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Food Sector as an Interactive Business World: A Framework for Research on Innovations

Michał Gazdecki [1,*], Grzegorz Leszczyński [2] and Marek Zieliński [2]

[1] Department of Economics and Economy Policy in Agribusiness, Faculty of Economics, Poznań University of Life Sciences, 60-637 Poznań, Poland
[2] Department of Marketing Strategies, Poznań University of Economics and Business, 61-875 Poznań, Poland; g.leszczynski@ue.poznan.pl (G.L.); marek.zielinski@ue.poznan.pl (M.Z.)
* Correspondence: michal.gazdecki@up.poznan.pl

Abstract: The objective of this paper is to enhance the dominant research perspective of innovations in the food market (power or supply chain centric) with an interactive/network approach. Many scholars identify the development challenges facing the food sector, including economic factors, changes in lifestyle, climate change, changes to the food consumption mix, shrinkage of Earth's resources and interactions between food production and the environment, in the context of sustainable development. A new approach to innovations in the food market may shift it towards a more sustainable path of development. Based on a literature review, we present the specific conditions for innovation in the food market and discuss previous research as being focused on the power of operators and flows in supply chains. Methodologically, this paper puts these considerations in the context of interaction and business networks. We note that the concept of power and dependence can be embedded with the concept of interdependence, and flows in supply chains can be replaced by the concept of cooperation in business networks. We conceptualize a research framework based on innovative activities in business relationships and networks and we propose the following themes as research avenues for further research: (1) What drives innovation in food ecosystems? (2) When is the power-centric approach to innovations more effective than taking the perspective of interdependence? (3) How do network-born innovations develop in the food sector? (4) How do actors handle innovation in their business models? (5) What is the impact of innovations on the food sector?

Keywords: business networks; business relationships; co-creation; open innovations; food markets; sustainable food supply

Citation: Gazdecki, M.; Leszczyński, G.; Zieliński, M. Food Sector as an Interactive Business World: A Framework for Research on Innovations. *Energies* **2021**, *14*, 3312. https://doi.org/10.3390/en14113312

Academic Editor: Karolina Pawlak

Received: 5 May 2021
Accepted: 31 May 2021
Published: 4 June 2021

1. Introduction

Innovation is discussed as one of the most important sources of competitive advantage in the food industry as it allows food companies to meet consumer needs and stand out from competitors [1]. However, the food industry has experienced much less innovations than other industries, and it is still discussed as traditional and conservative [2]. Several studies recommend that food companies embark on the path towards innovation driven by cooperation with their surroundings, and several authors have suggested the need to further develop research on innovations in the food sector [3]. Theoretical and empirical studies on innovations in the food sector can be divided into two general streams [4,5]: the first one is focused on internal drivers of innovations (e.g., quality policy and R&D efficacy), while the second one investigates external factors of innovations (the institutional context and market) [6]. In the second stream, it is emphasized that the dominance of a few operators over many small players reduces innovation-oriented cooperation efforts in the food market. The literature also notes that each company plays a specific role in the value chain, which determines its commitment to innovation in a restricted circle of

suppliers and buyers. Such an approach to innovation in the food market has given rise to the discussion on innovation limitations and challenges in the food sector [7].

This paper focuses on food markets, which are defined as a separate sub-sector in the economic literature [8,9]. The relevant literature places emphasis on the evolution of food markets and the shift away from neutral management to a highly professionalized sector where many of the actors' behaviors correspond to those found in industrial markets. The authors refer to studies where the food sector covers the entire food chain including R&D centers (related to crops, animals and pharmaceuticals), all agricultural input industries and farm production enterprises. It includes many food processors; complex transportation and distribution systems (between food manufacturers and retail outlets); retail food stores; food service establishments; and, last but not least, consumers who are the beginning of the demand chain. The issues addressed in this paper are of universal nature because the food sector "operates within the culture of its community, the economy of its nation, and a market that extends around the world" [10]. The authors also refer to studies which assume that the use of knowledge in food production and processing are an important factor of economic activity in the food sector [11]. That condition, attained through the development of digital technologies, creates an unprecedented number of links between organizations and makes it necessary to take a broad look at the food sector together with the complex relationships among its enterprises, political actors, consumers, etc.

The purpose of this paper is to enhance the dominant research perspective of innovations in the food market (power or supply chain centric) with an interactive/network approach. This paper addresses research on innovation in the food market in the context of studies of industrial networks that started in the early 2000s [12,13]. The authors also refer to a broader framework of research on innovation underpinned by the relational paradigm, which assumes that relationships between organizations play a significant role in driving organizational competitiveness [14]. Reference is also made to studies which indicate the importance of inter-firm cooperation for innovation [15–17] and especially the importance of external agents for innovation [18,19]. The authors also rely on business-to-business marketing literature that underlines the fundamental role of relationships and networks in fostering innovation [20]. Interactive/network-based approaches, proposed and developed by IMP Group since the 1980s, are of particular importance in that context. It is already supported by considerable theoretical and research achievements which, however, is of little use in research on the food market [21].

