



Article

Producers' and Consumers' Perception of the Sustainability of Short Food Supply Chains: The Case of Parmigiano Reggiano PDO

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Abstract: Recent literature has highlighted the importance of testing the sustainability performances of supply chains. Nevertheless, this field of research is still in its early stages, in particular with reference to short food supply chains (SFSCs). This research analyzed producers' and consumers' perception of the economic, social and environmental sustainability of two SFSCs of a specific quality of cheese (Parmigiano Reggiano PDO) placed in two different contexts: the first is a rural area in the Appennino Tosco-Emiliano National Park mountains and the second is a peri-urban area in Parma surroundings, both in Italy. The case study also analyzed the carbon emissions of shopping for Parmigiano Reggiano at dairy shops. Qualitative and quantitative methodologies were employed to achieve the aims of the present study. For producers in both areas, the SFSC is a successful strategy to sell a part of their output in their own outlets, gain reputation, reduce costs and at the same time increase their levels of self-esteem. Product quality is the biggest factor attracting consumers to the outlet; moreover, it is associated with trust in the producers and the idea of combining "leisure with pleasure". However, the environmental impact of the consumers' purchase activities is a drawback.

Keywords: short food supply chain; sustainability; rural areas; peri-urban areas; Parmigiano Reggiano PDO

1. Introduction

Over recent decades, the global food system has been perceived as increasingly unsustainable [1,2] and responsible for extensive food waste, food insecurity, environmental damage, and unfair distribution of the added value between supply chain members [3]. As a reaction to globalization, several models of local agri-food production have been developed [4] with the aim to move agriculture and consumption towards higher levels of sustainability [5]. The concept of sustainability is broad, and goes back to the Brundtland Report [6]; however, it is generally accepted that sustainable development requires a convergence between the three pillars of economic development, social equity and environmental protection [7].

One model of local agri-food production that is gaining consumer support is the SFSC, which can be defined as a "supply chain involving a limited number of economic operators, committed to co-operation, local economic development, and close geographical and social relations between producers, processors and consumers" [8] (p. 5). Recent literature has highlighted the importance

of testing the sustainability performance of supply chains [9] by measuring their impact on the environment and the social system [10]. Nevertheless, this field of research is still at an early stage, in particular with reference to alternative food chains, such as SFSCs. This research contributes to filling this gap by analysing the role of two SFSCs of a specific quality food product in the environmental, socio and economic sustainability of two areas in Italy. The first is a rural area in the Appennino Tosco-Emiliano National Park mountains and the second is a peri-urban area surrounding the city of Parma. This aim was pursued by investigating consumer and producer perception of the two SFSCs and measuring the environmental impact of the purchase activity of consumers in the SFSCs. The product examined is Parmigiano Reggiano PDO cheese, one of the most representative PDO products in the longstanding Italian gastronomic tradition, marketed in both domestic and EU markets, as well as worldwide. In Italy, the value of the geographical indication (GI) system is distributed throughout the territory, although it is more concentrated in the North-East and North-West areas, with 20% of the Italian provinces accounting for more than 80% of the total economic value. In particular, the three provinces with the highest economic value (Parma, Reggio Emilia and Modena) are all located in the heart of the Emilia-Romagna region. This region, with a total 45 PDO and PGI products, is the most important in terms of economic turnover generated. Parmigiano Reggiano PDO (for which exports account for almost 40% of the total value of sales), Prosciutto di Parma PDO, Aceto Balsamico di Modena PGI and Mortadella di Bologna PGI are four of the ten PDO and PGI products produced in the Emilia Romagna region with the highest economic value.

To the best of our knowledge, this research is the first attempt to investigate the role played by two SFSCs of the same product in the sustainability of two different contexts (i.e. rural area and peri-urban area).

The main questions addressed through this case study are:

- In terms of economic sustainability, to what extent are SFSCs food prices perceived as fair by producers and consumers? How are SFSCs perceived as contributing to local economic development?
- In terms of social sustainability, how do producers and consumers view SFSCs contribution to local community building?
- In terms of environmental sustainability, what is the level of carbon emission from Parmigiano Reggiano PDO's purchase activities?

The paper is structured as follows: Section 2 reviews literature concerning SFSCs impact on social, economic and environmental sustainability. Section 3 defines the materials and methods. Section 4 presents a case study providing results on producer and consumer perception of the two SFSCs and an estimate of the level of carbon emission due to Parmigiano Reggiano PDO's purchase activities. Section 5 includes the discussion and conclusion.

2. Literature Review

SFSCs have been widely investigated. Early conceptualizations go back to Marsden et al. [11] and Renting et al. [12] who identified three main types of SFSCs according to the characteristics of producer-consumer relations in time and space: "face to face", "proximate" and "spatially extended". Other classification criteria can be the number of intermediaries [13] or the individual/collective character of the supply-chain [14,15]. More recently, the concept of proximity has been referred to, with regard to organizational aspects, as well as geographical closeness [5,16].

The earliest studies focused on the socio-economic and political sustainability of SFSCs. These supply chains are studied as a response to the inequalities of the agri-food system [17,18]. Consumers are willing to pay a premium price to support local development paths [19,20]. SFSCs are seen as a "catalyst for rural economic regeneration and dynamism" [18] (p. 364) and a tool for creating new economic spaces [12,21,22]. They increase the share of local financial flows, hence amplifying the multiplier effect of the expenditure of other economic activities on agriculture within the territory [23,24].

Social sustainability is included to the extent that SFSCs are considered as a form of alternative market to correct the effects of social exclusion and marginalization produced by capitalism [25–29] by reversing the decline of rural services and depletion in food and farming physical infrastructure [30]. Reducing the number of intermediaries and enhancing local production and consumption seem to be valuable levers for rural development, cultural keeping, generational renewal in rural areas and the improvement of consumer wellbeing [12,23,31–34]. Indeed, local agri-food production systems are also thought to be socially beneficial for keeping rural communities in rural areas, providing new job opportunities for young people, and helping to create relationships between the city and the countryside [34,35]. SFSCs are also considered as an expression of territorial governance. Brunori et al. [36] state that SFSCs are a strategy of spatial, cultural, social and economic reconnection between production and consumption, enabled through the development of synergies between agriculture and other sectors at the local level. From this perspective, SFSCs are an instrument for re-forging links between territorial partners, as well as a marketing channel [37,38]. More recently, another line of research investigated the impact of SFSCs on human health [39,40] and revealed that consumers may benefit from SFSCs insofar as they increase access to healthier food options.

While the effect of SFSCs in supporting marginalized rural areas has been under investigation for several years, recent research has focused on the role of SFSCs in urban and peri-urban areas. SFSCs can act as engines for territorial development in these areas [5,41–43], reflecting recent developments in post-modern consumers, who increasingly look for food quality and traceability [44,45]. The main reasons for consumers buying from local producers include: greater product variety, higher food safety and easier traceability, better taste and freshness, less packaging concealing the product, environmental concerns [46] and face-to-face relationships between consumers and producers [47].

Interestingly, it has been noted that regions are frequently characterized as “marginal” or “industrial” with relation to food production [43]. Regions considered marginal to the productivist agricultural regime have been considered the stronghold for Local Food Systems [43]. This dualistic view, however, fails to consider how complex and spatially contingent local food production systems can be. For instance, the characteristics of a SFSC are closely related to the product and SFSC quality and sustainability level perceived by consumers [48]. An inclusive view of how socially constructed criteria are coordinated in processes of food quality assessment by the consumer is offered by convention theory [49–53].

More recently, SFSCs have been analyzed in relation to their environmental effects. Consumer choice impacts the environment and contributes to accelerating, decelerating or reverting global warming and the production of CO₂ and other greenhouse gases. The assumption that local food production and distribution are beneficial for the environment meets with an objection in the logistical efficiency of SFSCs. In this respect, the contribution of SFSCs to saving non-renewable resources and mitigating climate change has been questioned by several authors [18,54–57].

