Supply Chain Strategies for Speciality Foods: A Norwegian Case Study

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Abstract

Despite strong market interest in speciality foods, producers find market access and distribution challenging. This exploratory research includes a literature review and five case studies of supply chains relating to shellfish, cheese, meat, potato, and miscellaneous speciality foods in the Mid-Norway region. The study identifies key supply chain configuration parameters from the extant literature, and these are used to analyse the cases. The study makes three main contributions to literature: an analytical framework for analysing the supply chain characteristics of speciality foods; important supply chain factors for accessing the conventional food supply chain; and five propositions for improving market access. We argue that the speciality foods supply chain should be configured according to these propositions to ensure responsiveness to customer needs and to strengthen market access.

Keywords: speciality food, speciality food production, supply chain strategy, Norwegian speciality foods, case study

1 Introduction

As well as feeding the world's population, securing health and good living conditions, and encouraging wealth and economic growth, the food sector provides a livelihood for a significant part of society (Manzini and Accorsi 2013; Eurostat 2010). Systems for growing, producing, distributing, and selling food have developed by utilising mass production and principles of economy of scale to reduce costs (Hirsch and Gschwandtner 2013; Oglethorp and Heron 2013). Simultaneously, food niches provide an alternative for those who favour organic foods, people with food intolerances, consumers with ethical concerns about how food is produced, and those who seek unique premium food products produced by small or local niche producers. This last category in particular adding qualities that differs from the food industry is attracting significant market interest (Visser et al. 2013; Abatekassa and Peterson 2011; Hingley et al. 2010; Ekelund and Tjärnemo 2009); in Norway, these products are labelled "speciality foods" and have emerged as an important complement to the traditional range of food products (Kvam et al. 2014).

While the traditional market channels for speciality foods are farm stores, farmers' markets, and alternative food schemes, the current trend is to sell these products through more conventional and premium channels such as retailers, hotels, restaurants, and other food service channels (Hval 2012; Ilbery and Maye 2006; Renting et al. 2003). These conventional channels

find the speciality food product category attractive because its richer assortment of high quality and niche products attracts consumers. The conventional channels in turn offer speciality food producers an opportunity to reach broader markets and geographical areas, which means more consumers and increasing sales. In short, this is a win-win situation for producers, conventional channels, and consumers. However, despite the growing market interest, producers of speciality foods find it challenging to access conventional channels (Visser et al. 2013; Abatekassa and Peterson 2011). To become a supplier to these channels, speciality producers are exposed to supply chains other than the farm store and farmer market outlets. These supply chains are configured for high-volume and standardised distribution packages, consolidation and centralisation, high delivery frequency, rotation speed, and stability of supply (Martikainen et al. 2013; Abatekassa and Peterson 2011). The challenge for speciality producers, with their low product volume and limited capacity and located far from key infrastructure, is how to adapt to the requirements of these conventional food channels, and how to choose appropriate strategies (Martikainen et al. 2013; Sodano and Hingley 2009; Magnus and Kvam 2008). The speciality producer therefore struggles because of what Fisher (1997) defined as a lack of the right supply chain design, or what Chopra and Meindl (2013) later characterized as a lack of strategic supply chain fit (Mason-Jones et al. 2000; Naylor et al. 1999).

Previous research on speciality food production is quite extensive. The majority of studies contribute to an understanding of market conditions and consumer preferences, as well as size and growth of the speciality food market, the variety of market channels, geographical aspects, and sustainability (Menozzi 2014; Oglethorpe and Heron 2013; Gellynynck et al. 2012). However, few studies to date have focused on supply chain logistics and operations or on strategies for entry to conventional market channels (Martikainen et al. 2013; Visser et al. 2013; Nordmark et al. 2012; Abatekassa and Peterson 2011; Bosona et al. 2011; Matopoulos et al. 2007). To the best of our knowledge, no study has adequately addressed how producers of speciality foods should adapt to the supply chains of conventional markets. The aim of the present study is to analyse the speciality foods supply chain, to understand it's attributes and to propose a set of strategies that can be used to improve market access for speciality foods, so strengthening the position of these niche producers. The focus here is on speciality food producers' access to conventional food supply chains, represented by retail stores, hotels, and restaurants in the medium to premium segment, as these channels offer maximum scope for most producers of speciality foods.

The paper is organised as follows. Section 2 reviews the extant literature on strategic fit and food supply chains, serving as input to an analytical framework. Section 3 presents the research methodology, followed by the five case studies and data sets in Section 4. In Section 5, we analyse the supply chain configurations in each of the five cases, and in Section 6, five propositions are developed, suggesting how speciality supply chains should be configured. The paper concludes (Section 7) with a summary of key contributions and suggestions for future research.