Methodologically, this is a conceptual paper which identifies some limitations in previous research framework of innovations on food market and suggests a modified perspective. This conceptual work enhances the power-centric and supply chain-centric points of view on conditions of innovations at the food sector by enhancing it with the interdependence and network perspective. This allows regarding conditions at this sector as more colorful, which leads to suggest an enhanced research framework and formulate some themes for further research about innovations in the food sector. It conceptually contributes to discussion on how innovations in the food sector could be better understood and how to develop research on it to answer managerial challenges in this field [5].

The paper is organized as follows. The first part presents the specific conditions for innovation in the food market and discusses previous research as being focused on the power of operators and on flows in supply chains. Next, these considerations are put in the context of interaction, relations and business networks in the food market. Then, the authors note that the concept of power and dependence can be embedded by the concept of interdependence, and cooperation in business networks can be used instead of the concept of supply chain cooperation. Based on the above, the last part of this paper indicates the opportunities for enhancing the approach to innovation in the food market and points out avenues for further research.

2. Power-Centric and Supply Chain-Centric Approaches to Innovations in the Food Sector

Many scholars identify development challenges facing the food sector. These include economic factors, changes in lifestyle, climate change, changes to the food consumption mix, shrinkage of Earth's resources and interactions between food production and the environment, considered in the context of sustainable development [22–24]. The response to these challenges is the development of the food sector, driven by innovative processes in value chains, which allow not only to better meet consumer expectations but also to adapt to changes to be faced in the future. It is also proposed that the food sector considers the concept of open innovations (a paradigm that assumes that firms should use external ideas as well as internal ideas, and internal and external market channels should be used to generate additional value) to be the answer to shorter innovation cycles, the growing costs of industrial research and the lack of resources [25].

The strong imperative for innovation in the food sector has led to a well-established body of research on innovations [26]. Papers focusing on external drivers of innovations in the food sector are strongly impacted by two analytic approaches to phenomena occurring in that market. The first one involves considering the market power of operators; the food sector is primarily seen from a transactional perspective and in the context of the impacts each operator has on other market players (compared to their market power). Strong concentration, complex systems of vertical links and coordination of activities [24,27] are the reasons the perfect competition paradigm lost its role in the relevant literature to theories underpinned by the market power concept [27]. Despite being criticized for its failure to account for factors specific to food markets, such as product heterogeneity, information asymmetry, resource limitations, etc. [27], this power-centric approach is widespread in papers on food market innovations. It emphasizes that powerful actors need to manage relationships with a number of heterogeneous, often small actors (e.g., farmers, fishers or plant suppliers) [1]. By looking from the perspective of power, researchers focus on understanding mechanisms that enable stronger players to use their dominant position over weaker partners in developing and implementing innovation [28,29].

The second approach strongly noticeable in food market research is the analysis of food products movement in accordance with the supply chain concept. According to Christopher [30], supply chains link the marketplace, the distribution network, the manufacturing process and the procurement activity by planning, coordinating and integrating the flow of materials from the source to the user. The reasons, which make the supply chains theory useful in analyzing food markets, include the fact that chains actors are integrated through a product (or product category) and that their mutual cooperation enables the flow of products and accompanying flows. Papers related to commodity flows through supply chains of the food sector analyze the logistic processes and the formation of their prices and costs [31–34] as well as supply chain management and coordination [32,35–37]. This literature is focused on operational flows of goods in a supply chain. This results in less attention being paid to knowledge exchange or to more general, limited knowledge of the food sector's SMEs on the ways of organizing the innovation process in an inter-organizational setting [38].

Supply chain-centric studies of innovations in the food sector concern the need for collaboration between participants of chains instead of internal efforts, which is related to the innovation continuum proposed by Buffington and McCubbrey [39]. Bigliardi and Galati [1] pointed out that innovation in the food sector needs the involvement of other actors to develop open innovation. Grunert and Valli [40] claimed that, in the food sector, an open, innovative approach is more supportive for innovations than internal R&D efforts. Other researchers underline a strong need for networked innovations on food markets [7], especially in the context of widespread SME food manufacturers [41]. Similarly, some studies focus on the selection of partners for innovation development within one chain [7,42].

Some studies indicate that, in the food sector, network capability improves innovative capacity [43] and that inter-sectoral linkages with other economic sectors are significantly

important in the food innovation process [26]. Such approach calls for a wider perspective that allows considering not only power but also more colorful aspects of relations between actors, as well as not only actors of a supply chain but also several actors of business networks. Indeed, adopting these perspectives has important consequences for research on food sector innovations that are discussed in this paper while taking the conditions for innovation development into consideration.

3. Conditions for Innovation Development in the Food Sector

Food markets are strongly heterogeneous because of the great diversity of actors and goods traded. From the perspective of commodities traded, while the supply of food raw materials converges to the same pattern around the world [44], basic nutrients (energy, proteins and fats) are still derived from only ca. 94 crop species [44]. However, final products are becoming increasingly diversified. This is reflected in many ways, including by the growing number of items offered in stores. According to the data from the U.S. market, an average grocery store had ca. 7000 items in its assortment in the 1990s; after 2010, that figure went up to ca. 40,000–50,000 products [45].

