benefits" the organization offers to its customers. The term is used to describe the different forms of value that the organization intends and promises to convey.
3. Channels, through which the organization distributes and sells its products or services, also communicating its value propositions.
4. Customer relationships, through which the organization attempts to generate and sustain strong linkages with its clients. The efforts to build and enhance these relationships range from the offering of personalized services and/or products to the development of different delivery strategies, and the creation of effective communication conduits.
5. Revenue streams, which, for Osterwalder and Pigneur (2010), represent the arteries of a business model, since they permit the viability of the organization. Different types of revenue streams may create the need for diverse pricing mechanisms.
6. Key resources, referring to physical, economic, intellectual, or human assets that are incorporated into the production process and lead to the production of products and/or services.
7. Key activities take place in order to engage customers and ensure that key resources are used in a way that generates profit.
8. Key partnerships developed between the organization and other actors (either organizations or individuals) intending to protect or expand the position of the organization in the market.
9. Cost structure, that is the way the costs are structured (e.g., some organizations, depending on the business model that follows have fixed expenses, whereas others have variable)

Despite its usefulness for offering an image of the ways organizations can increase their value-generating capacity, Osterwalder and Pigneur's (2010) business canvas model received justified criticism for its overemphasis on the economic dimension of value. Indeed, today, there is little doubt that customers

endorse the environmental (Karami and Madlener, 2021; Han et al., 2020; Gregori and Holzmann, 2020; Liao et al., 2020; Pal and Gadner, 2018) and social dimensions of value (Amin and Tarun, 2021; Chen et al., 2021; Gregori and Holzmann, 2020). The same is true for potential partners (John, 2021; Breus et al., 2020; Chen et al., 2019). To cover the gap that Osterwalder and Pigneur's (2010) model left open, Joyce and Paquin (2016), developed a new canvas (the Triple Layered Business Model Canvas – TLBMC), adding the environmental and social dimension of value.

In their view, to design sustainable business models, organizations should also depict the ways environmental and social value emerges and pays-off. The triple layered model continues to pay attention to the economic forms of value, however, attributes equal emphasis on the components that can lead to the production of environmental and social value. In a similar way to that the original business model canvas is used as a template to depict and understand how revenues and costs are combined to produce economic value, the environmental layer of the TLBMC can be used to gauge how an organization can produce environmental benefits that outweigh its environmental impacts. It consists of the nine elements that follow:

1. Functional value, which refers to the total of products and/or services consumed by customers in a given period of time (e.g., one year).
2. Materials that must be used to render the functional value. The term encompasses stocks in physical form that are used to produce products, but also infrastructures, technology, vehicles, and any other asset that is needed for an organization to produce what it produces. The contribution of some materials to an organizations' environmental impact is of major significance, and the model mainly focuses on these types of materials.
3. Production. That component attempts to capture the environmental impact of the procedures needed to transform materials into products (or services). The authors suggest users of TLBMC focus their attention on these production processes that have a high environmental impact.
4. Supplies and outsourcing, which are those materials and activities performed during the production process that are necessary for the production of functional value, without being at the core of the organization. Usually, organizations pay less attention to this component, whereas its environmental influence is limited.
5. Distribution, in the sense of the physical process that is used by the organization to offer customers access to the functional value. As Joyce and Paquin (2016) explain, to appraise the environmental impact of distribution, it is important to involve transportation modes, distances between the place of production and the consumer, weights of distributed products, as well as the packaging and delivery logistics.
6. The use phase refers to the buyers' actions that contribute to the functional value. That is to say, the practice of product maintenance, the materials used during consumption, the energy needed to consume a product, and the repair of products when such a practice is needed. Although the use phase is often underestimated, sometimes it leads to more severe environmental impacts than the production process.
7. End-of-life, that is the stage in which the consumption of a product or service (in other words, of the functional value) ends. In that stage, positive (reuse practices, recycling, etc.) or negative

environmental impacts (referring to the carbon footprint of the recycling process and the disposal of products) are possible.

8. Environmental impacts, where the term is used to describe the ecological cost of an organization's practices. Emissions of CO_2, impacts on the ecosystem, depletion of natural resources, water consumption, and other bio-physical measures can be used in this component.
9. Environmental benefits refer to the ecological value that the organization creates through its way of doing business. Any measure taken to reduce the environmental impacts of organizations' activities belongs to this component.

The social layer includes other nine components that are presented below:

1. Social value, which concerns the benefits that the organization creates through its practices for the stakeholders and the society. It takes different forms, depending on the meanings attributed to the term by organizations.
2. Employees. The term refers to the social value that employees in the organization enjoy. Training programs and professional development projects, different forms of employee support, and other practices aimed at enhancing the human capital within the organization belong to this category. Since the "employees" component might include many practices that are more or less important for an organization's business model, emphasis should be given to those aspects that identify the business model adopted.
3. Governance is a general term describing the structures and processes (and the relationships emerging from them) that define ownership and control within organizations (Ocasio and Radoynovska, 2016). It affects the decision-making procedures, hierarchies, and, finally, the level of stakeholders' engagement in the social value creation process.
4. Communities are those constellations of individuals and organizations (including suppliers) that interact with the organization contributing to the value generation. The term encompasses geographically defined communities but also communities of interest. The degree to which an organization supports the communities linked with it defines its ability to produce and deliver social value.
5. Societal culture is a latent construct used to denote the sets of values and normative systems that influence the minds of individuals and social institutions (Schwartz, 2014). In the TLBMC language, the term denotes the actions through which an organization can positively impact the wider society. Many organizations enact practices that promote positive societal change; however, when applying the TLBMC, one should always recall that some practices may negatively affect the values and normative systems of a society.
6. Scale of outreach is a complicated term that speaks of the relationships that an organization develops and nurtures with stakeholders over time and their "depth and breadth." Of course, it is easy to believe that all organizations develop relationships, at least with key-stakeholders. However, not all relationships have the same outreach of impact. Some are narrowed to a local level, whereas others extend to a regional or even global scale.
7. End-users are those individuals that enjoy the value of a product or service. They, actually, contribute to the value creation process (Vargo et al., 2008) not only by using the product or

service but also by offering feedback to the organization about products or services and the marketing strategies that accompany them (Taghizadeh et al., 2021; Tardivo, 2017). An organization aiming at offering social value should attempt to meet end-users expectations, cover their needs, and serve their wants.

8. Social impacts, just like "environmental impacts," concern the social costs that emerge from the practices of an organization. The business models followed by organizations can have negative social impacts, referring to the disruptions of cultural standards or other externalities that negatively affect social systems.
9. Social benefits, on the other hand, are the socially desirable outcomes of an organization's actions. They can be measured using varying indicators, referring to the benefits individuals, groups, communities, stakeholders, and network members derive from the practices that the organization engages in.

As the above-presented sets of components indicate, the TLBMC is a valuable template for appraising the different types of value that an organization co-creates through its doings and relatings. In the following section, we outline the ways it can be used to evaluate the existing business models used in the three supply schemes under consideration.

5. Existing business models in the three supply chain systems under consideration

5.1 Short food supply chains

Starting with the economic layer (Figure 2), short food supply chains operate having as the main value proposition the offering of high-quality products, that local farmers cultivate and sell. The main activities involved in the system are the production of agrifood products and their selling through specific channels, whereas, in some cases, storage may be necessary.

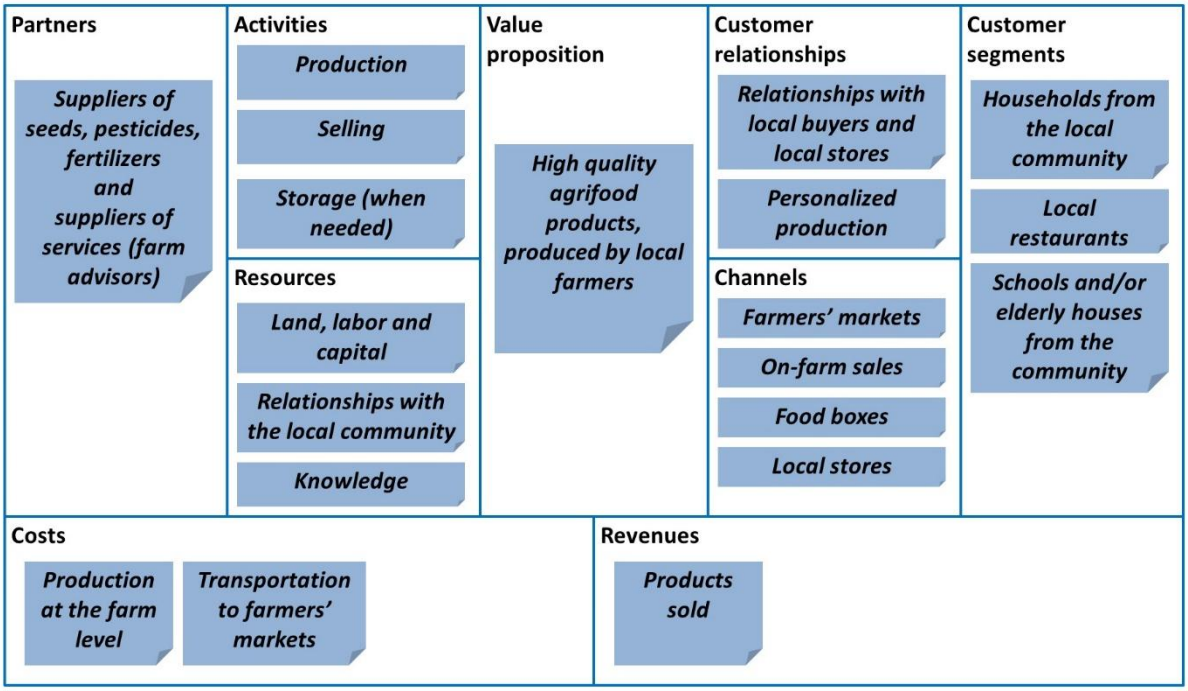

Figure 2 - The economic layer of TLBMC for short food supply chains

To perform these activities, producers use the basic resources – land, labor, and capital – but also intangible assets. Much more than other food supply chain approaches, short chains depend on the development of strong relationships with consumers, and on farmers' knowledge (Charatsari et al., 2020). Apart from these resources, to produce value, farmers collaborate with the partners commonly involved in agricultural production processes, like suppliers of propagational material, pesticides and, fertilizers, as well as farm advisors.