The increase in the distance between the place of food production and food consumption, due to ever more globalized diets and food supply chains, has spurred several initiatives to shorten the supply chain, aiming to reduce energy consumption and improve the environmental performance of the food distribution systems. For instance, in 2012, the French government introduced a specific environmental plan supporting food production relocation projects in order to reduce food miles and consumer journeys when grocery shopping [58,59]. However, the benefits of this approach are not completely confirmed by researchers. Local food sales, in fact, entail many small vehicles transporting low volumes of food with an unfavorable ratio fuel used-volume transported, i.e. a low level of energy efficiency [59]. On the other hand, some researches argue that the shorter the food supply chain, the lower the environmental impact by food packaging and transportation [54,60–62]. For some authors, reducing the transportation distance and the number of intermediaries are key drivers for improving the environmental performance of food distribution [59,63–65]. In other studies, findings point to positive relationships between food concentration in production and logistics, and environmental efficiency per unit of product [2,66–68]. There is no consensus on the environmental impact of local

agri-food chains and, specifically, of SFSCs. This could partly be because different methodologies have been used in research, which makes comparisons difficult [59].

3. Materials and Methods

Both qualitative and quantitative methodologies were used in the present study, which is exploratory in nature. Both types of methodology have strengths and weaknesses, but combining them makes it possible to achieve deeper insights and more satisfactory interpretation of results. The case and the participants were selected following the criteria agreed in the framework of the EU project Strength2Food concerning qualitative and quantitative data collection. As a part of the work on SFSCs in the realm of the Strength2Food project, Consortium partners agreed to study models of SFSCs differing in the number of intermediaries (e.g., firm/farm shops; box schemes or cooperative shops) and type of product (i.e., meat, dairy, vegetable products). The Strength2Food project aimed to employ both qualitative and quantitative research to investigate the sustainability of SFSCs, as well as capturing specific issues such as, for example, being located in a remote, less-favored area. The case studied here focuses on dairies that sell Parmigiano Reggiano PDO cheese at their dairy shops. In one case, the dairy is organized as a cooperative, processing the milk supplied by members, and is located in a remote mountain area more than 50 km from the main city (Reggio Emilia). In three cases, the dairy shops sell Parmigiano Reggiano PDO cheese obtained from milk produced in farms belonging to the owner of the dairy and are located in the Parma surroundings, on average, 15 km from the city.

In the first dairy shop, attached to the dairy cooperative “Latteria Sociale Garfagnolo”, a qualitative analysis was more appropriate to gain insights into the drivers, motivations, opportunities and barriers that enhance SFSCs in particularly marginalized areas. The respondents in the qualitative semi-structured interviews were selected on the basis of their roles as either producers (five dairy farmers members of the cooperative “Latteria Sociale Garfagnolo”), managers (the President of the “Latteria Sociale Garfagnolo”) and consumers (five consumers/customers of the store) (Table 1). The qualitative interviews of the farmers and manager of the “Latteria Sociale Garfagnolo” were conducted by the same interviewer, assisted in some cases by one or more assistants, on the farm premises. The interviews lasted between 1 h–1 h and 30 min. The farmers interviewed operate small and medium-sized companies cultivating 40 ha (Farmer #1) to 100 ha (Farmer #3), including both owned and rented land. One of the farmers grazes cows in the pastures during the spring and summer months (Farmer #4). The number of milking cows ranges between 30 (Farmer #1) and 100 (Farmer #3) per farm. The President of the cooperative was interviewed as manager of the dairy shop. He is also one of the farmers producing milk to be processed in the dairy cooperative and his farm is one of the largest among those delivering milk to the cooperative. He has been the President of the cooperative since 2014. The interview lasted about 1 h. The qualitative interviews with consumers were conducted by two different interviewers in the cooperative dairy shop (consumers #1, #2, and #3) or in the home of the consumers (consumers #4 and #5). Interviews lasted between 30 min–1 h. The qualitative interviews were recorded in all cases and key sections were transcribed. No payment was made to the interviewees but in some cases a bottle of wine was given to those who consented to the interview in the cooperative dairy shop.

Table 1. Case study “Latteria sociale Garfagnolo”, interviewees.

Producers (Farmers)	Manager	Consumers
Farmer #1, male, age 48	President of the “Latteria sociale Garfagnolo”, male, age 44.	Consumer #1, male, age 65
Farmer #2, male, age 56		Consumer #2, female, age 68
Farmer #3, male, age 44		Consumer #3, male, age 79
Farmer #4, male, age 60		Consumer #4, female, age 25
Farmer #5, male, age 48		Consumer #5, female, age 42

Source: Authors’ elaboration.

The quantitative data collection was carried out at three dairy shops located in a peri-urban area of Parma. The customer survey established who customers are, why they buy from SFSCs, how far they have travelled, what type of products and how much they purchase. This information is used in the calculation of environmental indicators (food miles, carbon footprint), and in the analysis of perceptions and motivations. Responses from 62 customers were collected on a hard copy questionnaire on different weekdays (Monday, Thursday, Friday and Saturday) over the period November 2017–January 2018, enlisting the help of a large number of trained interviewers. Interviews were carried out by means of hard copy questionnaires to collect respondents' answers and then uploaded into Qualtrics to provide a standard digital version of the survey data. The digital data were analyzed with descriptive statistics and non-parametric tests to highlight whether the answers to the questions in Tables 2 and 3 exhibit a systematic relationship with the socio-demographic data of the sample (i.e., gender and age, distribution of educational achievements, household types, and net monthly income ranges). For example, one question explored the motivations for shopping for Parmigiano Reggiano PDO cheese at the dairy shop, compared to purchasing it at a typical grocery store, quantifying to what extent customers agreed with each of the statements providing a ranking on a Likert scale with scores ranging from 1 ("fully disagree") to 5 ("fully agree") (Table 2). Another question enquired whether the motivations for shopping at the dairy shop are related inter alia to issues of trust, convenience, and perception of quality, using a similar Likert scale (Table 3).

Table 2. Comparing shopping at the dairy shop and at a typical grocery store.

To What Extent Do You Agree with the Following Statements (From 1 "I Fully Disagree" to 5 "I Fully Agree"): "Compared to a Typical Grocery Store . . . :	1	2	3	4	5	No Opinion
Here I get products which are fresher	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Here I get products which are better for my health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Here I do not find as good a selection of products that I look for as in a typical grocery store	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Here I get more value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I find shopping here to be more environmentally friendly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I find shopping here more pleasant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Here I get more information about the food products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Here I get unique food products that I cannot buy in a typical grocery store	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I only do some supplementary shopping here compared to what I buy in a typical grocery store	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Source: Authors' elaboration.

Table 3. Reasons for shopping at the dairy shop.

To What Extent You Agree with the Following Statements (From 1 "I Fully Disagree" to 5 "I Fully Agree"): "I Shop Here Because . . .	1	2	3	4	5	No Opinion
It is convenient for me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
This business is innovative and creative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I trust this outlet/shop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I wish to support environmentally friendly food production	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
This outlet/shop has a good reputation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I wish to support local producers (e.g., farmers/fishers)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It offers high quality products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is less expensive for me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Here I get traditional food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Source: Authors' elaboration.

Because of the limited number of customer responses available, quantitative analyses were carried out employing non-parametric tests, parsimonious on the data, although this could have hindered the ability of the tests to correctly identify statistically significant relationships. Non-parametric tests are less powerful than the corresponding parametric ones, but appear more appropriate to handle variables collected on ordinary scales [69]. In fact, the answers to the questions presented in Tables 2 and 3 are interpreted as being measured on ordinary scales, where the differences between successive rungs are not necessarily the same.