Food markets witness the coexistence of cooperating or competing actors with different characteristics and are strongly affected by market power asymmetry. Both of these phenomena can be considered natural and are present at every market level, from the production of raw materials to retail trade. Therefore, food markets must be provided with mechanisms that enable cooperation between operators, which differ in bargaining power, scope of activity (local vs. global), activity formalization level and cultural organization. Therefore, the issue of power is also usually linked with dependency of small actors upon big ones or those that play a key role in a supply chain. In such a setting, making small companies embrace open innovations that need transferring their boundaries to a "semi-permeable membrane through which information and knowledge can flow" [46] becomes a risky way to innovate. Moreover, dependency prefers interest in partnering and alliances with those actors that achieved a dominant position and limit the possibility to open for radical changes originating from new relationships [47]. Hence, asymmetry in food markets could make the creation of innovative processes a challenging task. In addition to the phenomena listed above, small operators struggle with a limited capital capacity, while large organizations are affected by strong formalization and low flexibility. Hence, the structure of food market players and commodities has an impact on innovations in that market.

Moreover, food market innovations are conditioned by demand, which is addressed by market players. At a basic level, this means ensuring the supply of food (adequate quantity of food and organization/logistics of supply). This is particularly important in the light of forecasts according to which food demand will grow considerably by 2050 [48,49]. Furthermore, demand for food products is a universal process, and food expenses are very frequent and make up a significant part of total household expenditure [50]. Demand for food products is also dispersed, which can be explained by its general nature and by differences in population density.

Additionally, the evolving consumer needs and the extension of food market functions beyond ensuring adequate quantities of food are the reasons expanded functions (such as social functions, meeting the requirements of sustainable growth and addressing the growing healthcare needs) will become increasingly important [51]. Changes in consumer behaviors and evolving consumer needs generate demand for innovation [52–54], which will be implemented more efficiently if based on an open formula with the inclusion of consumers and operators in charge of different functions. If consumers have a negligible market power, they will accept the products offered by food producers. They are not considered as participants in innovative processes and attention is focused on cooperation opportunities with suppliers, universities and researchers [1].

In addition to business organizations, governmental policy-making bodies are also active in the food market for several reasons. They impact the market mechanisms by inter-

vention, sales or purchases raw materials and, control the quality of food. The institutions attempt to regulate the way food markets affect the financial standing of societies and contribute to domestic product. Therefore, raw materials production is strongly impacted by institutions which regulate the farms' operating methods by creating conditions intended to stimulate specific development activities [55]. In addition, agriculture is strongly supported under subsidy schemes. At higher levels of food markets, legislative impacts mostly consist in inspection and supervisory measures (e.g., the requirement for the food sector enterprises to implement an HACCP-based procedure). Similar tasks are also performed by organizations surrounding the food markets, e.g., the European Food Safety Authority, whose main responsibility is to protect consumers against threats present in food chains.

In the studies, institutions are believed to stimulate innovation by creating appropriate conditions so that the developed solutions match the current economic policy at the regional or national level [56,57]. However, the effect they have on innovations in the food sector is reflected in only a few publications. When discussing the operation of social networks established between entrepreneurs grouped in food clusters, Ramirez and colleagues [58] noted the impacts of local government units and regulatory factors. The ability to develop innovations in clusters was also tackled by Geldes and colleagues [59], who found that, in the food sector, the elimination of institutional and social barriers is a particularly important innovation enabler. In turn, Ferrara [55] dealt with the impact of institutional conditions on the development of international cooperation for Italian food enterprises.

When analyzing these phenomena from the perspective of power, researchers focus on issues such as laws imposed by institutions that implement regulations and carry out inspections in order to protect consumers and avoid market imperfections. For instance, the importance of certification bodies and their role in business networks in food markets was investigated by Gandenberger and colleagues [60], who found that they may promote the wide adoption of sustainable production and consumption practices. In turn, when considering the impact of institutions on innovativeness in food markets from the perspective of supply chains, it is important to focus on the efficiency of economic policy tools in stimulating innovativeness in local- and regional-level supply chains or in supporting global diffusion of national agri-food chains [55].

The above considerations suggest that food market innovations are conditioned by factors related to: (1) that market's structure; (2) facets of demand; and (3) institutional impacts. The combination of these market conditions with the two previously identified key perspectives that are specific to that sector (power-centric and supply chain-centric) could provide a conceptual framework for considering innovation in the food sector. The framework is presented in Table 1, built by a conjunction of power-and-flow approaches to structural, demand and institutional conditions of innovations in the food sector.

Table 1. Framework for innovation research in the food sector from the perspective of market conditions and power/flow in supply chain.

	Market Structure	**Demand**	**Institutions**
Power-centric	Focus on use of power and dependence to innovate.	Focus on demand of strong actors as a driver to innovate.	Focus on imposition of rules to avoid imperfections of markets and protect consumers from wrong innovations.
Supply chain-centric	Focus on choice of partners in the supply chain to innovate.	Focus on effective response as a driver to innovate.	Focus on influence on development of innovations through supply chains.

Previous research on food sector innovations points out the relationships between actors involved in innovative efforts. However, looking at relationships through the prism of power means focusing on problems caused by asymmetry between cooperating companies (exerting/succumbing to pressure, operational adaptation and changes imposed

by institutions). Conversely, adopting the supply chain perspective results in focusing on market demand and on the flow of goods and data between chain participants. Considering the assumptions of the interactive/network approach may significantly enhance that perspective. Adopting that approach to relationships between food market players provides an opportunity to go beyond the power-centric perspective and look at them through the prism of interdependencies. In turn, accounting for the fact that many supply chains coexist and may establish collaborative networks has the potential to broaden the supply chain-centric perspective. The consequences of that approach for research into innovation are shown below in this paper.