The cost of the activities performed within a short supply chain is related to the production cost which, according to Zhang et al. (2019) is significantly higher than that of conventional supply chain approaches, and the transportation to the farmers' markets or the delivery of the products in the case of box delivery schemes that however represent only a minor part of the total cost.

Short food supply chains' revenues stem from the products sold through only one or a combination of the following channels: farmers' markets, on-farm sales, food box schemes, direct distribution to local retail stores, and farm-owned retail shops (Kneafsey et al., 2013). Apart from individual consumers, short supply schemes target local restaurants (Paciarotti and Torregiani, 2018) and units like school canteens and elderly houses (Yacamán Ochoa et al., 2019). Since these schemes are based on the relationships between farmers and customers, the development of relationships with either individual consumers or local stores is a key attribute of short supply systems (Smith et al., 2016; Mardsen et al., 2000), whereas the offering of personalized services is another way used to enhance the economic value (Stanciu, 2013).

Moving to the environmental layer (Figure 3), the functional value of short food supply chains is the total amount of products consumed during a year. The calculation of the functional value is difficult because many different products are distributed through these systems (Tundys and Wiśniewski, 2020) since polyculture is the norm. To be produced, the functional value requires some standard materials (seeds, fertilizers, and pesticides, water for irrigation, farm equipment) that have an environmental footprint. The production process, which includes the use of farm machinery and the energy needed, is perhaps the major contributor to this footprint. In fact, farms in these schemes are lacking new equipment (Lioutas and Charatsari, 2020), that can reduce the impacts of farming activities on the environment. Supplies include the production of the machinery used to cultivate the land and the electricity (for example, for product storage purposes).

Beyond the farm gate, the distribution component of the TLBMC contains the transportation from the farm to the local markets and the packaging of products. However, as Paciarotti and Torregiani (2021) explain, the packaging in short supply systems is limited compared to conventional supply approaches. Concerning consumption, the preparation of meals and the impacts associated with the ways buyers treat the products (e.g., the washing of fresh vegetables) are also expected to have an impact. Finally, in the end-of-life category are included the disposal of products and the waste of unconsumed production.

Despite the environmental externalities, the short supply chain systems have also a positive impact, because of the reduction of food miles (Malak-Rawlikowska et al., 2019) and the ability to better plan the production process. Being located at a niche, these systems are built on the relationships that farmers develop with consumers. Hence, it is easier for producers to define what should be produced and at what quantity.

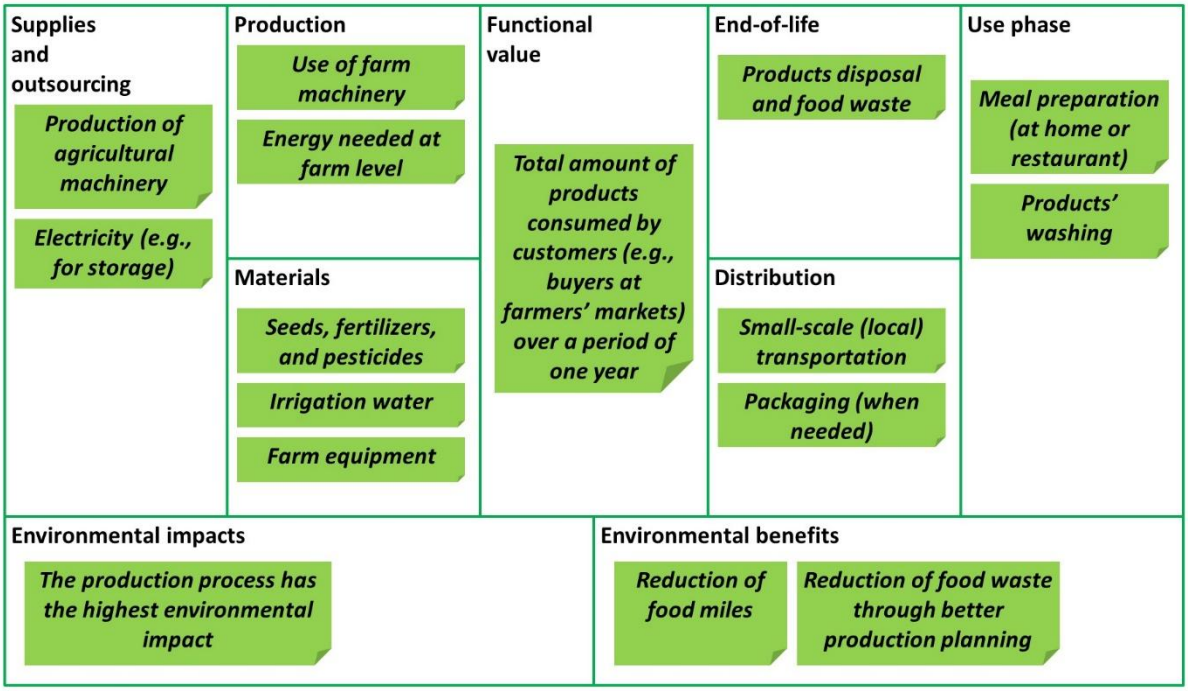

Figure 3 - The environmental layer of TLBMC for short food supply chains

The social layer (Figure 4) refers to the social value produced through short supply chains. Elements unique to their character, like the promotion of "local consumption," the creation of social capital, and social support (Charatsari et al., 2017; Giamplietri et al., 2016), form the social value of the system. The development of intra-community relationships, the cultivation of a sense of community, and the trust between actors participating in that niche (Giampietri et al., 2018; Selitto et al., 2018), are different facets of the contribution that short supply chains have to the development of local communities.

The governance structure is farmer-centric, since regime actors are not directly involved in these schemes, whereas there is a seamless flow of information between farmers and buyers (Hooks et al., 2017). Concerning the employee component of the TLBMC, short supply chains offer more opportunities to women farmers than systems belonging to the agrifood system regime (Zirham and Palomba, 2016). That characteristic differentiates short food supply chains from other distribution systems, since, as it is known, the entrepreneurial activity of female farmers is conditioned by many factors in regimes (De Rosa et al., 2020). Another element of the component is the customer-orientation of farmers.

The creation of a culture of belongingness, which promotes citizenship behavior and social support are typical attributes of the societal culture. Although by their very nature, short supply systems have a limited breadth of outreach, the depth of the social impacts is high: local communities absorb the main part of

social value. On the other hand, end-users enjoy personalized or extra services, whereas they can also have information on the production methods (Ilbery and Maye, 2005).

However, apart from the numerous social benefits – which include the development of human resources through the enhancement of intra-community collaboration, and the independence from dominant regime actors – short supply chains also have negative social impacts. These include the potential opportunistic or lethargic behavior of some of the involved actors – or, the "tragedy of the commons" (De Bernardi et al., 2020), and the potential underutilization of local resources (referring to both human and social capital), due to the limited efficacy of the system when compared with that of other, more regime-oriented chains.

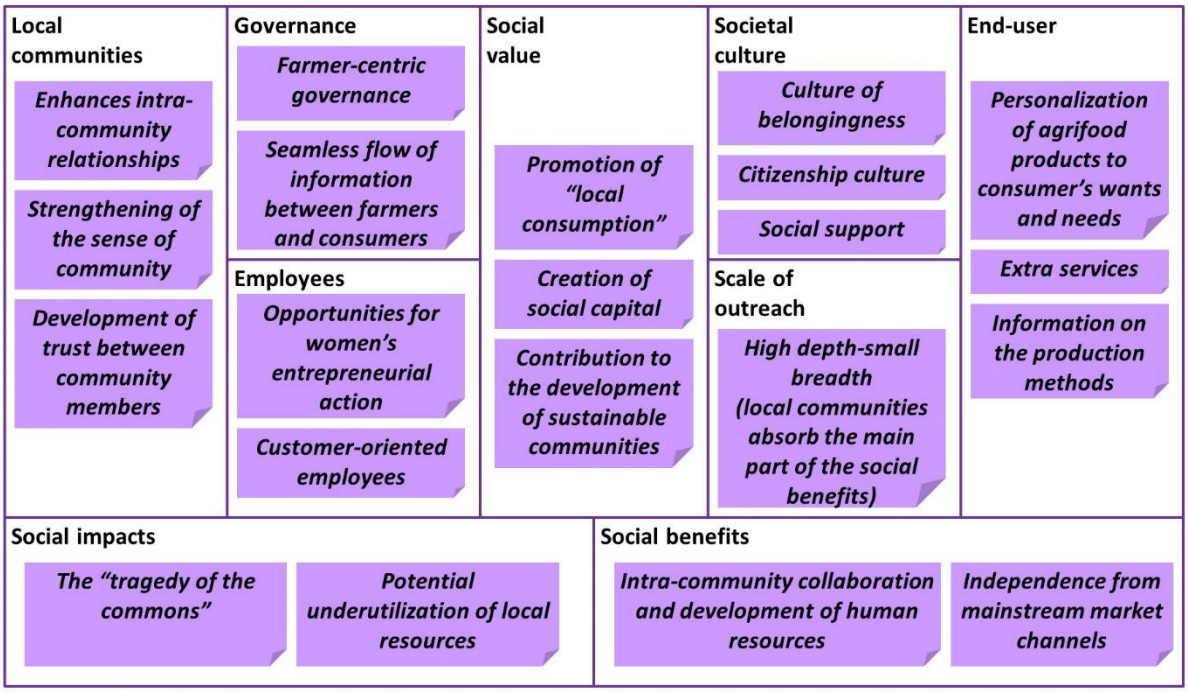

Figure 4 - The social layer of TLBMC for short food supply chains

5.2 Export-oriented supply chains

The main value proposition of export-oriented supply chains is the production and offering of high-quality agrifood products that are distributed from their place of cultivation to areas belonging to different countries. To achieve this purpose, the chains involve production, marketing, and logistics activities. As the economic layer of the TLBMC indicates (Figure 5), the resources used include not only the production process, as in the case of short food supply chains, but also the development and exploitation of

distribution channels, and the geographical indication certification (Mecic et al., 2017), which contribute to the total costs of these schemes.