2 Literature review

2.1 Concept of speciality foods

The range of food products offered by niche producers is diverse. Concepts discussed in the relevant literature include local food, speciality food, agro food, artisanal small-scale food, local

organic food, origin-labelled food, and food from specific geographical regions (see e.g. Duram and Cawley 2012; Abatekassa and Peterson 2011; Pearson et al. 2011; Ilbery and Maye 2006). There is evidence that consumers are concerned about the safety, health, and environmental and social standards of conventional products, and that the market perceives products from niche producers as differing from conventional products. At the same time, the spectrum of foods from niche producers continues to grow, making the boundaries between the categories relative and faint (Vanhonacker et al. 2010). The European Union (EU) policy framework (Bureau and Valceschini 2003) also reflects this difference in understanding of the food niche concept (Vanhonacker et al. 2010). In southern Europe, the term 'niche foods' often has a broader meaning, associated with products from specific cultures or traditions, climatic conditions, or geographical boundaries of production and consumption (Chambers et al. 2007). In the northern part of Europe, and particularly in Norway, the niche concept is strongly related to the uniqueness of the product and the geographical area where the product is grown or produced (Kvam et al. 2014; Hval 2012).

In Europe, the geographical indications component has been important in distinguishing niche food products. Certification labels (Protected Designation of Origin, PDO; Protected Geographical Indication, PGI; and Traditional Speciality Guaranteed, TSG) within the EU policy framework and national regulations (as in Italy, France and Spain) strongly emphasise the geographical aspect of certified products (Vanhonacker et al. 2010). In Norway, geographical indication and certification labels are more strongly connected to food products and raw materials produced in Norway than to specific regions (www.matmerk.no).

The present study focuses on small scale producers who offer niche products, extending beyond the local aspect to the products' uniqueness and authenticity, added by the recipe, the origin of the raw material, or the small-scale and artisanal production process. We classify these products as speciality foods that add value based on one or more of the following features: geography and area; heritage and cultural tradition; growing conditions and quality of raw material; recipe and production processes; and authenticity and gastronomic qualities. In Norway, speciality foods are produced in rural geographical areas and commonly include products such as cheese, fish, shellfish, meat, fruit, and berries (Kvam et al. 2014; Hval 2012). These are standard products of high quality with unique features, made by small-scale artisan and handicraft processes, and sold at premium prices. Production is in rural and local contexts but the products could be sold across a wider geographical area, including regional, national and international markets.

2.2 Conventional and speciality food supply chains

The conventional food supply chain is a highly industrial and global system, providing a broad range of products and offering availability, high service levels, and low prices (Romsdal 2014; Godfray et al. 2010). As well as the food industry's role as the main supplier of food, recent scandals have forced the industry to accept clear responsibility for more sustainable development of the sector (Kastner et al. 2011). The industry typically consists of global suppliers of inputs for agriculture, primary producers (agriculture), and other suppliers (e.g. packaging, ingredients), industrial processing units, retailers (wholesalers as well as chain and independent stores), and food service channels such as hotels, restaurants, and catering organisations, as well as institutions such as schools, nurseries, and hospitals. Actors in the

conventional supply chain are characterized by highly industrialised structures, infrastructure, systems, and processes. They benefit from handling high product volumes at high speeds, distributed to a broad set of consumers (Romsdal 2014; Van Donk et al. 2008; Entrup 2005; van der Vorst et al. 2001; Van Donk 2000) (**Error! Reference source not found.**). However, industrialisation is also associated with drawbacks such as loss of artisanal and speciality qualities in meeting the profitability requirements of owners and other stakeholders (Gellynck et al. 2012). This again highlights the challenge facing small speciality producers in their efforts to expand—that in the process of expanding, they may lose their uniqueness. Over the past decade, market power in the grocery sector has shifted from producers to retailers. In Norway, for instance, four big retailers manage the entire flow of products from suppliers to stores within proprietary systems (Kvam et al. 2014). All suppliers must fulfil specific logistical requirements in terms of number of packaging and distribution units, as well as specific requirements related to labelling, product volume, delivery frequency and lead time, and delivery slots.