4. Interactive/Network Approach to the Food Sector Innovations

4.1. Innovations in the Interdependent Business Landscape of the Food Sector

Interaction between market players is a basic term used in describing the business-to-business domain [20]. While it consists in the exchange of products, services, information and money, or social exchange between these players, it also has an impact on the parties involved [61,62]. Therefore, a business interaction is a major multidimensional economic process, which takes place between market players and creates or modifies their physical, financial and human resources.

Business interactions build relationships through mutual adaptation and institutionalization. Enterprises in business relationships are provided with mutual access to important resources, establish closer interpersonal links and act jointly. Hence, a business-to-business relationship is defined as a process where two companies, or other types of organizations, establish strong and extensive social, economic, service and technical links with a view to reduce their total costs and/or add more value and, thus, to deliver reciprocal benefits [63].

Papers dealing with the food market indicate the imbalance of power and the dependency resulting from the coexistence of players with a different scale of operations and a great diversity in organizational culture [64]. Adopting a relational approach changes that perspective because interaction and business relationships are considered to be a mechanism that consolidates interdependencies between operators. The consequence of looking at the business landscape from that angle is the assumption that it is actually rare for an actor to be very weak and fully dependent upon another stronger partner, because usually both actors are interdependent to a certain degree. Power and dependency are not balanced within a relationship which, however, does not mean the weaker (more dependent) player entirely loses its importance. Coping with power and dependence is the feature of business-to-business relationships, and companies can cope with that because they are mutually dependent and are able to actively influence their relationship [65]. Thus, power is exploited in a constructive way rather than coercively [66]. The assumption behind looking at the business landscape of the food sector from this angle is that power and dependency do not preclude cooperation between players, which impacts the approach to open innovations. This approach is consistent with a study by Colurcio and colleagues [7], who found that the imbalance of power may be mitigated by strategic and operational aspects of the relationship, social aspects of supplier's relationships and through the development of information and knowledge. In addition, Petroni [67] suggested that the level of dependence of a supplier on a buyer in the food sector does not stimulate the development of skills and competences needed for innovations.

The shift away from placing emphasis on power and dependence as a driver of food market innovations towards adopting an approach based on interdependencies modifies the power-centric perspective in the analysis of conditions for innovation, as shown in Table 1. If business interactions in the food market are considered as repeatable and multiple, they include more than just the process of exchanging physical goods and money. As the interactions succeed each other, conditions resulting from behaviors and expectations of people involved in these relationships grow in importance. Thus, as a relationship develops, interdependencies grow and relational standards and habits are formed; however, this may also be accompanied by a growing sense of security and mutual trust. Therefore, the authors propose to take a broader

look at the conditions for food market innovation by shifting from the power-centric perspective to the interdependence perspective.

The proposition is shown in the upper row of Table 2. Accordingly, it is proposed that: (1) as regards conditions for innovation resulting from the market structure, the analysis of the use of power should be extended with mutual learning; (2) as regards conditions resulting from low demand, the analysis of interest in actors of low power should be extended with co-creation between market players; and (3) as regards innovation conditions resulting from institutional impacts, the analysis of imposition should be extended with the elicitation of institutions.

Table 2. Framework for innovation research in the food sector from the perspective of market conditions and power/flow in supply chain.

	Market Structure	**Demand**	**Institutions**
From the focus on power to the focus on interdependence	From the focus on use of power to the focus on mutual learning.	From the focus on demand of strong actors to the focus on co-creation with prosumers.	From the focus on imposition to the focus on elicitation.
From the focus on flow in supply chains to the focus on business networks	From the focus on choice of partners to the focus on resource mobilization.	From the focus on effective response to the focus on taking account of consumers' impact.	From the focus on influence to the focus on sensing and shaping in ecosystems.

4.1.1. Mutual Learning

Supplier–buyer communication is embedded in interaction to understand each other's needs [68], reducing uncertainty and fostering relationships [69]. As learning is embedded in innovation-based activities [70], "the transfer of knowledge embedded in products or processes or the transfer of knowledge in a more pure form" [71]. In a dyadic setting, two parties can vary with regard to their knowledge and competencies. If a relationship exists between actors of asymmetric power, asymmetric possession of knowledge can also be assumed [72]. However, even in the case of a strong dependence, the weaker party may learn from successive interactions. A small food supplier will be weaker than a trading network, but meeting the network's logistic requirements provides them with an opportunity to learn new solutions from their larger partner. At the same time, even if unaware of it, a large trading network can use each interaction with a small partner to build experience in working with a small, specialized provider. Gaining tacit and explicit knowledge is another benefit derived from a relationship. While the latter may be acquired, tacit knowledge is transferred within close relationships. However, this requires the actors to develop their capacity to learn and assimilate knowledge from others [73].