Likewise, the socio-demographic variables for the age groups, education levels and net monthly income ranges are interpreted as ordinal, while the variable for gender is treated as a dummy and the variable for household types is considered as a multinomial one. The rationale for performing the non-parametric analyses of the variability of the responses in Tables 2 and 3 with respect to the socio-demographic characteristics of the sample interviewed is based on interest in identifying which socio-demographic characteristics of the customers might be targeted by individual dairies wishing to establish or develop further their dairy shop operations. The analyses might also further corroborate the governance actions of the Parmigiano Reggiano PDO Consortium, which aim at promoting SFSCs based on dairy shops as viable marketing options for all its member dairies. The sustainability of the SFSC model of retailing Parmigiano Reggiano PDO in dairy shops appears to rely heavily on the engagement of customers with the model. In turn, and compared to the model of shopping at a typical grocery store, it may depend on customer willingness to pay a higher price for the product, customer capacity to recognize that the product purchased may be of higher quality and that the price premium pays for the higher quality, customer trust in the shop as well as customer time resources for a “slower” and dedicated shopping experience. It is likely that these motivations are linked to customer (household) income, education and gender, age and family composition.

In line with our research methodology, each of the (ordinal) levels of agreement with the items listed in Tables 2 and 3 is evaluated with respect to the gender variable using the Goodman and Kruskal γ [70]. The Goodman and Kruskal γ measures the number of concordant and discordant pairs of observations of two ordinal variables, returning a value similar to the correlation coefficient for quantitative continuous variables. Despite considering the variable for gender a dummy in nature, the actual quantitative analysis considers it an ordinal variable. The relationship between the (ordinal) levels of agreement with the items listed in Tables 2 and 3 and the ordinal variables for age groups, highest education levels completed and household net income ranges is analyzed using the Kendall τ_b to take into account the possibility of ties [70]. Lastly, the relationship with the multinomial variable for household types is evaluated using the Kruskal-Wallis test for the hypothesis that several samples are from the same population [71]. Note that the evidence of these quantitative analyses needs to be interpreted with care and results interpreted as suggestions, because of two factors. On the one hand, the limited number of interviews meant that a more thorough and sound multivariate analysis, or a fully-fledged regression, could not be implemented. The results presented here may highlight spurious relations or may be affected by unidentified confounding factors. On the other hand, the peculiar features of the data we have worked with required us to resort to non-parametric bi-variate analyses, which may be less powerful than parametric ones in detecting the existence of significant relationships.

The third issue under analysis was the carbon emissions of shopping for Parmigiano Reggiano at the dairy shops. This was measured using the information collected on the consumers' itinerary and the quantity and type of food items bought in the three dairy shops located in the Parma peri-urban area. The estimated carbon emissions reflect the energy required for travelling to and from the dairy shop. The approach was based on the information provided on the food basket and the trip modes retrieved from dairy shop customers during the quantitative interviews. The questionnaire supplied information about:

- the quantity and typology of foods bought in dairy shops;
- the type of vehicle used for transportation: car, bus, train, bikes, walking;
- for cars: type of car (small, medium, large), fuel (petrol, diesel, LPG, CNG, hybrid, electric);

- the distance travelled and the starting point (from home, work);
- the round trip: number of stops expected during the trip.

The calculation of the carbon footprint of the travel to purchase Parmigiano Reggiano in dairy shops took into account the type of vehicle used for travelling, the distance covered by the customers from the origin (starting point or vehicle departure) to the dairy shop (arrival), the number of stops planned in the journey and the weight of the food bought in the dairy shop. Hence, the carbon footprint of the Parmigiano Reggiano purchase activity was derived as follows:

$$CF_s = \frac{\sum_{n=1}^N \sum_{f=1}^F (K_{snf} T_{sn} B_{sn} EF_f)}{PR_s} \forall s, \quad (1)$$

where:

CF_s is the carbon footprint per kg of Parmigiano Reggiano purchase activity for each dairy shop s (for $s = 1, 2, 3$);

K_{snf} is the number of km travelled by each customer n (for $n = 1, 2, \dots, N$) to each dairy shop and for each type of fuel powering the vehicle f (for $f = 1, 2, \dots, 5$);

T_{sn} is the reciprocal of the number of stops during travel (the parameter is equal to 1 if the customer planned a single stop at the dairy shop);

B_{sn} is the share of Parmigiano Reggiano in the total volume of food purchased at the dairy shop;

EF_f is the emission factor (gCO₂eq/km) per type of vehicle.

The emission factors used in this study were extrapolated from the database of the average emission factors of vehicles in Italy developed by ISPRA [72]. We selected the passenger car category and the related emission factors for the three main greenhouse gases (GHGs), CO₂, CH₄ and N₂O in relation to the type of fuel. GHG emission factors were then converted into CO₂e using the Global Warming Potential coefficients provided by the IPCC Fifth Assessment Report [73]. Table 4 shows the emission factors used in this analysis.

Table 4. Emission Factors for Italian Passenger Car Transportation.

Type of Fuel	Emission Factors (g/km)			
	CO ₂	CH ₄	N ₂ O	CO ₂ e
Petrol	183.91	0.0240	0.0057	186.05
Diesel	171.57	0.0004	0.2530	236.34
Petrol hybrid	130.84	0.0177	0.0009	131.56
LPG bifuel	182.72	0.0232	0.0044	184.51
CNG bifuel	180.26	0.0603	0.0025	182.58
Global Warming Potential (100 years)	1	28	256	

Source: Authors' elaboration on ISPRA (2016) [72] and IPCC (2014) [73].

4. Results

4.1. The Rural Area Perspective: the Appennino Tosco-Emiliano National Park Dairy Shop

4.1.1. The "Latteria Sociale Garfagnolo"

The co-operative "Latteria Sociale Garfagnolo", founded in 1947, is one of the oldest dairy firms producing Parmigiano Reggiano PDO in the Appennino Tosco-Emiliano National Park mountains. Thanks to its features and ongoing relationship between man and nature, the Park was designated a Man and Biosphere Reserve by the United Nations Educational, Scientific, and Cultural Organization

(UNESCO) in 2015. The agricultural and food sector is historically important for the territory of the Appennino Tosco-Emiliano National Park not only because it produces traditional food products, but also because it protects the territory, and favors the replication and sustainability of natural, anthropic and socio-economic resources. Permanent meadows and pastures also occupy a significant role in agriculture, due in large part to the renewed interest in high quality, especially in dairy cattle breeding for production of Parmigiano Reggiano PDO. However, the entire territory of the Appennino Tosco-Emiliano National Park has experienced widespread decline in the number of farms and a steady and slow increase in average farm size [74]. This consolidation process has been underway for some decades, together with a progressive decrease in the Utilised Agricultural Area (UAA). The demise of the less competitive farms and dairies from areas of the Appennino Tosco-Emiliano National Park and from similar challenging areas threatens the economic, environmental and social sustainability of the production, the product and the territory. In this rural context, the dairy co-operative “Latteria Sociale Garfagnolo” is now producing roughly 10,000 wheels of Parmigiano Reggiano PDO every year. Today, 23 dairy farms are members of the co-operative and produce the milk needed for cheese production. This is a group of small-scale local farms, which differ according to the number of cows: some of them have only a handful of dairy cows. The Parmigiano Reggiano PDO cheese produced by the dairy co-operative “Latteria Sociale Garfagnolo” is sold using the Parmigiano Reggiano PDO Consortium brand, the brand “Mountain Product” (see Regulation (EU) No 1151/2012, supplemented by the Delegated Act (EU) No 665/2014.), and the logo of the Appennino Tosco-Emiliano National Park. The co-operative currently sells around 20% of the production (around 2000 out of approximately 10,000 wheels) through the dairy shop.

4.1.2. Producers’ Perception

The co-operative shop was established with the dairy in the 1960s, a period of industrial development, to meet the demand for Parmigiano Reggiano PDO of people living in the area. The share of annual production sold through the co-operative shop has grown rapidly over the years. Although the main advantage is the possibility of selling the product at a higher price than through other channels, obtaining a higher profit margin, it also gives producers greater personal satisfaction in interacting with and forming a relationship with the consumer: *“In terms of profitability, direct sales give us the possibility to earn more money than the wholesaler [. . .] We hope to increase the sales [. . .] It gives an extra monetary value, but also a greater satisfaction to us, because the product is appreciated. It is an opportunity to make yourself known and make the product known”*, Farmer #1.