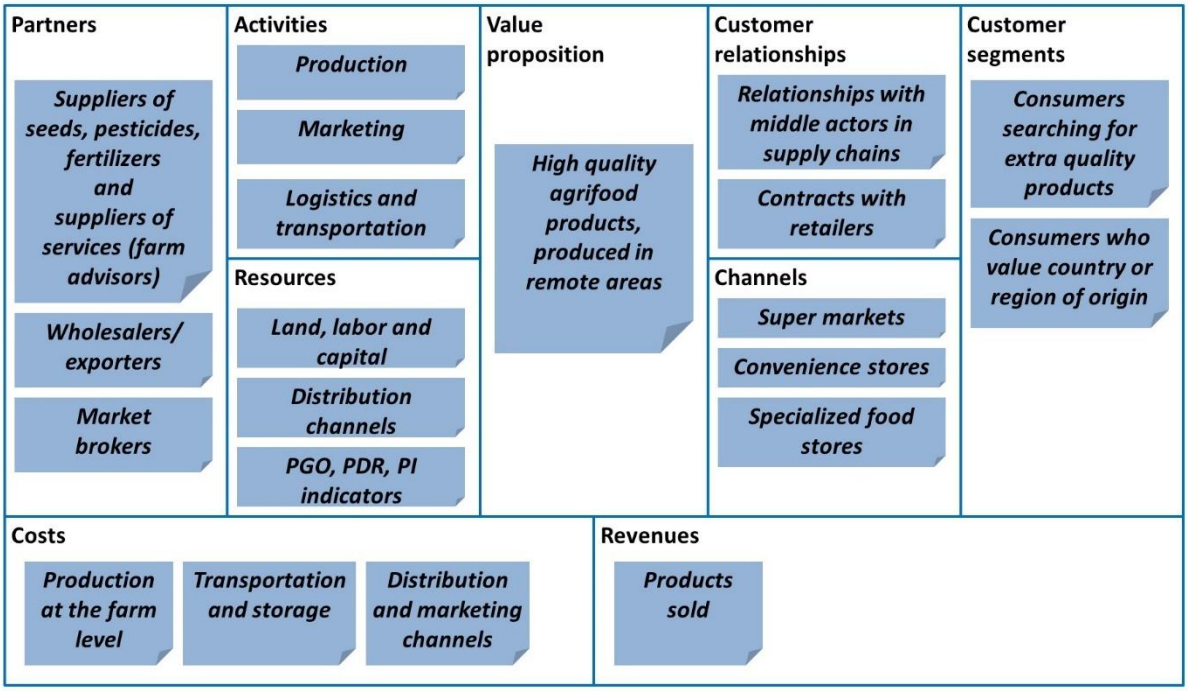

Figure 5 - The economic layer of TLBMC for export-oriented supply chains

In addition, farmers exporting their products through such chains develop partnerships not only with actors involved in the production process (sellers of agro-supplies), but also with wholesalers, exporters, and market brokers. Since wholesalers are the actors directly linked with these farmers, the efforts to build relationships are mainly focused on the middle of the supply chain. Contracts represent a mainstream strategy used to develop such relationships and to define the emerging transactions (Pascucci, 2011). Supermarkets, convenience stores, and specialty retail stores are the main channels through which the products are distributed to the target consumer segments, that include consumers seeking high-quality foreign food products (Insch et al., 2004), and those who use the country or region of origin as the main criterion for choosing among alternatives (Sagheb et al., 2020). The revenues originate from the total of products sold, whereas the costs include the production process, the storage and transportation, and the distribution.

The environmental layer of the TLBMC, as Figure 6 shows, is more complicated than in short food supply chains. The functional value of the scheme concerns the total of products consumed. For instance, in the case of exported wine, the functional value refers to the sum of bottles consumed during a year. To produce these quantities, farmers use the standard materials (seeds, fertilizers, pesticides, farm

machinery, and irrigation water), however, to be operative, the chain also uses transportation vehicles. Both, on-farm materials and vehicles consume energy, which is necessary for production activities. The food miles in export-oriented supply chains generate high levels of CO_2 emissions, with fruit and vegetables to have the major contribution to this amount (Kissinger, 2012).

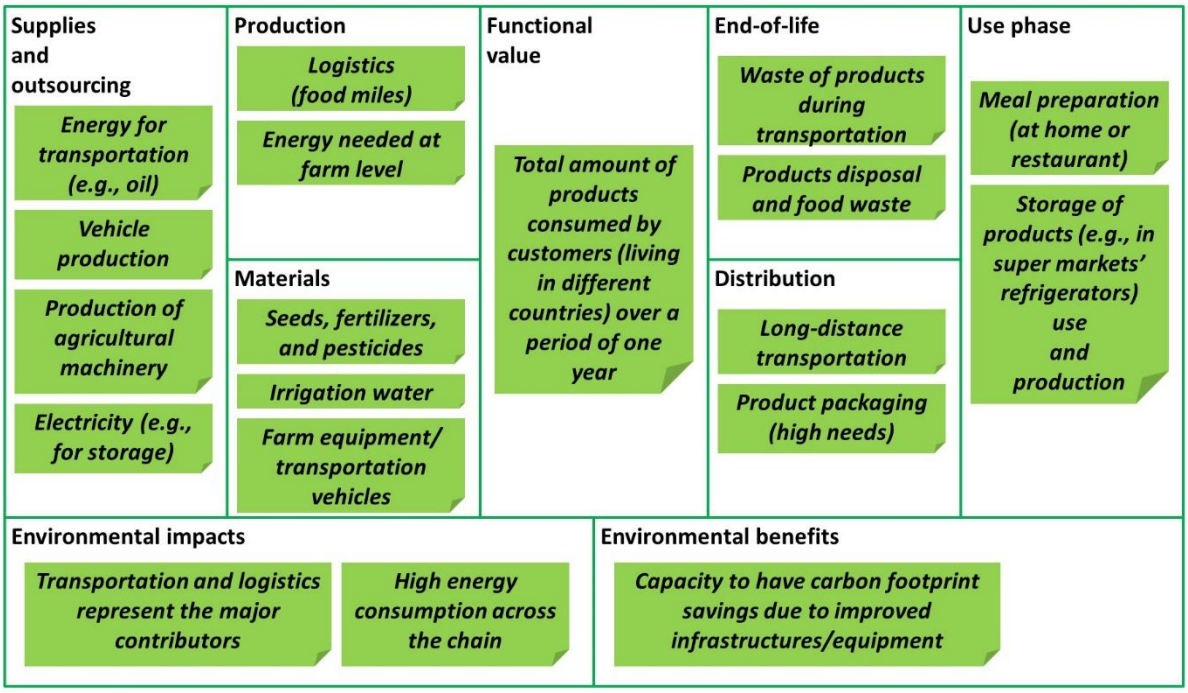

Figure 6 - The environmental layer of TLBMC for export-oriented supply chains

Along with the production of farm machinery and the electricity needed, supplies of transportation energy and vehicles are also necessary for keeping the system functional. This type of supply chain is a high energy-consuming one. In total, transportation and logistics activities seem to have a major impact on the environmental performance of these chains (Wiedemann et al., 2016; Dalin and Rodríguez-Iturbe, 2016), especially when loses of products during the various logistics operations enter the equation (Read et al., 2020).

Food waste both across the supply chain and at its final stage – estimations indicate that between a third and half of the produced food is wasted (Oelofse and Nahman, 2013) – is a paramount problem for export-oriented chains (Parfitt et al., 2010). Standardization of products and implementation of specific requirements on the qualitative characteristics of, for example, fruits and vegetables, represent strategies commonly used in that type of chain that further sharpen the problem (Frieling et al., 2013).

Beyond the end-of-life component, at the user phase, the meal preparation at home and the storage of products (also in supermarkets, because some of them are ready to eat products), also have environmental externalities. When combined with the distribution phase, which is high energy-consuming not only due to transportation but also because packaging (depending on the materials used), has a high environmental cost (Wohner et al., 2020; Marsh and Bugusu, 2007). Of course, export-oriented supply chains also lead to some environmental benefits. Being technology-intensive, they can reduce carbon footprint via improved and more environmentally efficient equipment and infrastructures.

The social layer of the TLBMC is presented in Figure 7. The social value of export-oriented supply chains emerges from the ability of such supply chain systems to improve consumers' quality of life by offering them the opportunity to enjoy products originating from geographically distant countries. A consumer living in Oslo can enjoy a wine produced in Monte San Pietro (Italy) accompanied by a cheese produced in a small village in Crete (Greece). Hence, at the end-user phase, the supply chains of this type help consumers accessing food products from all over the world, also improving their diets.

This way, export-oriented chains have also benefits for local communities: they offer income and employment opportunities, by increasing the base of wine and cheese consumers. In addition, looking at the employee component, the supply chains operating under an internationalization mindset offer competence development opportunities to their employees. A study by Nguyen et al. (2021) indicates that the training projects offered by food companies that export their products are more than double compared to those offered by firms operating only in national markets.

Nevertheless, such chains are characterized by a governance mechanism that is based on nested hierarchies and decision-making processes, in which a market-dominated modus operandi prevails. Regime actors make the decisions, and farmers follow the institutions prevailing to the regime. Such a governance structure offers limited opportunities to small-scale farmers to shape the direction of their production where they really want and concentrates power on those regime actors who have the key resources that mobilize the system (Lioutas et al., 2021; Carolan, 2016; Aiking and De Boer, 2004). These particular characteristics of export-oriented supply chains generate and infuse a culture of globalization. On the one hand, such a societal culture has positive outcomes: it connects farmers (sometimes from remote and less developed areas) to the world – and, hence, links niches and landscapes, to use the terms of Geels (2002) – and gives meaning to their particular style of farming. On the other hand, it may disconnect farmers from their traditions and reduces their autonomy in decision-making.