4.1.2. Co-Creation

Turning away from a product focus to the collective meeting of customers' needs opens the way for co-creation as the way to develop innovations [74,75]. Strong relationships between the involved actors are important for dialog and knowledge generation between actors coming from different backgrounds [76]. However, as learning does not have to be mutual, cooperation requires joint engagement and collective actions of actors. If companies do not cooperate on innovations, they would need to enhance their innovative capacity by discovering hidden competencies or building a new, key co-creation function [77]. Although co-creation is embedded in relationships, it is not given; it is based on the common platforms, concepts and tools that drive it (e.g., meetings, workshops, prototypes, design probes, exploratory design games or generative tools) [78]. Therefore, co-creation of innovations in the food sector cannot be understood without paying attention to the interrelatedness of actors.

In line with the underlying assumptions of interactive approach [79], innovative activities involve several actors that are related to each other in dyads or in the network. Von Hippel [80] addressed the need for the inclusion of suppliers, customers and consumers. Even a weaker supplier or customer can point to needs and problems and bridge different ideas located apart because of their different perspectives that originated from their different power, role or position in a network [77]. However, if suppliers or customers are too dependent on a powerful actor, they might have limited capacity to break up institutionalized collaborative routines.

4.1.3. Elicitation

In the context of the relational paradigm, the institutional impact on innovations in the food sector may be analyzed by reference to innovation sociology which provides a dual definition of institutions [81]. First, institutions defined as standards create a specific environment where innovation processes will take place between market actors [82,83]. That environment can have both positive and negative impact on interactions by developing standards that affect the establishment and maintenance of relations and by maximizing the efficiency of cooperation on innovations between market players. This is how standards can influence the elicitation of innovative activities in business relationships.

Second, the institutional environment of the food sector is made up of organizations which, while not being directly involved in transactions, have an impact on the functioning of the market and its participants. They are consistent with the concept of national innovation systems, i.e., sets of interconnected institutions and organizations that structure the development, diffusion and use of new technologies, products and processes [84]. Viewed as such, these institutions mostly include regulatory and inspection authorities [85,86]. However, they may also engage in linkages among the government, industry and consumers [87]. The inclusion of political actors as institutions in the food sector is also an important problem [88], for their ability to regulate the market. These issues are rarely discussed in papers dedicated to marketing and relationships [89,90], while the food sector is virtually unaddressed.

4.2. Innovations in Food Sector Networks

The network approach stresses that no player is related exclusively to one supplier or one customer within a single chain. Every company appears to be a node in a network of business relationships that is linked to other nodes [61]. When placing emphasis on the entire body of relationships between an enterprise and actors of its market environment, authors pay attention to the actor's position and role in the network vis-à-vis other actors [65]. This is a clear difference between the network approach and one focused on the supply chain. According to the network approach, each actor of the food sector may participate in different chains and have a different position and role in each of them. This is a way to go beyond the traditionally defined food market and account for an actor's participation in many supply chains [12,91,92]. Therefore, the network approach focuses on how the participants see their position and role in the network of links and on the importance and role of each participant. That aspect of networks in the context of agribusiness/biobusiness was noted by Wiśniewska-Paluszak [93] who pointed out that network members share the same strategic goals in the environmental, economic and social areas. However, typically, they have different strategic goals and by the interactions in the network they make certain adaptations or specific implementations of their strategic goals. Thus, the network approach opens the possibility for looking at the links between direct or potential competitors from another angle. They may compete in some areas of the network and cooperate in others to achieve shared network effects. This is noticeable in the activity of producer groups (farmers' associations) and in what makes them succeed or fail.

Close relationships between business partners, interlinked through value chains in the food market [94], can be considered in a broader network-based perspective. Each supply chain is a component of a business network as its participants are linked to the participants of other chains. The literature emphasizes the strong contribution of research

and scientific actors in such networks [95], as well as the simple need to push the horizon of each chain [96].

The focus on the supply chain obscures opportunities for handling innovation processes beyond food companies [1]. Some authors assume that establishing relationships with partners operating in more technologically advanced sectors (e.g., biotechnology and preservation techniques) than the food sector could be beneficial for innovativeness of food companies [97,98]. This is because the same company has different roles with regard to certain portions of the network. A local producer of food can, at the same time, participate in a global supply chain and learn from multinational companies and be in the position of a leader in a local food production group and transmit knowledge to that part of the network [99,100]. This way, an actor performs a certain role in a single relationship, but they may have different roles in the overall network. Therefore, the authors suggest broadening the supply chain-centric approach to market conditions of innovation in the food sector (in Table 1) by considering business networks. The proposition is shown in Table 2. Accordingly, the authors propose: (1) as regards conditions for innovation resulting from the market structure, the analysis of the choice of partners to innovate should be extended with resource mobilization in networks; (2) as regards conditions for innovation resulting from demand, the analysis of effective response to consumer needs should be extended with consumer impact on network participants; and (3) as regards conditions for innovation resulting from institutional impacts, the analysis should be extended with institutions sensing and shaping in ecosystems.

4.2.1. Resource Mobilization

It is hard to assume that a single company has a resource collection that is needed for development of innovation [101] and bringing it to markets [102]. The network approach gives attention to the significance of required resource mobilization in networks. Thanks to inter-firm relationships, some actors gain the ability to collect relevant resources for innovations, even if those resources are dispersed through business networks [65]. Möller [103] even claimed that, as a part of the innovation process, firms are required to attract and/or influence other actors to acquire and use their resources in aligned and coordinated actions. From such perspective, a business network consists of a constellation of resources owned by different actors, located in different places and accessible in different times. Mobilizing and combining them for the purpose of innovation opens new trajectories for the actors involved. This is reflected in findings from research by Colurcio and colleagues [7], who noted that active networking can be an important driver of innovation for food market SMEs. This is because they can rely on resources of other network participants in a situation where their own internal resources are limited.