According to the producers, the quality of raw materials and the final product is a feature that makes the Parmigiano Reggiano PDO produced by the dairy co-operative and sold in the dairy shop different from other Parmigiano Reggiano PDO cheese: *“In the mountains we still have traditional stables and feed”*, Farmer #5. *“Our product is differentiated for animal welfare. The fodder consists of fresh grass and the breed of cows . . . in fact, many say that the milk from the Bruna breed is qualitatively better than other breeds. They certainly produce less milk but of better quality”*, Farmer #4. *“The product is certainly of high quality, genuine and without added preservatives. As a dairy we improved a lot on the quality of the milk, and the quality of the cheese; in fact, of the last 3087 wheels only 35 were downgraded”*, Farmer #1.

Moreover, the dairy shop allows the producers to establish a direct relationship of trust with the customer who can be directly informed about the characteristics of the farms and the product obtained by the processing of the milk produced by the co-operative members: *“The short supply chain gives more visibility and recognition to the company, there is a whole discourse of food traceability and quality of the product that we can transmit to consumers”*—Farmer #1. The practice of grazing cattle in pastures, followed by three members of the dairy cooperative, is considered by the farmers as a further added value. It is perhaps not appropriately promoted, as the farmer grazing cattle in pastures suggested the idea of producing a Parmigiano Reggiano PDO cheese made only with grazing milk, to be differentiated on the marketplace and command a higher price: *“It is a characteristic that should be exploited for example by producing cheese with only grazing milk. Transportation would not be a problem because we bought a*

truck with 4 compartments: one would be dedicated to grazing milk and the rest to others. I do not know why there is no desire to do this by other members, perhaps because many are elderly, and it is hard to change methods”, Farmer #4. One of the limits to the development of the SFSC is communication, but today the products and activities of the “Latteria Sociale Garfagnolo” could be promoted through social media networks: “Until now, we didn’t have the possibility to have feedback of customers, for example with comments, or likes”—Manager.

The economic aspects are important factors in the evaluation of the SFSC. The farmers are aware that increasing the sales of the cheese with direct sales of the dairy shop allows the co-operative to increase the average price paid to the farmers. This is particularly true when the market prices decrease and the competition becomes severe: “We have to try to increase sales at the store, because the real advantage is the difference of our store price, and the price paid by the wholesalers. Now the gap is very narrow, because we sell the fresh portioned cheese at 11.50 €/kg, while the wholesalers pay 10 €/kg; the problem is when market prices collapse. With all the competition that is created between the various supermarket chains, the offers on cheese increase, but this mechanism creates confusion among consumers, who no longer know what basis a product is valued”, Manager. Therefore, the co-operative is searching for new opportunities, using its website among other tools, to increase direct sales: “Last year we bought a van to distribute the product to a network of contacts we have in other regions like Tuscany and Liguria. We distribute the product to restaurants and solidarity purchasing groups (GAS) contacting us by internet”—Manager. However, the maturation room of the co-operative “Latteria Sociale Garfagnolo” was built when production was significantly lower, so for reasons of space the co-operative is often forced to sell as much as possible to the wholesalers, even at a lower price. This is a clear logistic disadvantage. The enlargement of the warehouse is in fact one of the most frequently mentioned points by the members: “The maturation room with a capacity of 12,000 wheels was suitable for production a few years ago; now we want to season the cheese sold by the dairy shop and this requires more space”, Manager.

The location of the farms in a mountainous territory has not only positive consequences (e.g., particular aromas in milk and cheese thanks to grazing), but also negative outcomes, such as higher production costs due to difficulties in farming and a wider area for milk collection. In addition, the proximity to the Appennino Tosco-Emiliano National Park can place additional constraints: “We had a problem with being in an area near the National Park because it limits the possibility of expanding or building barns. The municipality, in particular, is very strict for environmental and landscape nature reasons”, Farmer #1).

Collaboration by the dairy co-operative in the territory should be improved, say the farmers interviewed. The only two collaborations mentioned concern the Appennino Tosco-Emiliano National Park brand and participation in a few fairs organized in the territory. (“To enhance the value of the cheese, we have made an agreement with the Appennino Tosco-Emiliano National Park: we insert their logo “Product of the Mountains” on our product and they list us on their website”, Farmer #1.) The landscape that characterizes the area and the flow of families, cyclists and motorbike rider tourists on the weekends is not sufficiently exploited by the dairy cooperative or by the municipalities of the territory in general: “We should generate more value through the territory in terms of tourism; even the National Park does not promote the territory enough. We have tourism, cyclists and motorbike riders, during the weekend because the places are very beautiful, and we could take advantage of this!”, Farmer #4. The Manager seems convinced that the co-operative should provide more services, possibly in collaboration with other stakeholders of the territory: “An idea is to collaborate with a bed & breakfast to link tourists to the agricultural activity, make them sleep where they can visit the territory and consume the product. It is not just a tourist activity, but also a way to attract interest in the cooperative. We should involve other stakeholders because the territory is beautiful and it could also be possible to create a tourist route or suggest a park or rest area where customers can consume the products of the store or have a picnic.”

4.1.3. Consumers' Perception

The answers collected through the in-depth interviews with consumers confirm their appreciation of products supplied by the "Latteria Sociale Garfagnolo" SFSC. All respondents stated that they perceived a higher level of product quality than those sold in supermarkets or, in some cases, by other dairy shops. Notably, two consumers based their statements on their direct knowledge of the precise production circumstances: *"My family usually buys from this shop because we know the stables that supply the milk to the cooperative. In particular, I have worked with some of them"*—Consumer #4. Selling local products and the direct contact with the producers are important strengths of the SFSC and distinguish it from impersonal supermarkets (*"In my opinion, the main difference between direct selling and other sales channels is the origin of the products"*, Consumer #4; *"Supermarkets are not my scene because I like to have a direct contact with the producer"*, Consumer #3; *"The strengths of the shop are the direct contact and the fact that it is family-run"*, Consumer #1.) Consumers state that they prefer to buy from the SFSC thanks to a trust relationship originating in the practice of direct selling and most of them have been customers for a long time, as a family tradition. Because of their preference for their products and their geographical proximity to the co-operative dairy shop, they think buying there is convenient, even though the price is higher than in a supermarket: *"I recognise a difference in the price, but I prefer to buy in a traditional way because I really trust this shop"*—Consumer #2.

Because the shelf life of the cheese is long and average daily intake is low, they usually visit the shop once or twice per month, while purchases increase during the summer holidays. (*"We buy Parmigiano Reggiano every two months, since we make limited use of it"*, Consumer #4; *"I often go to the shop, mainly during summer holidays, since I spend summer vacation in a nearby camp site"*, Consumer #1.) Two respondents stated they also purchase other products and go to the cooperative store more frequently than the other interviewed customers: *"I go to the shop once a week"*, Consumer #3; *"The product that I usually buy here is Parmigiano Reggiano, I buy also butter, stone-ground flour, yogurt and ricotta, as necessary [. . .] if it was possible, I would also buy other products here because I like to buy from small-scale retailers devoted to the sale of local fresh products"*, Consumer #5.

The perception of a different shopping experience and the opinion that products supplied by the SFSC are fresher than those provided by "normal" shops are confirmed by this study. (*"I have the perception that the product in the shop is less processed, fresher and, as a result, qualitatively better. In my opinion, doing shopping in the shop is faster and less exhausting compared to at the supermarket"*, Consumer #5; *"Sometimes, when I do not have time to come to this shop, I buy food products in other similar shops, not at the supermarket. The place where I purchase makes a difference"* Consumer #2.) Product quality is considered one of the most important drivers of preference for the SFSC: *"Usually, I do not buy the same product from other points-of-sale because I think that they are not comparable from a qualitative point of view"*, Consumer #2; *"In particular I find the mountain cheese tastier than normal cheese"*, Consumer #1), followed by the intention to support local producers—*"I choose to buy from the shops to support them and because I know the animal living conditions as well as the feed and grazing which raises the cattle"*, Consumer #4. In addition, the staff play an important role in creating a friendly atmosphere: *"I appreciate very much the contact with the staff, whom I often talk to, [. . .] I have an informal relationship with the girl behind the shop counter; I feel free to ask her for information about the products. Sometimes she gives me products left over at the end of the day. Of course, there is different customer care"*—Consumer #5.