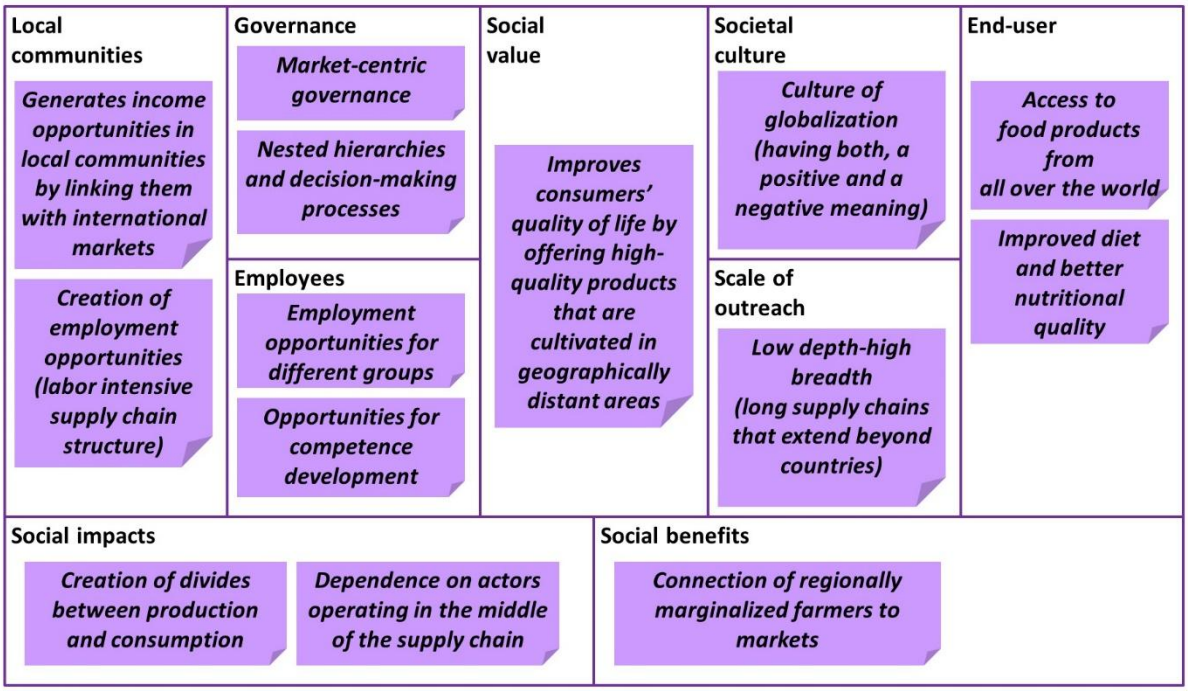

Figure 7 - The social layer of TLBMC for export-oriented supply chains

By summing up, the social impacts of export-oriented supply chains deserve serious attention. Such configurations generate dependence on regime actors operating in the middle of the supply chain system, whereas they also create divides between producers and consumers. At the other side of the coin, the connection of regionally marginalized farmers to international markets is a major social benefit. The scale of outreach is characterized by low depth, since these benefits do not affect all the involved actors the same way, but the breadth of outreach is high, given that supply chains operate beyond countries, thus affecting a wide number of actors and organizations.

5.3 Green public procurement

Green public procurement schemes emerged having as their main value proposition the supply of public organizations with high-quality products that are produced in an environmentally sound manner and meet specific environmental criteria. The main segments to which these supply systems are targeted are public authorities, municipalities, universities, and kindergartens/nurseries (Fuentes-Bargues et al., 2018; Neto and Caldas, 2018; Testa et al., 2016). To build relationships with these segments, the suppliers can offer complaint forms and traceability systems (Bucea-Manea-Țoniș et al., 2021). As Figure 8 highlights, the

channel used is direct selling to public agencies. That is to say, green public procurement schemes connect farmers' niches to landscape actors.

To meet their objectives, green public procurement systems use on-farm resources (land, labor, capital), combined with certification schemes (organic, ethical, or fair-trade certification) (Cerutti et al. 2018). Hence, for these systems, sustainable branding is another intangible resource that contributes to their economic performance. The activities performed include the production of food products, logistics and transportation, and the costing since in public procurement the cost is always an important factor for choosing among potential suppliers (Schotanus and Telgen, 2007). In such systems, farmers develop partnerships with those actors who supply them seeds, pesticides, and other agro-supplies. However, partnerships between farmers and brokers are also possible.

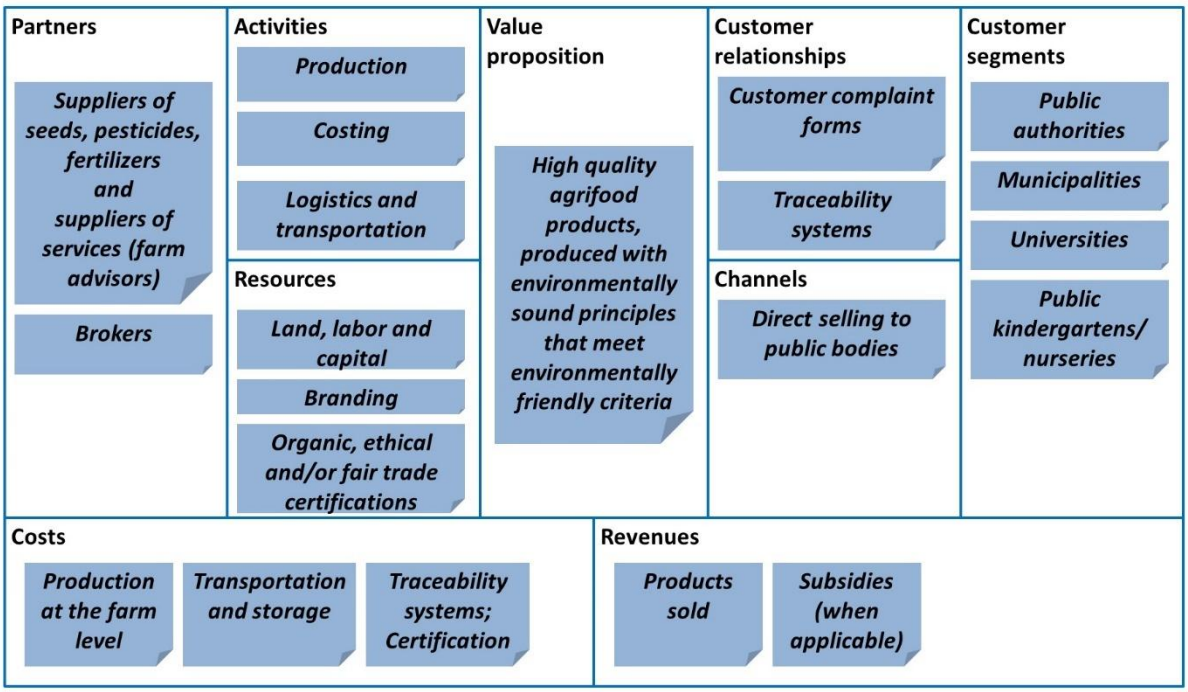

Figure 8 - The economic layer of TLBMC for green public procurement systems

To close with the economic layer of the TLBMC, the revenues emerge from the selling of products while subsidies – when applicable – can also increase the economic performance of green public procurement schemes. The costs involve the budget for the production at the farm level, the transportation and storage expenses, the fees for certification, and the costs for the development and implementation of traceability systems.

The environmental layer of the TLBMC (Figure 9) has at its core the functional value of green public procurement schemes, that is the total amount of products purchased through these systems and consumed by public authorities over one year. Aside from the energy needed at the farm level, the production activities include logistics operations, which also have an environmental cost. The materials used include those integrated within agricultural production (agrochemicals, propagation material, farm equipment, irrigation water), and the transportation vehicles, as in export-oriented supply chains. Beyond the core of the system, the energy used for transportation, the production of transportation vehicles and agricultural machinery, and the electricity needed, also produce environmental externalities.

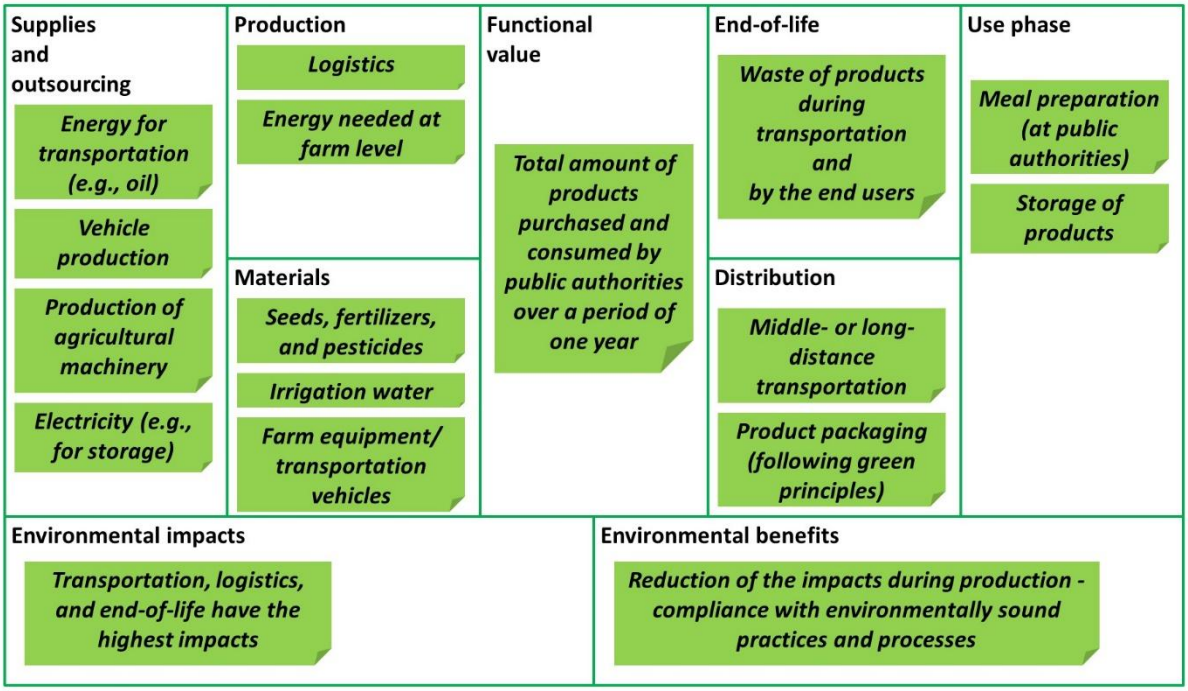

Figure 9 - The environmental layer of TLBMC for green public procurement systems

When looking at the end-of-life component of the environmental layer, the food waste by the end-users remains a major issue. By nature, some public institutes – like schools (García-Herrero et al., 2019) or hospitals (Sonnino and McWilliam, 2011) – produce high quantities of food waste. Since products are transported, food waste during the transportation is also possible. Besides, the distribution might involve middle or even long-distance transportation, also having environmental costs (Cerutti et al., 2016), whereas packaging is another source of environmental burden. However, since packaging in green public procurement is expected to follow green practices (Lundberg and Marklund, 2018), its externalities are limited.

At the use phase, the preparation of meals (when the food is not ready-to-eat) and the storage of products contribute to the environmental footprint of the system. For instance, research on schools indicates that electricity and/or gas needed for preparing and serving meals is an issue that should be taken into account (Batlle-Bayer et al., 2021; García-Herrero et al., 2019).