4.2.2. Taking Consumer Impact into Account

The diversity of operators and the intensity of links between business network actors is a reason to consider the question whether consumers should be included in business networks. As Röndell [104] explained, the way of thinking of consumers changed in line with the evolution of marketing paradigms. Hence, three phases can be identified. In the first one, consumers were viewed in an economic perspective, as passive users of goods. In the second one, derived from the marketing mix concept, consumers were considered to be reactive buyers. Finally, together with the development of concept originating from the Consumers Culture Theory [105,106], consumers started to be perceived as active participants of the markets. Another look at the role consumers play in the market is related to the service-centered dominant logic [107], which sees the consumer as a "co-producer of service" and considers marketing to be a process of doing things in interaction with customers. Defined as such, consumers interacting with enterprises are active participants in relational exchange and co-production. Viewing the consumer as an active market player (prosumer) resulted in references to the relational approach development by scientists centered around the IMP group [104,106]. The boundaries between B2B and B2C marketing became increasingly blurred [108,109], and the two terms started to be perceived as increas-

ingly similar; this provided grounds for the emergence of the A2A (actor-to-actor) concept, where a major role is played by online platforms and interactions between consumers and enterprises [110–112].

When discussing the role of consumers in business networks, Haugnes [113] noted the existence of shared areas of activity of consumers and business market participants, i.e., raw material suppliers, processors and trading companies. He also emphasized the mutual adjustment of activity between consumers and entrepreneurs. Despite its general nature, his work may provide a basis for an analysis of food markets by the type of actors covered. The presence of consumers in networks was also taken into account by Ricciardi [114], who additionally emphasized the existence of public and consumer organizations. However, the participation of consumers and organizations representative of their interest in business network is a topic that needs to be developed.

4.2.3. Institutions Sensing and Shaping in Food Ecosystems

Analyzing and understanding heterogeneity of actors together with increased connectivity in the food sector needs a wider approach to institutions than only through the prism of their influence on actors or supply chains. Innovation processes that occur through collaboration in networks require a wider perspective that includes diverse actors and stakeholders, their connections to other sectors and technologies. According to Fukuda and Watanabe [115] and to Clarysse [116], they interact in innovation ecosystems comprising actors, technologies and institutions that are focused on innovation-driven goals and act accordingly. Such ecosystems include actors, whose interdependencies are less explicit than between supply chains, in such a way that connections are established between dispersed elements. This puts forward new approaches and practices that support innovations [117]. Considering institutional conditions of innovations in the food sector needs sensing that sector as an ecosystem where every actor innovation effort can be dependent on others' resources and activities and can support others. This approach requires sensing actors' roles and positions and the blurred borders of the ecosystem.

By bridging the gaps between ecosystem members, institutions contribute to forming collaborative nets which are labeled as business ecosystems [118]. Through those nets, firms combine their individual offerings into a coherent, customer-facing solution. Such a perspective can be seen in recent papers on the involvement of public operators in promoting agricultural progress [119–121] and on how regional development is driven by creating innovation in food markets, as discussed by Ferrara [55]. In addition, when reviewing literature on the food sector, Schoen [122] observed that the network perspective was manifested mainly by consideration of innovation brokers that reduced the obstacles for food companies to collaborate with others. From a normative point of view, institutions can support institutionalization of new practices and emergence of patterns for defining problems and creating solutions [123]. This can be done, for instance, by adopting regulations for intellectual property rights, establishing technology transfer offices and public incubators, enabling venture capitalists to grow and granting funds for science-based start-ups [124]. Therefore, it is worth considering normative shaping of the food sector ecosystems and shaping of the role and position of institutions in those ecosystems.

4.3. From Power and Flow-Centric to an Interaction/Network-Based Approach to Innovations

The idea of broadening the view of the food sector landscape by bringing attention to what happens between actors implies changes to the approach to market conditions. Moving from the power-centric view to the interactions-centric view redirects attention from a state of dependency to activities that build or exploit interdependence. Departing from flows in supply chains to interconnectedness of networks redirects focus from actors in networks to dynamics of actions aimed at calling up actors of business networks in the food market. This changes the approach to key market conditions that shape innovations in that field, which is conceptualized in Table 2. It extends the view presented in Table 1 with

the interaction/network approach. The consequences of that approach could be discussed according to the food sector market conditions.

In the case of market structure, extending the idea of use of power by mutual learning allows the assumption that even high dependency and lack of balance in a relationship may be fruitful for both sides thanks to learning. Moving to a network perspective leads to a wider view on resources that can be mobilized in business networks. It is not only knowledge that can be acquired but also products, production facilities, organizational skills in handling particular resource combinations and organizational relationships [125].

In the case of market demand, the proposed change of focus results in shifting attention to consumers as innovation initiators. They can be perceived both as individuals involved in new product development process and as groups discussing diets or health issues and initiating trends. What consumers express as unmet needs or complaints could be beneficial for innovations.