People close to the interviewees represented an important source of information about the dairy. (*"I first learnt about the dairy cooperative thanks to friends"*, Consumer #5.) On the other hand, one customer said s/he first learnt about the cooperative on to a school trip: *"My first knowledge of the dairy cooperative was thanks to a school excursion, but all long my family shopped here"*—Consumer #4. Because of their positive perception of the cooperative store, the interviewees recommend the shop to friends and relatives. This suggests that word of mouth is the main way of extending the catchment area of the shop.

Trust is a key aspect in the participation of consumers to the "Latteria Sociale Garfagnolo" SFSC, and cooperative management needs to exploit this strength. The verification system, based

on third-party certification system involving an independent and external body providing assurance that the requirements of the PDO are met, is strengthened by the guarantees provided by producers themselves, based on self-reporting by individual producers and internal control by the cooperative organization. This internal control is a key aspect: the trust system in the “Latteria Sociale Garfagnolo” SFSC differs from the trust system in the long Parmigiano Reggiano PDO distribution chain (e.g., large scale retailers). In both cases, the third-party certification system guarantees compliance with PDO specifications. However, for the SFSC, only first-party verification is provided; it is the cooperative itself which guarantees the distinguishing quality attributes of the product. The cultural and geographical proximity of producers and consumers contributes to making sure that the rules are respected and the quality of the product is guaranteed.

The price and lack of innovation, in terms of product variety among other areas, are the two shortcomings identified by both the qualitative and quantitative interviews. Moreover, the way that consumers have heard about the initiatives is commonly word of mouth. The development of the SFSC will thus require support for organizational (e.g., price, product variety) and communication aspects (e.g., improvement of social media coverage).

4.2. *The Peri-Urban Perspective: The Dairy Shops in Parma Surroundings*

4.2.1. The Territorial Context

The three dairy shops located in the surroundings of Parma sell the cheese made in the same dairies. In all cases, the farms and cheese factories have the same owner. The first is “Caseificio Giansanti”, 10 km from Parma along a very busy road; the second is “Caseificio Bertinelli”, 15 km from Parma, also on quite a busy road; the last, “Caseificio Ciao Latte”, is 20 km from Parma and is also a well-known agro-tourism guesthouse with a restaurant. These three dairy shops have taken advantage of the Parmigiano Reggiano PDO Consortium strategy aimed at promoting SFSCs [48,75]. The outlets have the same layout and sell their own Parmigiano Reggiano PDO cheese and other local and PDO/PGI products (salami, dried mushrooms, bread, butter, etc.).

4.2.2. Consumers’ Perception

The sample of customers of the dairy shops located around Parma present the socio-demographic characteristics shown in Table 5. The data sample features an almost equal split of gender, the prevalence of middle to old age consumers and highly educated individuals. Moreover, most respondents did not wish to disclose or could not recall any further details of income. However, large shares of customers interviewed reported to have a monthly household net income level included in the intervals identifying the second and third lowest rungs of the monthly household net income ladder employed in the questionnaire. The average monthly household net income for the sample of respondents wishing to disclose the data is calculated at €2586.29, closing the income class at the bottom of the distribution at 0 € and the one at the top of the distribution at 5499 € and using mid-range values as representative of the class. Compared to the average monthly value of individual income, calculated from the average value of the 2016 income declaration in the Parma municipality (€2256.58), the sample of customers interviewed may be slightly more affluent. Likewise, the highest percentage of respondents did not disclose any information on the socio-economic characteristics necessary to classify them in any of the household types foreseen, such that they are included in the “Not reported” category, while the lowest percentage of respondents could be classified as “Single or living alone”.

Customers’ answers to the question regarding the perception of shopping at the dairy shop compared to at a typical grocery store show that they are in complete agreement with almost all of the statements presented in Table 2. This can be gauged from the percentage distribution of the answers reported in Table 6, as well as from their median values.

Table 5. Customer Sample Summary Statistics.

Variable	%
<i>Gender</i>	
Female	45.16
<i>Age groups</i>	
Age ≤ 29	6.45
29 < Age ≤ 44	20.97
44 < Age ≤ 59	35.48
Age > 59	37.1
<i>Education levels</i>	
Primary/lower secondary	24.19
Upper secondary (including short-cycle tertiary education)	41.94
Tertiary	33.87
<i>Income levels</i>	
Monthly household net income ≤ 1499 €	11.29
1499 € < Monthly household net income ≤ 2499 €	19.35
2499 € < Monthly household net income ≤ 3499 €	25.81
3499 € < Monthly household net income ≤ 4499 €	9.68
Monthly household net income > 4499 €	3.23
Do not wish to tell/Do not know	30.65
<i>Household types</i>	
Not reported	35.48
Single or living alone	16.13
Couple without child(ren)	24.19
Single or couple with child(ren)	24.19

Source: Authors' elaboration.

Table 6. Distribution of Customer Agreement with Statements Regarding the Experience of Shopping at the Dairy Shop.

	Completely Disagree			Completely Agree			Median	# Responses
	1 %	2 %	3 %	4 %	5 %			
“Compared to a typical grocery store:								
Here I get products which are fresher	0.00	3.33	11.67	13.33	71.67	5.00	60	
Here I get products which are better for my health	0.00	3.33	10.00	15.00	71.67	5.00	60	
Here I do not find as good a selection of products that I look for as in a typical grocery store	8.62	13.79	18.97	22.41	36.21	4.00	58	
Here I get more value for money	0.00	3.28	16.39	16.39	63.93	5.00	61	
I find shopping here to be more environmentally friendly	5.00	5.00	10.00	26.67	53.33	5.00	60	
I find shopping here more pleasant	3.23	3.23	12.90	16.13	64.52	5.00	62	
Here I get more information about the food products	6.56	1.64	14.75	11.48	65.57	5.00	61	
Here I get unique food products that I cannot buy in a typical grocery store	6.45	8.06	11.29	19.35	54.84	5.00	62	
I only do some supplementary shopping here compared to what I buy in a typical grocery store	0.00	0.00	0.00	22.58	77.42	5.00	62	

Source: Authors' elaboration.

Most of the evidence confirms the expectation that dairy shop customers agree that the shopping experience is unique, takes place in a pleasant environment, and a high-quality product—perceived as

better for health—is sold at the “correct (fair)” price. Indeed, the distributions of the level of agreement with the items appear to be heavily skewed to the right (i.e., towards the high(est) values), such that the median value of the responses is often 5.00. Perhaps somewhat unsurprisingly, customers agree that “Here I do not find as good a selection of products that I look for as in a typical grocery store”. This may reflect the fact that for the modern consumer, the “typical grocery store” is a super- or hypermarket, which offers a one-stop shopping opportunity to stock up for the household for even longer than a week. Super- or hypermarkets can easily provide more choice than a dairy shop, even when the consumer is shopping for cheese (as a category). Additional surprising results include disagreement with a couple of items. Disagreement with the statement “I find shopping here to be more environmentally friendly” probably reflects consumer insight that she might be driving some way to purchase a small quantity of Parmigiano Reggiano PDO. We would posit that the consumer is aware that shopping for few items at a dairy shop is less carbon efficient (i.e., higher quantity of CO_{2e} per kilo of shopping) than shopping at a grocery store, where much more than just a few wedges of Parmigiano Reggiano PDO is bought. Lastly, the disagreement concerning the statement “Here I get more information about the food products” may reflect the long standing and expert knowledge of the product customers of dairy shops have of their local specialty, such that they have no need for serving and culinary tips. A consumer purchasing cheese at a super-hypermarket may require more information on how to enjoy a product never consumed before and which he/she is buying for the first time. The need for additional information on Parmigiano Reggiano PDO is usually expressed by tourists or other people unfamiliar with the product who stop by at a dairy (shop). A very similar distribution of answers, collected in Table 7, characterizes responses to the questions presented in Table 3.