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[Figure 1 about here]

As illustrated in **Error! Reference source not found.**, the speciality food supply chain is more compact than the conventional food supply chain, with smaller distances between producer and retailer. Farming and growing are often integral to the producer's activities as the main source of raw materials. Finished products are typically shipped directly to points of sale, and the producer is responsible for arranging their own deliveries (Banterle et al. 2010; Hingley et al. 2010; Ilbery and Maye 2006). Production often takes place in rural areas lacking proximity to logistical infrastructure (Visser et al. 2013), and the marketplace is fragmented.

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2.3 Framework for analysing the speciality food supply chain

2.3.1 Strategic fit

According to the supply chain literature, to be successful, companies must align their competitive features and priorities with supply chain strategy to meet market requirements (Chopra and Meindl 2013; Wagner et al. 2012; Lee 2002; Fisher, 1997). This theory originates from the manufacturing literature, which has emphasised the importance of the relation between production system and market characteristics (Skinner 1974; Hayes and Wheelwright 1984). Analysis of fit requires producers to decide how the supply chain should be configured, and how products and information should flow through the supply chain. The configuration issue has been addressed in a number of studies discussing what constitutes the 'right' supply chain for a given company. Classic examples include Fisher's framework for physically efficient vs. market-responsive supply chains (Fisher 1997), designing multiple channels (Godsell et al. 2011; Aitken et al. 2005), lean vs. agile supply chains (Mason-Jones et al. 2000; Bruce and Daly 2004), and 'leagile' supply chains (Naylor et al. 1999; Bruce and Daly 2004). The debate relates mainly to whether supply chains should be flexible and responsive or rigid and efficient (Reichhart and Holweg 2007; Aitken et al. 2005; Christopher and Towill 2002).

Chopra and Meindl (2013) argued that three basic elements need to be addressed in analysing strategic fit: market and customer needs, level of uncertainty, and supply chain capabilities. The needs of each customer segment must be understood in terms of specific requirements such as lead time, response time, product availability, variety of product range,

price, and product innovation. Level of uncertainty relates to variability in demand and the implied uncertainty imposed on the supply chain in related to satisfying customer requirements. Uncertainty can be mitigated by implementing buffers (e.g. by maintaining adequate levels of safety stock) or by sharing information. Supply chain capability refers to the production and distribution system's capacity to react to customer requests—that is, the ability to respond to a wide range of demanded quantities, to meet short lead times, and to handle a large variety of products. The basic argument in the literature to date is that fit exists when the supply chain's design in relation to customer needs, level of uncertainty, and supply chain capabilities align with overall supply chain strategy. Any mismatch would necessitate restructuring of the supply chain or adjustment of the competitive strategy (Chopra and Meidl 2013).

The concept of strategic fit is relevant to the speciality food supply chain because demand and market requirements significantly influence how the supply chain should be configured. As suppliers of speciality foods commonly operate outside the conventional food supply chain, they need to understand the logistical features of their own supply chain to be able to also configure it for the conventional supply chain. The concept of strategic fit is therefore a building block in an analytical framework for the speciality foods supply chain. We are aware of the existence of geographical indications (GIs) frameworks for origin-based systems, but these lack logistics and supply chain elements (Menozzi 2014). We argue that:

- The barriers to bringing speciality foods to the conventional channels are caused by the current configuration of the speciality foods supply chain.
- The way to improve market access is to adjust the supply chain's strategies for speciality food producers according to their capabilities.

2.3.2 Characteristics of the speciality foods supply chain

Analysis of a supply chain's key characteristics is required in order to understand its strategic fit. Several studies of production and supply chains have argued the importance of the main product-, market-, and production-related variables for understanding the environment (see e.g. general studies such as Selldin and Olhager 2007; Wänström and Jonsson 2006; Fisher 1997; Hayes and Wheelwright 1979; Skinner 1969; and specific food-related studies such as Ivert et al. (forthcoming); Romsdal 2014; Kittipanya-ngam 2010; Verdouw and Wolfert 2010). Here, we deploy these variables to describe the speciality foods supply chain. However, because we maintain that distribution of speciality foods represents a barrier, we have separated distribution-related aspects from market- and production-related variables, adding distribution as a fourth variable.