Finally, in the case of institutions, extension of focus from imposition to elicitation of innovations in mutual relationships leads to modification of understanding of the role of institutions. Instead of being a passive creator of norms for an innovative environment in the food sector, institutions could become actors that support efforts of business players, especially their mutual learning and co-creation with consumers. Similarly, taking the network perspective, institutions could tend to sense the business network and define their positions, expected outcomes and networking activities [65]. Institutions, by their normative role, could consider shaping the food ecosystem to make it more innovative. The network perspective assumes that actors' expectations of effects of joint actions in a network, expectations of coordinated development and features of network created jointly are understood and considered institutional.

Considering innovations in the food sector from the proposed perspective requires paying attention to the interactivity of actors in innovative ecosystems. Interactivity is two-dimensional; it consists of the capacity to interact and the propensity to interact [61]. Interactivity is an individual feature of every participant of a network that turns out to be significant whenever an actor is going to relate to another actor. Therefore, it is needed for mutual learning, co-creating, elicitation, resource mobilization, making use of consumers' impact and shaping ecosystems. Moreover, interactivity is also a network feature created collectively by actors that see opportunities for interaction with others. Therefore, it is not only the role of individual actors to develop their interactivity to use it for innovations, it is also the role of institutions to shape network interactivity for innovations.

5. Conclusions

The objective of this paper is to enhance the dominant research perspective of innovations in the food market with an interactive/network approach. This paper points out two mainstreams in research on external factors of innovations in the food sector: a power-centric approach and a supply chain-centric approach. Taking that view on food market innovations, some key aspects in the usual research logic can be seen: an innovative initiative is usually linked to power in a business relationship or a supply chain, while sourcing of innovations is limited to internal activities or cooperation within the supply chain. Such approach leads to placing focus on business positions and roles of actors. While agreeing with this approach, the authors propose to extend it by changing those dominant perspectives, shifting from power to interdependence and from flow in supply chains to connections in business networks. It delivers a more colorful picture for innovations in the food sector, provides some conclusions about activities and actors and gives opportunities for further research.

First, the proposed change in perceptions towards external drivers of innovation in the food market enables another approach to the actors' activities. Mutual learning, co-creation, elicitation, resource mobilization, considering consumer's impact and sensing and shaping ecosystems are based on the understanding of interdependencies. This requires accounting for the links between different actors' innovative activities which can be performed and

delivering outcomes depending on other activities. In this context, the coordination of activities can drive improved performance and better innovative outcomes while also resulting in greater dependence [65]. As a consequence, it enables activity linking and coordination across boundaries of companies. This conclusion is compatible with Rahimina and Molavi's [2] suggestion that food companies should effectively manage their business relationships to develop innovations.

Second, in the innovation creation process, measures focused on a more efficient use of resources in a business network should be even more important than the selection itself of partners. When Bigliardi and Galati [1] analyzed several models of adoption of open innovation in the food sector, they found that the importance of cooperation with suppliers, universities and research labs is pointed out in all models, while consumers, customers (retailers or food companies), competitors, innovation intermediaries, companies operating in other sectors and other actors are much less covered. The extended approach to food sector innovations could result in considering these actors, even though they have less power and are often ignored in today's innovation models. Nevertheless, they can considerably contribute to the innovative potential, e.g., with their specific knowledge or unique links with other operators. That approach is also true for the changing perception of consumers and their role in networks. They can provide valuable inspiration to generate innovations, and therefore it becomes reasonable to count them among network actors. This provides a basis for the evolution of the role of consumer organizations, which can increasingly go beyond protecting consumer interest, focusing their efforts on creating consumer value.

Hence, the proposed approach extends the perspective of thinking of food market innovations; thus far, their sources have been mostly sought on the demand side of the market (among powerful actors). Such an approach can result in a failure to fully use the total potential for innovativeness which exists in the networks operating in the food sector (as argued by Waluszewski [126]) or in the real estate sector [127]. The authors believe that particular emphasis needs to be placed on the role of institutions that mainly establish standards or act as inspection authorities in food markets. Undoubtedly, these are extremely important roles. However, based on the network approach, institutions (defined as operators) can be considered an intrinsic component of the market network, which participates in networks of relationships with other players where it may act as an innovation initiator. In combination with institutions defined as standards and principles, it becomes a component of a specific ecosystem where innovation generation and adoption processes will take place.

Concluding, the contribution of this paper is twofold. By taking another perspective on relationships in the food market, it proposes a conceptualization of conditions for innovations on that market by focusing on interdependence in relationships and networks. That approach extends the works of several other authors who have already found evidence that the approach to the food sector innovations is increasingly open to relationships and networks, as necessary to develop successful food innovations (e.g., [128]). It shows the complexity of conditions that influence innovations by focusing on the actors' activities and roles in business relationships and networks. This conceptual proposal also leads to some implications for further research that could develop the understanding of the food sector innovations by adopting an interactive and network perspective. The following sections present several suggestions for further research avenues.