Among sources of environmental footprint, the transportation and logistics activities and the end-of-life component seem to have major negative impacts. Nevertheless, green public procurement systems are based on operating mechanisms that comply with environmentally sound practices. The European Union has already developed a relevant legal framework (Mélon, 2020; Kunzlik, 2013), defining what criteria should be met by suppliers. Such a structure of guidelines and regulations helps to reduce the environmental impacts of green public procurement schemes.

Moving to the social layer of TLBMC for green public procurement (Figure 10), the system seems to have the potential to generate "green" communities, when suppliers and the purchaser belong to the same community. Another key impact of the system refers to the development of institutions between communities and public authorities. By definition, green public procurement is a landscape-driven initiative, which involves actively both regime actors (e.g., financial institutes offering loans to farmers) and niches (e.g., organic producers). The governance mechanisms of such schemes are a priory defined by legislative regulations. The rules are clear, and the decision-making processes (e.g., while choosing a supplier) are pre-described, explicit, and accepted by all the involved actors.

That characteristic represents a pivotal difference from the two previously analyzed systems (short food supply chains and export-oriented supply chains), compatible with the main social ambition of green public procurement: the creation of social value through the promotion of both green production and responsible consumption (Wang et al., 2021; Pacheco-Blanco and Bastante-Ceca, 2016). In pursuing these targets, the system under consideration infuses a societal culture of responsibility in production and consumption. Some scholars argue that the application of green practices during public procurement can promote the transition towards more sustainable production paradigms (Borsato et al., 2020; Lindström et al., 2020). Nevertheless, they can also promote an elitist culture, since those farmers not certified with organic, ethical, or fair-trade certifications might be excluded by these chains.

The social outcomes of green public procurement for end-users refer to the access to healthy food products that meet sustainability standards, the development of awareness on issues like environmental sustainability, ethical food production, fair trade, and the information the public authorities can have on the food production standards.

Finally, the exclusion of non-certified farmers from green public procurement chains and the potential transformation of green, sustainable production to a marketing mechanism that overemphasizes the market benefits and undervalues the real meaning of sustainable agrifood production represent the main negative social impacts of green public procurement schemes. On the other hand, the promotion of sustainable and responsible food production and consumption is a valuable social benefit. Hence, it can be argued that the depth of outreach is high, but the breadth – being limited to a regional or national level – is rather medium.

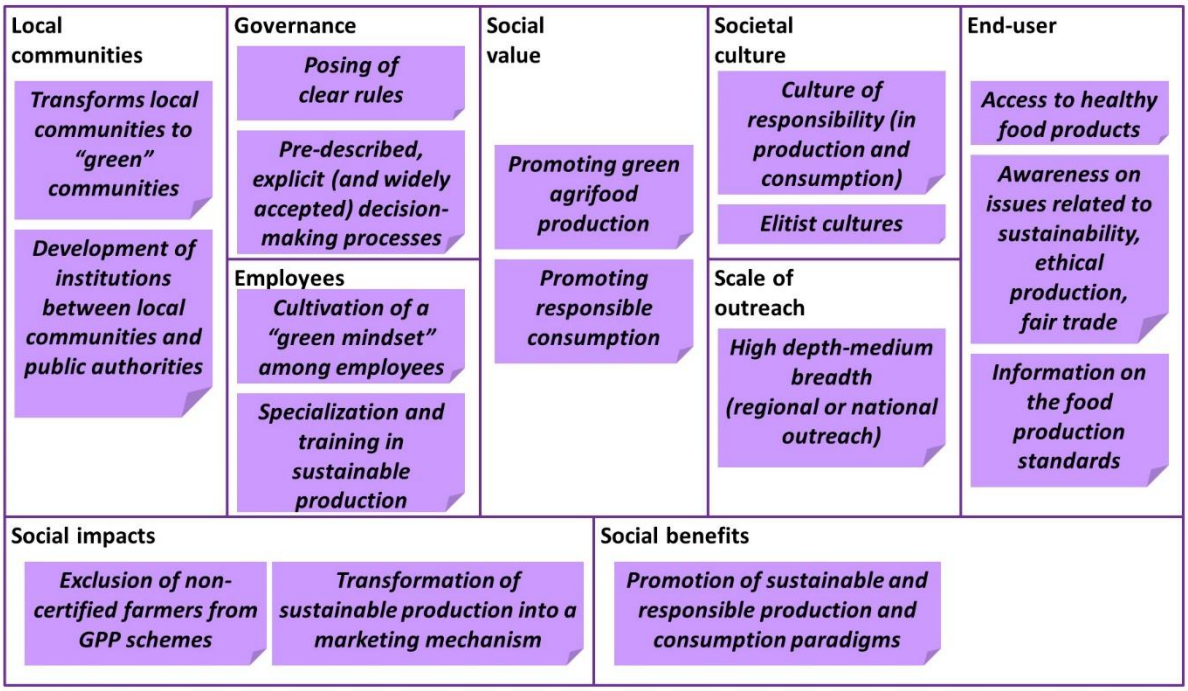

Figure 10 - The social layer of TLBMC for green public procurement systems

6. Methods

6.1 Instruments and procedure

To assess the business models used in the three supply chain systems under examination, we developed one instrument for each chain. As a first step, we created 222 items referring to the 27 components of each TLBMC. To ensure proper variability and capture the varying aspects of models' dimensions, at least two items were developed for each component. After an initial evaluation of the content and face validity, the total number of items was reduced to 214.

For short food supply chains, we used 70 items attributed to the different components as presented in Table 1. Table 2 highlights the 72 items developed per component of the TLBMC for export-oriented supply chains. Finally, the 72 items created for the case of green public procurement are presented in Table 3.

Table 1 - Components of TLBMC and relevant items for the case of short food supply chains

Component	Items
Economic layer	
Value proposition	are able to offer high quality agrifood products, produced by local farmers; attract consumer interest
Activities	are characterized by high production effectiveness; use effective selling strategies; use effective storage practices
Partners	are based on functional collaborations between farmers and suppliers of seeds, pesticides, fertilizers; are based on functional collaborations between farmers and suppliers of services (e.g., farm advisors)
Resources	are based on the effective use of land, labor, and capital; are based on robust relationships between farmers and local communities; exploit authentic farmers' knowledge
Customer relationships	are characterized by strong relationships between farmers and local buyers/local stores; offer personalized production when requested; offer customers the opportunity to visit the farm
Channels	distribute effectively products through farmers markets; distribute effectively products through on-farm sales; distribute effectively products through food boxes; distribute effectively products through local stores [E]; distribute effectively products through online direct sales [E]

Customer segments	target effectively households from the local community; target effectively local restaurants; target effectively schools or elderly houses
Costs	have low production cost at the farm level; have a low transportation cost for the products delivery to farmers' markets; have high costs due to the compliance with rigorous quality standards*
Revenues	offer high revenues to producers; permit farmers to sell high quantities of products
Environmental layer	
Functional value	have a low environmental footprint per unit of product sold in farmers' markets; have a low environmental footprint per unit of product sold through channels like local stores or on-farm sales
Production	have a low environmental burden due to farm machinery used; are based on efficient energy use at the farm level; use agricultural supplies (seeds, fertilizers and pesticides) that do not harm the environment
Materials	use irrigation water prudently; make limited use of farm equipment
Suppliers and outsourcing	use farm machinery that requires high amounts of energy to be produced*; use low amounts of electricity (e.g., for product storage)
End-of-life	produce no environmental impacts due to products disposal; contribute to the reduction of food waste
Distribution	are based on small-scale (local) transportation that do not harm the environment; use environmentally friendly or no packaging
Use phase	require high amounts of energy for meal preparation (home- or restaurant-cooking); consume high amounts of water for products washing*
Environmental impacts	have high environmental impact due to the production process*; have low environmental impact due to the distribution philosophy used
Environmental benefits	reduce the food miles (the distance between producers and consumers), with positive environmental effects; reduce food waste through better production planning
Social layer	
Social value	promote local consumption; create social capital; contribute to the development of sustainable communities; help preserving local traditions and cultures

Local communities	enhance intra-community relationships; strengthen the sense of community in farmers and consumers; facilitate the development of trust between community members
Governance	are based on farmer-centric governance schemes; permit the seamless flow of information between farmers and consumers
Employees	offer opportunities for women's entrepreneurial action; occupy customer-oriented employees
Societal culture	promote a culture of belongingness; promote citizenship culture; promote social support
Scale of outreach	offer important benefits to local communities; offer many benefits to local communities; offer benefits that do not extend beyond local communities
End user	offer agrifood products personalized to consumers' wants and needs; offer extra services to consumers; provide consumers with information on the production methods
Social impacts	cannot prevent opportunistic behaviors*; cannot fully utilize local resources*
Social benefits	promote intra-community collaboration; facilitate the development of human resources within the community; offer farmers independence from mainstream market channels

Notes: Items endorse the statement "sort food supply chains…" Each participant was first asked to concentrate on supply chains operated in her/his region. Negatively worded items are marked with an asterisk. Items eliminated during the analysis are marked with "E".

In all cases, items were measured using a five-point Likert scale, ranging from "strongly disagree" to "strongly agree." The use of such a scale allowed us to proceed with statistical comparisons, and multivariate analyses. We also included questions related to respondents' demographics and their roles or expertise in supply chains under consideration.