Table 7. Distribution of Customer Agreement with Statements Regarding the Reasons for Shopping at the Dairy Shop.

	Completely Disagree			Completely Agree		Median	# Responses
	1 %	2 %	3 %	4 %	5 %		
“I shop here because ...							
It is convenient for me	8.06	9.68	16.13	16.13	50.00	4.50	62
This business is innovative and creative	22.95	16.39	21.31	14.75	24.59	3.00	61
I trust this outlet/shop	0.00	0.00	3.23	11.29	85.48	5.00	62
I wish to support environmentally- friendly food production	0.00	4.84	6.45	11.29	77.42	5.00	62
This outlet/shop has a good reputation	0.00	0.00	1.61	11.29	87.10	5.00	62
I wish to support local producers	0.00	0.00	0.00	8.06	91.94	5.00	62
It offers high quality products	0.00	0.00	1.61	9.68	88.71	5.00	62
It is cheaper for me than other shops	6.45	14.52	30.65	11.29	37.10	3.00	62
Here I get traditional food	0.00	0.00	0.00	22.58	77.42	5.00	62

Source: Authors’ elaboration.

As before, we first focus on the distribution of the responses. There is some disagreement with the statements presented in Table 3, which again could provide unexpected evidence. It is noteworthy that customers perceive the “business model” of the dairy shop not very innovative or creative. This echoes the evidence collected in the qualitative interviews, which suggested that some of the outlets were struggling to use modern communication technologies (i.e., the Internet and/or Facebook and the social media) to attract younger customers. In fact, as already noted, most of the respondents to this customer survey are middle to old age. Roughly 10% of the survey respondents report that shopping at the dairy shop is not that “convenient for me”. This pairs with the perception—already analyzed—that this kind of shopping trip may be so long that they call into question the environmental

friendliness of participating in these types of SFSCs. The perception of environmental unfriendliness of the shopping experience (i.e., trip) noted above is counterbalanced by the “correct” consumer motivation for purchasing Parmigiano Reggiano PDO which—in itself—is more environmentally friendly than other types of cheese (i.e., the level of agreement with the statement “I wish to support environmentally-friendly food production”). In fact, the dairy shops where survey responses were collected represented the retail stage of supply chains whose dairy farms belong to the same owner(s) as the shop. Thus, the milk producing this Parmigiano Reggiano PDO travels fewer food miles between the farm and processing stages of the supply chain, compared to supply chains organized around cooperative or private dairies.

In a way, it could be posited that selling Parmigiano Reggiano PDO through a SFSC, rather than a long supply chain, shifts the carbon equivalent load from the product supply chain (i.e., the retail outlet) to the consumer shopping trip. In other words, the consumer may travel more than the product. The remaining customer responses paint the picture of participating in this SFSC because of very high trust in the reputation of the producer/processor/shop (i.e., very frequently in the “family”, because often these are family-run businesses), capable of delivering a very high quality product (or the quality the customer expects) at a somewhat high price which the consumer is willing to pay. This willingness to pay is a vital lifeline to these businesses, which are often understood to be not sufficiently profitable and yet make a vital contribution to the local rural economy.

Lastly, we analyzed the distribution of the levels of agreement with the statements presented in Tables 6 and 7, with respect to the socio-demographic information collected using the questionnaire. The aim is to identify which socio-demographic characteristics of the SFSCs customers could be used by Parmigiano Reggiano PDO producers to set up, or further develop, dairy shops, although the small size of our sample means that our results can provide no more than tentative suggestions. Tables 8 and 9 present the results of the analyses of the relationship between the socio-demographic variables and the level of agreement with the statements. The relationship with the gender variable is evaluated with the Goodman-Kruskal γ statistic; the relationship with age groups, education and monthly household net income levels is quantified with the Kendall τ_b statistic; the relationship with household types employing the Kruskal-Wallis equality of distributions measure.

Because the data sample was small, few statistically significant test-statistics are calculated, even though, for the same reason, conventional boundaries of statistical significance are relaxed to 15%. In this commentary, we focus on coefficients that are statistically significant at either conventional levels or at the unconventional level of 15%. The variable “Gender” seems to be related to customer perception of environmental friendliness of the shopping experience and the uniqueness of products in a statistically significant manner at conventional levels. It is also related to the degree of business innovativeness and creativity as a “determinant” of shopping at a dairy shop. Age groups are related to the perception of higher freshness and the degree to which shopping at the dairy shop is considered “supplementary” to shopping at a typical grocery store. Furthermore, they are related to the trust in and reputation of the shop/outlet, as drivers of the shopping behavior. This result is not surprising considering that trust and reputation develop in the customer with the recurrence of the shopping experience, which increases with age. The extent to which the dairy shop is perceived as a destination for only “supplementary” shopping is the characteristic of the SFSC which is related to the highest number of socio-demographic variables. In fact, coefficients are statistically significant for age groups, education and net household income levels as well as household types. This may reflect the different demands on individual time according to family composition (e.g., the presence of a child may exclude making many “dedicated” shopping trips). This is confirmed in that household type is related to convenience being a “determinant” of shopping at a dairy shop. Likewise, the degree of specialization of the shop in one particular product (category) could be a proxy for the product quality such that the univariate relation with net household income levels may be spurious and the higher value (price) of the product may be the true determinant. Indeed, net household income levels are related to the high quality of products offered by the dairy shop.

Table 8. Relation Between Distribution of Customer Agreement with Statements Regarding the Experience of Shopping at the Dairy Shop and Socio-Demographic Variables.

	Gender	Age Groups	Education Levels	Income Levels	Household Types
“Compared to a typical grocery store . . . :					
Here I get products which are fresher	0.082 (0.262)	0.190 † (0.107)	0.010 (0.117)	−0.148 (0.098)	0.355
Here I get products which are better for my health	0.273 (0.256)	0.175 (0.104)	−0.086 (0.120)	0.006 (0.106)	1.475
Here I do not find as good a selection of products that I look for as in a typical grocery store	−0.151 (0.193)	−0.054 (0.111)	0.090 (0.099)	0.107 (0.104)	2.247
Here I get more value for money	0.022 (0.238)	0.110 (0.108)	0.038 (0.123)	−0.049 (0.108)	1.629
I find shopping here to be more environmentally friendly	0.339 * (0.206)	0.170 (0.102)	−0.052 (0.123)	−0.100 (0.100)	2.750
I find shopping here more pleasant	−0.136 (0.227)	0.139 (0.102)	−0.043 (0.112)	0.005 (0.105)	2.162
Here I get more information about the food products	−0.112 (0.236)	0.125 (0.109)	−0.133 (0.106)	0.036 (0.108)	0.479
Here I get unique food products that I cannot buy in a typical grocery store	0.627 *** (0.174)	−0.034 (0.116)	−0.228 ** (0.112)	−0.094 (0.100)	7.341 *
I only do some supplementary shopping here compared to what I buy in a typical grocery store	0.227 (0.228)	−0.300 *** (0.096)	0.197 * (0.107)	0.276 ** (0.111)	5.935 †

Source: Authors’ elaboration. Notes: Results are based on the number of questionnaire responses indicated in Table 3 for each item. Goodman-Kruskal γ is calculated for the Gender variable, Kendall τ_b for the Age Group, Education Levels and Income Levels variables, and Kruskal-Wallis for the Household type variable. The latter is χ^2 distributed with 3 degrees of freedom. Calculations performed using Stata 15.1, except for the calculation of the Goodman-Kruskal γ for which R was employed. ***, **, * indicate statistical significance at 1%, 5% and 10%, respectively; † indicates borderline significance up to 15%.

Table 9. Relation Between Customers’ Distribution of the Agreement with Statements Regarding the Reasons for Shopping at the Dairy Shop and Socio-Demographic Variables.