Theme 1. *For further research: what drives innovation in food ecosystems?*

The nature of network relationships between food market actors is determined by the permanent diversification of food markets visible at different levels, i.e., at sectoral (large number of strongly heterogeneous sub-markets), subjective (asymmetry of market power) and objective (heterogeneity of food products) levels. In such a relationship constellation, strength-based and interdependence-based concepts interfere with each other. Thus, the key questions should relate to the conditions that must be met to enable the creation of

innovative processes, which might take place at the actor and network levels. These issues are particularly important for the food sector, which is considered less innovative than others [129]. Note that the nature of innovations in the food sector is partly determined by the biological nature of production processes that often cannot be accelerated. The role of institutions in creating and stimulating conditions that enable innovation-oriented collaboration within a network should be considered in this context. However, in the network-based approach to innovation, no dominant entity exists that would be capable of imposing its solutions to the network. In this understanding of networks, who has the potential to stimulate innovations within the food sector network? What determines the involvement of actors in the innovation process? Who shapes and coordinates the efforts to innovate when the perspective of interdependences is introduced and how? In other words, under what conditions is it possible for entities of different power to cooperate on innovations?

Theme 2. *What are the tradeoffs between the power-centric and interdependence-based approaches to innovations?*

An important step enabling a better understanding of agri-food innovations would be to compare innovation outcomes seen from a power-centric perspective and an interdependence perspective. This issue involves not only the types of innovations [130], but also the strategic consequences or outcomes that have an impact on the firm, network or industry. Do the adopted perspectives of power or interdependence determine the understanding of nature and success of the innovation developed?

Rather than denying the power-centric approach, viewing innovations through the lens of interdependence means giving wider attention to both sides of the relationship. Meanwhile, external conditions, unpredictable aspects and events (e.g., natural disasters, severe weather or pandemics) can result in a situation where a strong entity is more efficient in leading the search for innovation. Therefore, an interesting problem will be to tell when the perspective of interdependence becomes more effective for understanding the process and outcome of innovation. Another interesting aspect seems to be the dynamics of and long-term perspective on cooperation networks and innovative processes. Will a dominant entity emerge (from the outside or within the network) in the long run that will ultimately impose innovation? How will this affect the outcome of innovations?

Theme 3. *For further research: how do network-born innovations develop in the food sector?*

If business networks link resources and activities of various actors, do they create a specific environment for innovative companies which can be established and developed exclusively in or because of networks? Taking such environment into consideration leads to undertaking research on actors that are able to develop new business models in the food sector by learning, co-creation and mobilization of resources. They would probably need other actors (e.g., intermediators) to play the role of network activity facilitators or resource integrators [15]. Analogies for further research on such innovations in the food sector can be derived from sharing economy platforms or collaborative consumption patterns. In addition, the identification and description of impacts of such network-based models on food producers' sustainability and collaboration with consumers is a source of interesting topics for further research [131].

Theme 4. *For further research: how do actors handle innovation in their business models?*

Following Timmers [132], business models can be viewed as an architecture of product and information flows, including a description of various business actors and their roles. Hence, further research could consider the inclusion of mutual learning, co-creation and institutional support in innovative processes of the food sector [5]. This could also be considered in line with the network approach to understand how actors cope in their

business models with resource mobilization, taking into account the consumer impact and institutions' sensing and shaping in food ecosystems. Dealing with interdependency in business relationships and networks should be reflected in business models adopted by the food sector actors that must handle collaboration and conflicts in their innovation efforts.

Theme 5. *For further research: what is the impact of innovations on the food sector?*

Thanks to the network approach, the impact of innovation on the food sector can be considered from a different perspective. For instance, it is possible to analyze the role of external actors (market operators active in non-food sectors) that differ in experience, resources and capacity. Having a broad view, they can combine network resources and use them differently than the food sector/chain traditionally does. In this respect, it can be examined whether and to what extent actors from other sectors are present in innovation processes in food markets, and how they can be most effectively incorporated into the network, having in mind the differences arising from sectoral characteristics.

Proposing the enhanced approach to food market innovations, the authors are aware of its methodological limitations. Indeed, a research project underpinned by the relational paradigm provides some methodological implications. Interactions are emergent and contextual, and interpretation is an important process related to them. This is because the collaborating parties must not necessarily understand and assess their interactions in the same way [133]. This requires research efforts to be based on a dyadic or broader framework (with many network actors). In addition, materials need to be collected to enable an exact understanding of the context of interactions that drive innovation. The assessment of activity links (which are intangible) and their type and strength is crucial for a research framework, but they might be difficult to identify.

Using the network perspective involves the difficulty in defining network boundaries. From the institutional point of view, they are defined by the network's social commitment to collaborate with its members and the actual or potential resource contribution. The size of the food network is difficult to determine, as there are no strict criteria for an inactive membership. Both active and inactive members can belong to different and overlapping networks unless a conflict of personal or economic interest exists between them. Food networks can include inactive members, which at the same time are inactive or active members of other networks. Researchers of food markets need to accept that, while these issues are discussed in the literature, no satisfactory results have been delivered yet that could form a consistent methodology [134].

Author Contributions: Conceptualization, M.G., G.L. and M.Z.; formal analysis, M.G., G.L. and M.Z.; investigation, M.G., G.L. and M.Z.; writing—original draft preparation, M.G., G.L. and M.Z.; writing—review and editing, M.G., G.L. and M.Z.; visualization, M.G., G.L. and M.Z.; and supervision, M.G., G.L. and M.Z. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

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