Table 2 - Components of TLBMC and relevant items for the case of export-oriented supply chains

Component	Items
Economic layer	
Value proposition	are able to offer high quality agrifood products, produced in remote areas; attract consumer interest
Activities	are characterized by high production effectiveness; use effective marketing strategies; use effective logistics and transportation practices
Partners	are based on functional collaborations between farmers and suppliers of seeds, pesticides, fertilizers; are based on functional collaborations between farmers and suppliers of services (e.g., farm advisors) [E]; are based on functional collaborations between farmers and wholesalers/exporters; are based on functional collaborations between farmers and market brokers; involve producers' organizations and farmers' cooperatives
Resources	are based on the effective use of land, labor, and capital; are based on effective distribution channels; exploit geographical indications (PDO, PDR, PI)
Customer relationships	are characterized by functional relationships between farmers and middle actors in supply chains; operate based on contracts signed between farmers and other supply chain actors; are based on rigorous contractual arrangements
Channels	distribute effectively products through super markets (at global level); distribute effectively products through convenience stores (at global level); distribute effectively products through specialized food stores (at global level)
Customer segments	target effectively major supermarket chains; target effectively convenience markets; target effectively alternative food shops [E]
Costs	have low production cost at the farm level; have a low transportation/storage cost; have a low distribution/marketing cost
Revenues	offer high revenues to producers; permit farmers to sell high quantities of products

Environmental layer

Functional value	have a low environmental footprint per unit of product sold in neighbor countries; have a low environmental footprint per unit of product sold in remote countries
Production	produce high environmental burden due to logistics activities*; are based on efficient energy use at the farm level; use agricultural supplies (seeds, fertilizers and pesticides) that do not harm the environment
Materials	use irrigation water prudently; make limited use of farm equipment; make heavy use of transportation vehicles*
Suppliers and outsourcing	spend large amounts of energy for transportation*; use vehicles that require high amounts of energy to be produced*; use farm machinery that requires high amounts of energy to be produced*; use low amounts of electricity (e.g., for product storage)
End-of-life	produce waste of products during transportation*; produce no environmental impacts due to products disposal; contribute to the reduction of food waste
Distribution	are based on long-distance transportation that harms the environment*; burden the environment due to packaging*
Use phase	require high amounts of energy for meal preparation (home- or restaurant-cooking)*; consume high amounts of energy during the storage of products (e.g., in super markets' refrigerators)*
Environmental impacts	have high environmental impact due to the transportation and logistics*; are based on energy-consuming procedures across the chain*; have low environmental impacts due to the compliance with mandatory practices; have low environmental impacts because they are using highly efficient logistics systems [E]
Environmental benefits	reduce the energy consumption by using improved technology; can reduce carbon footprint because they are using improved infrastructure

Social layer

Social value	improve consumers' quality of life; offer high-quality products
Local communities	generate income opportunities in local communities by linking them to international markets; create employment opportunities

Governance	are characterized by a market-centric governance; are based on nested structures that ensure efficient decision-making
Employees	offer employment opportunities to different groups; offer employees opportunities for competence development
Societal culture	are characterized by a culture of globalization that generates positive societal outcomes; alienate local culture because they are based on a globalized mindset*; contribute to the development of a "placeless economy" *
Scale of outreach	offer important benefits to local communities; offer benefits to consumers in different countries; offer benefits that extend beyond local communities
End user	offer consumers the opportunity to access high-quality products from all over the world; improve consumers' diets
Social impacts	create divides between production and consumption*; generate dependence on actors operating in the middle of the supply chain*
Social benefits	connect regionally marginalized farmers to markets; facilitate the development of human resources within the community

Notes: Items endorse the statement "export-oriented supply chains…" Each participant was first asked to concentrate on supply chains operated in her/his region. Negatively worded items are marked with an asterisk. Items eliminated during the analysis are marked with "E"

Some of the items were negatively worded to ensure that respondents accurately read them before answering, thus reducing response biases like acquiescence and agreement tendency and helping to avoid patterned responding. In all cases, the items were developed in a way reflecting the main attributes of each component, as depicted in the theoretical framework presented in the previous section. When needed, we used similar items for specific components of the three canvases, like in the case of partners (in the economic layer). This choice was made because in all cases, farmers collaborate with, more or less, similar actors.

Table 3 - Components of TLBMC and relevant items for the case of green public procurement

Component	Items
Economic layer	

Value proposition	are able to offer high quality agrifood products, produced with environmentally sound practices; attract consumer interest
Activities	are characterized by high production effectiveness; use effective costing strategies; use effective logistics and transportation practices
Partners	are based on functional collaborations between farmers and suppliers of seeds, pesticides, fertilizers; are based on functional collaborations between farmers and suppliers of services (e.g., farm advisors) [E]; are based on functional collaborations between farmers and wholesalers/exporters; are based on functional collaborations between farmers and market brokers
Resources	are based on the effective use of land, labor, and capital; are based on effective branding strategies; exploit the available certifications (organic, ethical, etc.)
Customer relationships	base their consumer relationship strategies on structured tools (like customer complain forms); operate based on effective traceability systems
Channels	distribute effectively products through direct sales to public bodies; distribute effectively products through direct sales to local authorities
Customer segments	target effectively public authorities; target effectively municipalities and municipal services; target effectively schools and kindergartens; target effectively universities; target effectively elderly houses and hospitals
Costs	have low production cost at the farm level; have a low transportation/storage cost; have a high cost associated with product traceability*[E]; have a high cost associated with the certification schemes used*
Revenues	offer farmers an extra revenue due to the associated subsidies; permit farmers to sell high quantities of products
Environmental layer	
Functional value	have a low environmental footprint per unit of product sold in public bodies; have a low environmental footprint per unit of product sold in local authorities
Production	produce high environmental burden due to logistics activities*; are based on efficient energy use at the farm level

Materials	use agricultural supplies (seeds, fertilizers and pesticides) that do not harm the environment; use irrigation water prudently; make limited use of farm equipment [E]; make heavy use of transportation vehicles* [E]
Suppliers and outsourcing	spend large amounts of energy for transportation*; use vehicles that require high amounts of energy to be produced*; use farm machinery that requires high amounts of energy to be produced*; use low amounts of electricity (e.g., for product storage) [E]
End-of-life	produce waste of products during transportation*; produce waste of products at the consumption phase*
Distribution	are based on middle-distance transportation that do not harm the environment; are based on long-distance transportation that harms the environment*; use green packaging strategies, thus producing limited environmental burden
Use phase	require high amounts of energy for meal preparation (referring to the meal preparation in public authorities)*; consume high amounts of energy during the storage of products (e.g., in public authorities' refrigerators)*
Environmental impacts	have high environmental impact due to the transportation and logistics*; are based on energy-consuming procedures across the chain*
Environmental benefits	have reduced environmental impacts during the production phase; mitigate the environmental impacts due to the compliance with environmental practices and processes
Social layer	
Social value	promote the idea of green agrifood production; promote responsible consumption
Local communities	transform local communities to "green" communities; develop institutions between local communities and public authorities
Governance	operate based on clear rules; decision-making processes are predescribed and widely accepted
Employees	cultivate a "green mindset" among employees; offer employees opportunities for specialization in sustainable production; offer employees opportunities for training in sustainable production

Societal culture	cultivate a culture of responsibility in production and consumption; generate "elitist" cultures*
Scale of outreach	offer important benefits to local communities; offer benefits to public authorities; offer benefits that extend beyond local communities
End user	offer consumers (employees in public authorities, public universities' students) access to healthy food products; offer consumers (employees in public authorities, public universities' students) opportunities to develop awareness on issues related to sustainability, ethical production, fair trade; offer consumers (employees in public authorities, public universities' students) information on food production standards; guarantee that school canteens offer healthy food [E]
Social impacts	exclude non-certified farmers from GPP schemes*; transform sustainable food production into a marketing mechanism*
Social benefits	promote sustainable and responsible production; promote sustainable and responsible consumption

Notes: Items endorse the statement "green public procurement schemes…" Each participant was first asked to concentrate on supply chains operated in her/his region. Negatively worded items are marked with an asterisk. Items eliminated during the analysis are marked with "E"

6.2 Participants

Partners from each country (Italy, France, Morocco, Egypt, Greece) administered the questionnaire to farmers (operating individually or as members of cooperatives/farmers' associations), wholesalers, retailers, transporters, market brokers, distributors, consumers, and specialists with expertise either in supply chain management or in social sciences. The procedure led to the collection of 270 completed questionnaires, as presented in Table 4.

Table 4 - Distribution of the sample in the five countries

Country	**Participants**		
	Short food supply chains	**Export-oriented supply chains**	**Green public procurement**

Italy	10	47	-
France	-	-	20
Morocco	44	-	-
Egypt	27	16	-
Greece	52	54	-
Total	133	117	20

Figures 11-15 present the distribution of actors within the samples. As the figures highlight, the majority of participants were farmers. Concerning gender, 77.7% of the total sample were men. The percentages of women participants were 19.3% for Italy, 35% for France, 2.3% for Morocco, 16.3% for Egypt, and 32.4% for Greece. Most of the participants belonged to the age category of 41-60 years old (57%). Among the 270 respondents, 4.4% noted that they had not completed primary education, 16.3% have completed primary school, 22.2% and 29.3% stated that they have a secondary or post-secondary education degree, and 27.8% have graduated from a tertiary education institute.

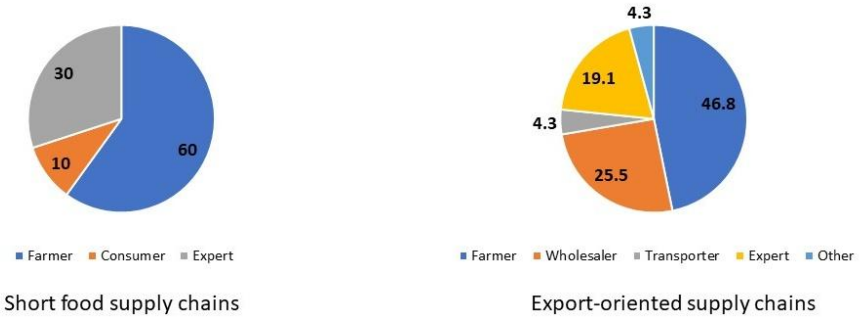

Figure 11 - Percentages of actors participating in the Italian samples

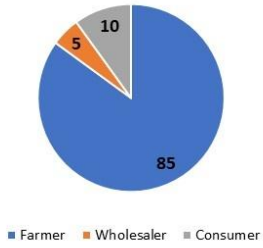

Figure 12 - Percentages of actors participating in the French sample

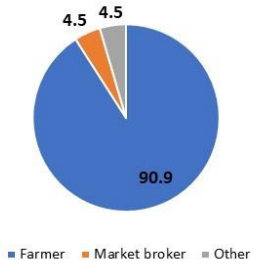

Figure 13 - Percentages of actors participating in the Moroccan sample

Figure 14 - Percentages of actors participating in the Egyptian samples

Figure 15 - Percentages of actors participating in the Greek samples

6.3 Data analysis procedures

To reduce the number of variables we performed a series of factor analyses. The variables created to assess each dimension of the TLBMC were subjected to an alpha factoring procedure to ensure that they belong to the theoretically expected factors. To estimate the proportion to which the new variables account for the variation of the original data we used the percentage of the explained variance, whereas Cronbach's alphas were used to assess of internal consistency. For the case of green public procurement, we did not use alpha coefficients due to the small sample size.