	Gender	Age Groups	Education Levels	Income Levels	Household Types
“I shop here because . . .					
It is convenient for me	0.012 (0.200)	0.128 (0.094)	0.023 (0.101)	0.051 (0.097)	5.728 †
This business is innovative and creative	0.267 † (0.175)	−0.041 (0.089)	−0.176 † (0.105)	−0.022 (0.104)	1.806
I trust this outlet/shop	−0.190 (0.344)	0.278 ** (0.132)	−0.105 (0.112)	0.020 (0.103)	5.415 †
I wish to support environmentally- friendly food production	0.244 (0.278)	0.018 (0.130)	0.161 (0.113)	−0.120 (0.100)	1.153
This outlet/shop has a good reputation	0.191 (0.372)	0.286 ** (0.114)	0.049 (0.110)	−0.075 (0.106)	1.378
I wish to support local producers	−0.315 (0.463)	0.101 (0.148)	−0.117 (0.129)	−0.023 (0.121)	1.847
It offers high quality products	−0.276 (0.394)	0.035 (0.138)	−0.084 (0.141)	−0.226 ** (0.084)	0.287
It is cheaper for me than other shops	−0.061 (0.193)	−0.091 (0.108)	0.094 (0.110)	−0.092 (0.101)	0.488
Here I get traditional food	0.247 (0.300)	0.091 (0.126)	−0.037 (0.130)	−0.027 (0.110)	0.559

Source: Authors’ elaboration. Notes: Results are based on the number of questionnaire responses indicated in Table 3 for the respective item. Goodman-Kruskal γ is calculated for the Gender variable, Kendall τ_b for the Age Group, Education Levels, and Income Levels variables and Kruskal-Wallis for the Household type variable. The latter is χ^2 distributed with 3 degrees of freedom. Calculations are performed using Stata 15.1, except for the calculation of the Goodman-Kruskal γ for which R was employed. ***, **, * indicate statistical significance at 1%, 5% and 10%, respectively; † indicates borderline significance up to 15%.

4.2.3. The Carbon Footprint of the Parmigiano Reggiano Purchase Activity in the Peri-Urban Area

An overview of the data collected from the sample of 62 dairy shop customers with the aim of estimating the carbon footprint of purchase activity in the peri-urban area SFSC is shown in Table 10. Ninety-eight per cent of the interviewees travelled by car, due to the fact that dairy shops are located quite far from the town or villages.

Table 10. Main characteristics of purchase behaviour by dairy shop.

Dairy Shops	No. of Customers	Average Quantity of Food in the Basket (kg)	Distance Travelled (km)	Type of Fuel (% Distribution)				Unique Destination (%)
				Petrol	Diesel	LPG	CNG	
Shop 1	37	3.65	6.51	15%	19%	16%	10%	46%
Shop 2	14	2.56	8.14	57%	14%	7%	21%	36%
Shop 3	11	3.59	15.41	55%	27%	0%	18%	73%
Total	62	3.39	8.56	37%	27%	18%	18%	55%

Source: Authors' elaboration.

Most of the interviewees are customers of dairy shop 1 (60%), probably because it is very close to the city of Parma and located along one of the main roads connecting the city with the province. The proximity of the town, the presence of densely populated neighbourhoods and the high levels of commuter traffic yield a high number of stops at the dairy shops. The other two dairy shops are located a bit further away, in particular the third one, whose customers are mainly from the local village and travel a distance greater than the average observed for the first shop. This is a consequence of the geographic location of these two shops. According to Forssell and Lankoski [2], the maximum distance an individual can travel such that their emissions are likely to be less than those generated from the cycle of chilling, mass-transport, chilling and home delivery for the large-scale distribution system is 6.7 km for a petrol-powered vehicle and 7.4 km for a diesel-powered vehicle. For our three shops, only Shop 1 lies below these thresholds. For Shops 2 and 3, the distance travelled is greater because of their location. It is, however, important to note that the decision to buy a local product in a local traditional shop could be made on the basis of criteria like cultural identity, rather than distance [67].

The average quantity of food bought in the dairy shops is 3.7 kg for Shop 1, 2.6 kg for Shop 2 and 3.6 kg for Shop 3, of which Parmigiano Reggiano represents 85%, 92% and 76%, respectively. Vehicles visiting the dairies are powered mainly with diesel and petrol (64% of the total purchases), followed by LPG and CNG (18% each). Shop 1 and Shop 2 are visited by customers planning other destinations in addition to the shops, whereas a significant share of Shop 3 customers (73%) identify the dairy shop as the only destination of their trip. The number of round trips probably depends on the location of the dairy shop.

The results of the carbon footprint for each dairy shop are presented in Figure 1, where the gCO₂e/kg of Parmigiano Reggiano measures the environmental impact the consumer travels to buy cheese. It is noticeable that Shop 3 shows the highest carbon footprint due to travel, and Shop 1 the lowest. As noted above, the attractiveness of Shop 1 may reflect its proximity to the city and main roads, and it could be a stop during a trip that is not specifically planned to purchase Parmigiano Reggiano. On the other hand, Shop 3 meets local demand from consumers from a wider area who plan their trip to the dairy shop as the main destination. Overall, the carbon footprint attributed to travel for purchasing cheese is 529 gCO₂/kg of Parmigiano Reggiano.

A review of Life Cycle Assessment (LCA) studies of Parmigiano Reggiano places the carbon footprint of the agricultural and processing phases within a range of 12.4 kgCO₂e/kg and 20.4 kgCO₂e/kg [76–79], with an average of 16.4 kgCO₂e/kg. Assuming that the estimates obtained through these LCA studies and the carbon footprint of travel estimated in this work are representative of the production sector and purchase behaviour, the contribution of purchase travel to climate change accounts for 3.2% of total product emissions.



Source: Authors' elaboration.

Figure 1. Carbon footprint of the purchase activity in Parmigiano Reggiano dairy shop (gCO₂e/kg of Parmigiano Reggiano PDO cheese).

The environmental impact of Parmigiano Reggiano distribution through a long food supply chain are provided by Giovenzana et al. [79] and Caseificio Caramasche Soc. Cop. [80], which estimate CO₂ emissions ranging between 1% and 2% of the total Parmigiano Reggiano carbon footprint. This confirms the relatively lower environmental efficiency of the SFSC in comparison with a supply chain characterized by more intermediaries at the distribution level, and is coherent with consumer perception of his/her environmental impact when buying cheese in dairy shops. The lower environmental efficiency of the SFSC is therefore determined largely by three main variables: vehicle carrying capacity, the share of effective vehicle load, and the average distance travelled. The consumers' vehicles observed during the survey are small-medium cars with an average load capacity of 250–500 kg, passengers included, and a share of effective load of about 20%. On the contrary, long supply chains are usually characterized by Heavy Good Vehicles with high carrying capacity and high share of effective vehicle load. The average distance travelled depends on the stretch of road between the point of origin and the shop, the distance of the shop from the main urban centre, and the number of stops along the way.

The average distance travelled relates to two purchase behaviour patterns. One pattern is more related to the contingent situation of the consumer, and the other to reaching the dairy shop to buy cheese. The first purchase behaviour model is more associated with Shop 1, because the location is attractive for commuters and people driving by. For Shop 1 customers, proximity (geographical or in terms of purchase opportunity) can be considered a key element, along with product quality. For Shops 2 and 3, the average distance seems to identify consumers intending to buy Parmigiano Reggiano in dairy shops located in marginal rural areas. For this category of consumers, proximity does not appear to be a key variable in the purchase decision, and they focus more on product quality, dairy shop reputation, and support for local supply chains and the related rural environment/economy. The present analysis cannot provide quantitative evidence on the variables characterizing the two purchase behaviours, but it can safely be assumed that dairy shop proximity, the search for a rural identity and the aim of supporting rural viability are the main variables distinguishing the two purchase models. Proximity is more important for Shop 1, and rural identity is a more important characteristic of the other two dairy shops.