To present data, we used mean scores, whereas comparisons between countries were performed using independent samples t-tests. Paired samples t-tests were employed to compare mean scores of different dimensions of the canvases.

7. Results

7.1 Short food supply chains

Our analysis for short food supply chains concerns four countries: Italy, Morocco, Egypt, and Greece. In all cases, Cronbach's alphas were high enough to permit the creation of new variables, whereas the variance explained by the new variables was high in all instances (ranging from 48.12% to 82.57% of the original variables).

For the economic layer (Table 5), the results indicate that short food supply schemes have a high value proposition. The mean scores were 4.15 for Italy, 4.65 for Morocco, 4.65 for Egypt, and 3.99 for Greece. Although the mean score in the latest case was lower, it is higher than those of the other dimensions of the economic canvas, as it was also noticed in the other three countries. High mean scores were also observed for the dimensions referring to resources and customer relationships for Italy (M=3.87 and M=3.97, respectively), Morocco (M=4.23 and M=4.02, respectively), and Egypt (M=4.27 and M=4.25, respectively). For the Greek case, the mean score for the dimension "resources" was somewhat lower (M=2.97); however, customer relationships yielded the second highest mean score (M=3.29). It is pivotal to mention that in all cases, the revenues were found to have higher mean scores than the costs of short food supply chains. The highest mean difference was noticed in Egypt (mean difference=1.55), and the lowest was in Greece (mean difference=0.08).

Table 5 - Mean scores for the nine dimensions of the economic layer for Italy, Morocco, Egypt, Greece

	Cronbach's α	Explained variance (%)	Mean score			
			Italy	Morocco	Egypt	Greece
Value proposition	0.72	78.35	4.15	4.65	4.65	3.99
Activities	0.68	61.56	3.27	3.45	4.39	3.18
Partners	0.68	76.10	3.10	1.94	3.80	3.20
Resources	0.78	70.43	3.87	4.23	4.27	2.97
Customer relationships	0.46	48.12	3.97	4.02	4.25	3.29
Channels	0.61	56.20	3.43	2.70	3.38	3.26
Customer segments	0.73	64.66	3.17	4.03	3.07	2.93
Costs	0.72	64.52	2.47	2.41	2.63	2.99
Revenues	0.46	65.07	2.65	3.86	4.18	3.07

To compare the mean scores of the revenues between the four countries, we performed independent samples t-tests. The analysis revealed that the mean score for Egypt was significantly higher than that of Italy ($t=7.72$, $p<0.01$) and Greece ($t=5.99$, $p<0.01$). The same pattern was observed for the differences between Morocco and Italy ($t=5.13$, $p<0.01$) and Morocco and Greece ($t=4.80$, $p<0.01$). Between Egypt and Morocco, the difference was marginally non-significant ($t=1.97$, $p=0.053$). These differences indicate

that, in these two countries, the revenues of short food supply chains are higher than in the two European countries.

Among the dimensions of the environmental layer (Table 6), the environmental benefits were found to have very high mean scores for Italy and Morocco (M=4.65 in both cases). Notably, in all countries, environmental benefits had higher mean scores than environmental impacts of short supply chains; however, for Greece, this difference was only 0.01. For Egypt, the highest mean scores were observed for the dimensions referring to materials and suppliers/outsourcing (M=4.63 and M=4.43, respectively). The mean scores received for the Greek sample were generally lower than those of the other three countries, with the distribution phase having the highest value (M=3.38). A remarkable finding was that the mean scores for the use phase were low for all the countries, and Italy, Morocco, and Egypt had the lowest values compared with the other eight dimensions.

Table 6 - Mean scores for the nine dimensions of the environmental layer for Italy, Morocco, Egypt, Greece

	Cronbach's α	Explained variance (%)	Mean score			
			Italy	Morocco	Egypt	Greece
Functional value	0.76	80.42	4.30	4.00	3.31	3.11
Production	0.57	54.66	3.50	3.78	4.27	2.94
Materials	0.71	77.60	3.70	3.79	4.63	2.82
Suppliers and outsourcing	0.42	63.64	3.25	3.01	4.43	3.10
End-of-life	0.77	81.85	4.00	4.41	4.07	3.10
Distribution	0.79	82.57	3.80	4.69	3.44	3.38
Use phase	0.45	64.95	2.50	2.12	1.37	2.84
Environmental impacts	0.56	69.65	3.70	4.02	3.48	3.24
Environmental benefits	0.76	80.87	4.65	4.65	3.65	3.25

Finally, the analysis related to the social layer (Table 7) suggests that in all four countries the social benefits have the highest mean scores than the social impacts (which presented the lowest mean scores among the nine dimensions in all cases). Mean scores for the social impacts range between 2.36 (for Morocco) and 3.11 (for Greece), whereas for social benefits the scores extend between 3.12 (for Egypt) and 4.71 (for Morocco). For all countries, the contribution of short supply schemes to local communities' wellbeing received the highest mean score. High mean scores were also noted for the total social value for Italy (M=4.55) and Morocco (4.60), but not for Egypt (M=3.98) and Greece (M=3.65). A similar pattern was observed for the dimension of societal culture, with high mean scores for Italy (M=4.30) and Morocco (M=4.58) and relatively low mean scores for Egypt (M=2.95) and Greece (M=3.24). In addition, in the two African countries, the mean scores for the scales of outreach were found to be higher than 4.00 (M=4.05

for Morocco and M=4.01 for Egypt), while in Italy and Greece were considerably lower (M=3.70 and M=3.42, respectively).

Table 7 - Mean scores for the nine dimensions of the social layer for Italy, Morocco, Egypt, Greece

	Cronbach's α	Explained variance (%)	Mean score			
			Italy	Morocco	Egypt	Greece
Social value	0.83	67.14	4.55	4.60	3.98	3.65
Local communities	0.89	82.35	4.57	4.83	4.35	3.66
Governance	0.54	68.63	4.20	3.53	3.61	3.38
Employees	0.61	72.17	3.90	4.20	2.85	3.55
Societal culture	0.83	74.67	4.30	4.58	2.95	3.24
Scale of outreach	0.47	57,46	3.70	4.05	4.01	3.42
End user	0.63	58.04	4.23	4.55	3.50	3.28
Social impacts	0.43	63.88	2.85	2.36	2.87	3.11
Social benefits	0.78	69.86	4.00	4.71	3.12	3.45

7.2 Export-oriented supply chains

The data for export-oriented supply chains were gathered from three countries: Italy, Egypt, and Greece. The new variables that were calculated as the average of the original ones have acceptable Cronbach's alphas (ranging from 0.40 to 0.87) and explain high proportions of the initial variance (from 50.29% to 87.51%).

For the economic layer (Table 8), the analysis revealed that export-oriented supply chains have an average-to-high value proposition, with mean scores of 3.95 for Italy, 3.68 for Greece, and 3.56 for Egypt. Nevertheless, in all cases, the differences between revenues and costs have a positive sign, with values of 1.31 for Egypt, 0.87 for Italy, and 0.74 for Greece. For the Egyptian export-oriented supply chains, the highest mean scores were observed for the dimensions "partners' (M=4.19) and customer segments (M=4.09). For Italy, the same dimensions had the highest mean scores; however, customer segments (M=3.69) ranked in the first position, and partners (M=3.31) followed. For the Greek supply chains, resources had a high mean score (M=3.68), which was considerably higher than the respective value for the Italian sample (M=2.86).

Table 8 - Mean scores for the nine dimensions of the economic layer for Italy, Egypt, Greece

	Cronbach's α	Explained variance (%)	Mean score		
			Italy	Egypt	Greece
Value proposition	0.58	70.85	3.95	3.56	3.68
Activities	0.56	53.27	3.28	4.08	3.57
Partners	0.70	52.49	3.31	4.19	3.64
Resources	0.55	55.81	2.86	4.00	3.68
Customer relationships	0.63	58.25	2.88	3.69	3.63
Channels	0.62	58.07	3.28	4.04	3.50
Customer segments	0.56	69.44	3.69	4.09	3.45
Costs	0.75	67.24	1.87	2.56	2.64
Revenues	0.41	61.16	2.74	3.87	3.38

When looking at the environmental layer (Table 9), one can see, in all the three countries, moderate values for the functional value in all the three countries (M_{Italy}=2.91, M_{Egypt}=3.31, M_{Greece}=3.05). For Italy, the highest mean score was observed for the dimension "end-of-life" (M=3.25), followed by the "use phase" (M=3.17) and the materials used (M=3.14). Between the environmental impacts and benefits the difference was only 0.01. For the Egyptian export-oriented supply chains, the distribution seems to have the highest contribution to the environmental footprint (M=4.06), whereas the use phase had an unexpectedly low mean score (M=1.41). The environmental benefits had a higher mean score than that of environmental impacts (3.06 versus 2.96). The same pattern was noticed in Greece, where the difference between environmental benefits and impacts was 0.55. For the Greek sample, the "use phase" (M=3.43) and the distribution (M=3.17) yielded the highest means.

Table 9 - Mean scores for the nine dimensions of the environmental layer for Italy, Egypt, Greece

	Cronbach's α	Explained variance (%)	Mean score		
			Italy	Egypt	Greece
Functional value	0.83	85.71	2.91	3.31	3.05
Production	0.50	50.29	3.08	3.35	3.12
Materials	0.48	51.85	3.14	3.75	2.79
Suppliers and outsourcing	0.67	53.71	2.71	2.53	2.52
End-of-life	0.66	59.70	3.25	3.37	2.92
Distribution	0.72	78.90	3.11	4.06	3.17
Use phase	0.84	86.38	3.17	1.41	3.43
Environmental impacts	0.65	61.20	2.74	2.96	2.68
Environmental benefits	0.71	77.39	2.75	3.06	3.23

The nine dimensions belonging to the social layer of the TLBMC for export-oriented supply chains (Table 10) received relatively higher mean scores than those of the environmental layer. A notable finding was that the contribution of that type of chain to the well-being of local communities had the highest mean score for both the Italian (M=4.03) and the Greek (M=3.85) sample. The dimension referring to the opportunities offered to employees in export-oriented supply schemes also had high mean scores for the two countries (M=4.00 and M=3.73, respectively), and the contribution of such chains to the development of a positive societal culture received the lowest mean scores (M=3.11 and M=3.01, respectively). For Egypt, the highest mean score was noticed for the dimension "end user" (M=4.66), followed by the scale of outreach (M=4.42). Although, for the Egyptian and the Greek samples, the social benefits of export-oriented supply chains surpass their negative social impacts (mean differences are 0.72 and 0.66, respectively), it is notable that for Italian participants the difference had a negative sign, indicating that the specific schemes are considered as having marginally negative societal impacts.

This finding acquires higher importance when compared with the respective mean scores for short food supply chains, where social impacts were lower by 18.25%, and the social benefits were higher by 16.25%. For the other two countries, the comparison indicated that the social impacts of export-oriented supply chains are higher by 8.71% in Egypt and only 0.32% in Greece than those of short supply schemes, and the social benefits are higher by 23.08% and 9.56%, respectively. Such differences can be attributed to the varying nature of supply chains in the three countries, and their potential contribution to the social sustainability of agrifood systems.

Table 10 - Mean scores for the nine dimensions of the social layer for Italy, Egypt, Greece

	Cronbach's α	Explained variance (%)	Mean score		
			Italy	Egypt	Greece
Social value	0.85	87.51	3.98	4.25	3.68
Local communities	0.77	81.53	4.03	4.41	3.85
Governance	0.40	62.61	3.74	3.22	3.43
Employees	0.73	80.05	4.00	3.41	3.73
Societal culture	0.48	51.32	3.11	3.31	3.01
Scale of outreach	0.87	80.16	3.83	4.42	3.61
End user	0.83	85.85	3.86	4.66	3.74
Social impacts	0.44	64.15	3.37	3.12	3.12
Social benefits	0.42	63.30	3.35	3.84	3.78

7.3 Green public procurement

For the case of green public procurement, the data were drawn from only one country: France. Before computing the new variables to reduce data, we calculated the variance of the original data that they

explain. In all cases, the percentages were satisfactory, taking into consideration the small sample size. The results of the analysis are presented in Tables 11, 12, and 13.

According to the mean scores, green public procurement schemes have an average to high value proposition (M=3.97), whereas they lead to higher revenues (M=3.10) than costs (M=2.80). The difference between the two variables is significant at the 0.05 level (t=2.49, p=0.022). Nevertheless, there are many spaces for improvement since all the dimensions of the model received relatively low mean scores. As Table 11 highlights, the margins for improving the effective use of resources (M=3.08) and targeting customer segments (M=3.18) are broad. The same is true for the creation of functional customer relationships (M=3.20).

Table 11 - Mean scores and explained variance for the economic layer in the case of green public procurement

	Explained variance (%)	Mean score
Value proposition	63.03	3.97
Activities	56.76	3.38
Partners	65.83	3.38
Resources	68.30	3.08
Customer relationships	65.89	3.20
Channels	72.07	3.37
Customer segments	69.37	3.18
Costs	59.83	2.80
Revenues	68.15	3.10

For the environmental layer, the mean scores (Table 12) reveal that, despite the fact that environmental benefits of green public procurement (M=3.65) surpass their negative environmental impacts (M=2.55) – a difference that, according to the paired samples t-test, is significant at the 0.01 level (t=4.76, p<0.01) – there are aspects related to the environmental performance of green public procurement schemes that can be seriously improved. The mean scores for the dimensions “suppliers and outsourcing” (M=2.68), “use phase” (M=2.42), and “end-of-life” (M=2.32) are below the baseline of 3.00, whereas the “production” dimension yielded a mean score of 3.00, indicating a positive effect on the environmental performance of these schemes. Nevertheless, the functional value of green public procurement is just above the reference line of 3.00 (M=3.27), suggesting that some aspects of green public procurement do not seem to be as “green” as hoped.

Table 12 - Mean scores and explained variance for the environmental layer in the case of green public procurement

	Explained variance (%)	Mean score

Functional value	68.30	3.27
Production	56.30	3.00
Materials	66.53	3.65
Suppliers and outsourcing	65.97	2.68
End-of-life	64.28	2.32
Distribution	44.35	3.62
Use phase	91.91	2.42
Environmental impacts	65.09	2.55
Environmental benefits	84.41	3.65

Finally, the mean scores for the social layer confirm that green public procurement schemes do have a relatively high ability to generate social value (M=3.82) and produce significantly higher social benefits (M=3.87) than social externalities (M=3.15). The paired samples t-test for the two variables yielded a value of 2.49, corresponding to p=0.022.

Table 13 - Mean scores and explained variance for the social layer in the case of green public procurement

	Explained variance (%)	**Mean score**
Social value	77.21	3.82
Local communities	83.10	3.37
Governance	86.67	3.17
Employees	69.57	3.40
Societal culture	72.04	3.52
Scale of outreach	71.57	3.60
End user	58.77	3.65
Social impacts	66.04	3.15
Social benefits	81.14	3.87

Among the other aspects of the model, the highest means were observed for the dimensions “end user” (M=3.65), “scale of outreach” (M=3.60), and “societal culture” (M=3.52). Interestingly, as it was also observed in the other types of supply chains (and in other countries), governance mechanisms had a somewhat low mean score (M=3.17), potentially suggesting that adaptations to the current governance structures can lead to the realization of higher levels of social value.

8. Conclusions

In this report, we presented the concept of business models, and we applied it, first, to a theoretical analysis of three supply chain systems (short food supply chains, export-oriented supply chains, and green public procurement) and, second, to investigate how it can depict the economic, environmental, and social performance of these systems in different countries. To perform this task, we approached supply chains as complex wholes, consisting of actors and organizations operating at niches but also interacting and affected by regimes and landscapes.

The theoretical analysis revealed essential differences among the three systems under consideration in the ways the economic, environmental, and social value is produced. The different structures of the three systems, their diverging ambitions, and the varying relationships between farmers and regime (or even landscape) actors catalyze the ways value is created and shared within supply chains. The analysis of data collected in Italy, Morocco, Egypt, and Greece facilitated the identification of similarities and differences between countries in the performance of short food supply schemes and export-oriented supply chains (with the exemption of Morocco, from where no data on export-oriented chains were available), whereas data from France were used to investigate the dimensions of TLBMC that contribute to the production of value that extends across and beyond the specific chain.

An interesting finding was that, in all cases, short food supply chains were found to have higher revenues than economic costs, despite the significant differences between countries. Moreover, the value proposition of such schemes is considerably high, indicating their ability to produce economic value. The capacity to build functional customer relationships is decisive for the total economic value emanating from such schemes. Moreover, the environmental benefits for short supply conduits are higher than their environmental externalities, although for some countries (Egypt and, especially, Greece) this difference is very low. That, when viewed in conjunction with the lower scores for functional value for these two countries, generates questions on the environmental performance of short supply chains in Greece and Egypt. The dimensions referring to suppliers and outsourcing and the materials used for production purposes have high mean scores, thus suggesting their contribution to the reduction of short supply chains’ environmental footprint.

However, what is clear from the TLBMC is that in all countries short food supply schemes have a positive social impact. The social externalities of such systems are considerably low, especially when compared with the benefits that they bring to society. The local communities emerged from the analysis as the main groups receiving the benefits of short supply chains’ operation. Interestingly, the positive social impacts

of short food distribution channels were found to be higher than the respective impacts of export-oriented supply chains for Italy, Egypt, and Greece. Despite the differences between countries, the ability of export-oriented supply schemes to facilitate the development of a positive societal culture is questionable, while aspects such as the governance structures of such chains also reduce their ability to produce social value.

Although export-oriented supply chains have a relatively high economic value proposition, limitations on their ability to effectively target customer segments and create partnerships reduce their capacity to produce that value. For the Greek sample, the use of resources is another constraint in the emergence of economic value. On the other hand, the analysis uncovered a low environmental performance for export-oriented chains, depending on different – and, potentially, context-specific – factors. The problem seems to be more intense in Italy, compared with Greece and Egypt, where environmental benefits clearly surpass their negative impacts.

In the case of green public procurement, the data from France demonstrated a high value proposition and a sufficient ability to produce social value. In the first case, the more effective use of resources and a better targeting strategy could improve the ability of such schemes to realize their full economic potential. For the social value, governance emerged – again – as a limiting factor. Finally, green public procurement schemes seem to have not yet achieved their full capacity to generate environmental value.

To conclude, the current report revealed that triple layered business model canvases represent useful tools for detecting the factors that catalyze the realization and capture of the economic, environmental and social value of supply chains. The analysis indicated a series of – often context-specific – parameters determining the ability of short food supply chains, export-oriented supply chains, and green public procurement schemes to generate value and offers future researchers a compass on how to improve the value-generating capacity of such supply chain systems.

9. Contribution to Sustainable Development Goals (SDGs)

This deliverable significantly contributes to several Sustainable Development Goals (SDGs) by analyzing and reviewing business models that can empower agri-food smallholders and SMEs, aligning with sustainable development principles:

1. **SDG 1: End poverty in all its forms everywhere:** The deliverable supports poverty alleviation by identifying business models that enhance the competitiveness of smallholders and SMEs in the agri-food sector. These models aim to increase economic opportunities and livelihoods, particularly for rural and vulnerable communities engaged in agricultural production.
2. **SDG 2: End hunger, achieve food security, and improved nutrition, and promote sustainable agriculture:** Through the analysis of business models tailored to supply chain systems, this report supports agricultural sustainability and efficiency, directly contributing to improved food security. The focus on short food supply chains (SFSCs) and sustainable practices enables better resource use, reduces food waste, and fosters resilient agricultural systems.
3. **SDG 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all:** By emphasizing the optimization of business models, the deliverable encourages inclusive economic growth and fair labor practices within the Mediterranean agri-food clusters. This fosters employment opportunities and supports SMEs in navigating global markets while maintaining ethical practices.
4. **SDG 12: Ensure sustainable consumption and production patterns:** The review highlights the importance of sustainable production processes and consumer engagement. By addressing the integration of sustainability-focused business models, the deliverable promotes eco-friendly practices that align with responsible consumption patterns.
5. **SDG 13: Take urgent action to combat climate change and its impacts:** The report underlines the necessity for climate-responsive business models. It emphasizes reduced carbon footprints, efficient resource utilization, and climate-resilient strategies within supply chains, contributing to the mitigation of climate change impacts.
6. **SDG 17: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development:** The deliverable fosters collaboration among stakeholders, including smallholders, SMEs, researchers, and policymakers, to optimize business models and strengthen partnerships within the Mediterranean agri-food ecosystem. This aligns with efforts to promote shared knowledge and global cooperation.

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