These different behaviour patterns result in different levels of environmental externalities. It is clear that the contribution to climate change is greater for Shops 2 and 3 than for Shop 1, because of the

average distance travelled by each consumer and their willingness to pay. In particular, willingness to pay for Parmigiano Reggiano seems to be higher for Shop 2 and 3 customers, because higher carbon emissions correspond to higher average distance and, thus, to a higher travel cost. It may be that consumer willingness to pay reflects the value of positive externalities, which consumers presume to be enhanced by their purchase. With varying levels of awareness, consumers believe that they are keeping farmers in marginal rural areas, supporting local rural economies, and strengthening the viability of rural communities.

5. Discussion

The issue of how to evaluate the benefit of sustainable supply chains, even SFSCs with small production volumes, is of interest for the implications for consumers and producers. The case study in this article provides a structured response to questions about promoting economic, social, and environmental sustainability.

An initial assessment must take into account the combination of cause and effect between the SFSC and the impact. In fact, the case study looks at one particular SFSC, that of Parmigiano Reggiano PDO. This cheese is one of the most famous PDO in the world and, in particular, in the production area. It is a product that is a significant element of one's diet and which consumers are culturally aware and fond of. This is why it has a strong capacity for attraction. Supermarkets, however, often sell Parmigiano Reggiano PDO at a low cost and in an undifferentiated manner, perhaps as a private label not even bearing any indication of the producing dairy. Consumers in the production area, including those of the area of Parma studied here, are not always satisfied with the product quality delivered by supermarkets and even if the price is attractive, they may find that the price-quality ratio is not adequate. For these reasons, too, consumers are driven to look for a higher quality at a fair price.

It is important to consider the area in which the research was carried out. In the case of the "Latteria Sociale Garfagnolo" dairy, it is a famous natural park, with valuable environmental and recreational features that attract many visitors. Among the attractions, there is certainly the opportunity to buy good Parmigiano Reggiano PDO directly from the hands of those who produce it and the possibility to meet them. This aspect, important in convention theory, has implications for producers as well as consumers. In addition to their pride in producing a unique food product, they also gain social and environmental motivation. They can thus become more resilient in areas that might be isolated and disadvantaged, at least, compared to neighbouring areas with more comforts and advantages.

On the producer side, it should be considered that the development of SFSCS for Parmigiano Reggiano PDO is a relatively recent phenomenon. Farmers are gradually adapting their activity to the new context and are preparing to meet new demands for services required by consumers. It is significant that producers are starting to perceive how they can do more and that their actions should be coordinated with the institutions that manage the park. Importantly, this shows how the "virtuous circle" of quality is starting to give concrete results and contribute to changing producer attitudes.

On the consumer side, the genuineness of the cheese and the other products, and the interpersonal relationship that is created over time, is appreciated. This is the case even though "Latteria Sociale Garfagnolo" is over an hour's drive from the nearest cities (Reggio Emilia, Parma, La Spezia). The cost of travel is largely offset by the overall quality perceived by consumers.

The case of dairies in the area of Parma is slightly different. Here, consumers are driven mainly by trying to maximize the price-quality ratio of their purchases, along with the search for a personal relationship that can further ensure the quality of the products purchased. The SFSC described here relies to an extent on commuter routes and on the idea of the quality that consumers have and claim not to find in supermarkets.

The environmental impact generated by this purchase model is not however fully satisfactory and our research shows that, from this point of view, these SFSCs are not very efficient. However, it must be considered that, given the location of the outlets, many of these consumers would still drive on these roads, and consumer awareness of pollution is in any case difficult to estimate.

The research confirms that in a peri-urban area and in a rural context of a wealthy and well-connected area, the SFCS strategy is successful. The positive results however are not achieved by chance. In the Emilia Romagna region, there is a steady and fruitful relationship between policy makers and stakeholders, pursued with the aim of transforming changes in the market into opportunities. On the producer side, the rural development policies of the Emilia-Romagna region together with Parmigiano Reggiano Consortium activities have contributed to keeping alive the link between producers and the market, favouring the process of technological and strategic renewal. In the first case, the aim of the Emilia Romagna policy makers was to enable farmers and dairies to adopt technological progress, which has improved the quality of products and firm efficiency. In the second case, the aim of the Parmigiano Reggiano Consortium was to push towards a strategy of commercial differentiation. From the consumers' point of view, the general level of well-being, the availability of time and the search for a specific quality at a fair price are all factors explaining the demand for food from unconventional channels.

An important question is whether these findings can be generalised to other comparable situations. It appears that they can, even when the local products are less well-known than the "King of cheeses" Parmigiano Reggiano. The history and evolution of phenomena such as the Slow Food movement and enogastronomic tourism show that the market segment is growing rapidly. The quality policies promoted over time by the EU have kept pace with evolution in consumer demand and lifestyles, and this context needs to be considered in discussing tools for managing local distribution channels and the future of the Common Agricultural Policy.

6. Conclusions

This paper shows how SFSCs can be a flexible market strategy for producers who have no assets apart from product quality and their own skills. The SFSC produces social and environmental as well as economic benefits, as shown by the two case studies embedded in different contexts. For Parmigiano Reggiano producers in both rural and peri-urban areas, the SFSC is a successful strategy for selling part of their output in their own outlets, gaining reputation, reducing costs and at the same time increasing their levels of self-esteem.

This is also an interesting example of how food quality systems facilitate the resilience of producers who take advantage from a specific territorial context, either a Regional Park or close to a wealthy city. Parmigiano Reggiano PDO SFSCs play a role in the sustainability of the production area of origin and show that compliance with a Code of Practice positively impacts producers' returns and generates positive social, environmental, and animal welfare externalities.

The two Parmigiano Reggiano PDO SFSCs under analysis differ in their territorial context (rural and peri-urban areas) and in communication strategies for meeting different consumer needs and targets. However, consumer perception of the role of SFSCs in the sustainability of the production area of origin is one of the main reasons for buying at a dairy shop. Product quality is the biggest attraction factor bringing consumers into the outlet, but it is associated with trust in producers, and the idea of combining "leisure with pleasure".

An apparent drawback is the environmental impact of the SFSC purchase strategy. There is a clear impact from the generation of CO₂, and the further the shop from consumer homes, the higher the CO₂ emissions.

According to the findings of this analysis, consumers perceive the higher environmental impact of their purchasing behavior when they shop at a dairy shop rather than in a big retail shop. The analysis of the carbon emission of the purchasing behavior provided here confirms this perception. Beyond the intrinsic quality of the product, consumers are encouraged to buy Parmigiano-Reggiano in a dairy shop by their willingness to strengthen positive externalities at the local level, such as preserving local farming and, hence, stabilizing local rural communities. Therefore, we can interpret the carbon emission produced by shopping at a dairy shop as an opportunity cost for sustaining the socio-economic characteristics of rural areas.

Some limitations should be considered when interpreting the results of this research. The first relates to the remoteness of the dairy (shop) in the rural area, as compared to the peri-urban location of the other three shops. It is not possible to anticipate how the results presented here would have changed had quantitative data been collected also at the Latteria Garfagnolo. Therefore, we acknowledge that these results should be interpreted cautiously also because arising from one type of dairies located in the sole Parma peri-urban area. However, the most relevant factors identified by the quantitative survey as consumers' motivations, i.e. the high-quality product, trust in and reputation of the shop, and support to local producers, have been frequently quoted as relevant in the qualitative interviews, too. Therefore, we believe that there should not be marked differences in the results of the different types of shops.

Second, in the present study, it is not possible to measure quantitatively the main drivers of the two models of purchasing behavior identified through the environmental analysis. A more extended questionnaire aimed at collecting detailed information on the production of externalities and public goods resulting from the shopping activity might be implemented in the future. However, the qualitative assessment proposed in this respect is supposed to be consistent with consumers' perception of their role in generating negative and positive externalities for rural areas. However, the research finds an overall positive impact of SFSC strategy on producers participating in the Consorzio del Parmigiano Reggiano initiative and, more generally, on rural viability and prosperity.

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