Product-related variables. Previous studies have identified shelf life, life cycle, product variety and range, volume, and predictability of volume as important product characteristics (Romsdal 2014; Manzini and Accorsi 2013; Joshi et al. 2012; van Donk et al. 2008; Aramyan et al. 2007; van Donselaar et al. 2006; Ferguson and Ketzenberg 2006). The literature on niche food highlights similar characteristics, but with a much stronger focus on the geographical dimension as an added value element (Dentoni et al. 2012). The quality features of speciality foods are important (Visser et al. 2013; Durham and Cawley 2012; Pearson et al. 2011; Ekelund and Tjärnemo 2009), especially as speciality food products offer uniqueness and add value by virtue of raw materials, production processes, region, and recipe (Abatekassa and Peterson 2011;

Hingly et al. 2010; Ilbery and Maye 2006). Quality is often communicated though labelling and certification arrangements (Kvam et al. 2014; Ilbery and Maye 2006; Jansen-Vullers et al. 2004), allowing the producer to claim a higher price than for conventional products (Visser et al. 2013). In addition to chilled, frozen, and dried products, speciality foods tend to include a high proportion of fresh products (Visser et al. 2013; Abatekassa and Peterson 2011; Pearson et al. 2011; Hingley et al. 2010), whose shelf life varies from a few days to weeks or months. In sum, we include uniqueness, value added, shelf life, and product range as the most important variables to describe product-related characteristics.

Market-related variables. In previous studies relating to conventional foods, market variables have generally related to service requirements, demand and supply variability, and seasonality (Romsdal 2014; Aitken et al. 2005; Lee 2002). The literature on niche foods tends to focus on selling channels and on motivations for buying local products, which include sustainability, personal choice, and lifestyle, as well as regional policy reasons (Pieniak et al. 2009; Chambers et al. 2007; Roinen et al. 2006; Weatherell et al. 2003; Jones 2002). For retailers, the order-winning criteria when selecting suppliers seem to be volume and cost; retailers prefer to buy speciality food products from intermediaries because of discounts and the guarantee of delivery stability. Speciality food producers may not always be reliable or consistent suppliers, which affects the level of transaction uncertainty (Gellynck et al. 2012). The lack of coordinated deliveries from local producers is also considered a disadvantage (Visser et al. 2013; Abatekassa and Peterson 2011; Ilbery and Maye 2006; Henchion and McIntyre 2005). Additionally, demand varies according to seasonality and consumer preferences (Abatekassa and Peterson 2011; Hingley et al. 2010; Little et al. 2010; Khan and Prior 2010; Hardesty 2008; Banterle and Stranieri 2006). On that basis, we include order-winning criteria, demand, and service level as the most important variables to describe market-related characteristics.

Production-related variables. The main production-related variables in previous studies of conventional foods include production strategy (make-to-stock and make-to-order), level of automation, process technology, and raw material supply (Ivert et al. (forthcoming); Romsdal 2014; van Donk et al. 2008; Alfnes et al. 2006; van der Vorst et al. 2001). While the niche food literature is quite extensive on producers' organisation (PO) and collaboration (e.g. how to exploit marketing strategies and awareness and how to manage GI systems) (Dentoni et al. 2012), there are fewer studies of speciality foods production operations. Only a few studies mention the restricted capacity and micro-size of producers in terms of volume and number of employees (Menozzi 2014; Visser et al. 2013; Abatekasa and Peterson 2011; Banterle et al. 2010; DEFRA 2003; Trienekens et al. 2003). Capacity restriction also limits the ability to spend time on other issues such as market and customer management, strategic development, and supply chain management (Kvam et al. 2014; Banterle et al. 2010; Hardesty 2008). Small order quantities limit opportunities to exploit economies of scale. The main production strategy is make-to-stock (MTS), based on sales forecasts and expectations (Dreyer et al. 2014). For speciality products, the level of process technology is relatively low, with a high degree of artisanal, handicraft and specialised processes, and batch- and job shop-oriented production. Growth time for raw material is often long, seasonal, and weather- and yield-dependent, creating supply uncertainty and long lead times and limiting producer flexibility (Dreyer et al.

2014; Pearson et al. 2011; Hingley et al. 2010; Little et al. 2010; Kahn and Prior 2010; Ilbery and Maye 2006). Food clusters exist to exploit horizontal and vertical benefits of collaboration in the supply chain (Matopoulos et al. 2007). In sum, we include order quantity, supply uncertainty, capacity, production strategy and technology, and collaboration as the most important variables to describe production-related characteristics.

Distribution-related variables. The distribution of conventional foods is generally related to variables such as transport, physical goods handling, terminal operations, and delivery service (Entrup 2005). The niche food literature primarily addresses distance to market and geographical issues (Hingley et al. 2010; Jones et al. 2004). Previous studies have reported that the highest volumes of niche food products are sold in the local area or within a narrow geographical radius (Pearson et al. 2011; Hingley et al. 2010; Jones et al. 2004). However, order lead times tend to be long (Abatekassa and Peterson 2011); one reason for this may be that producers need to have their own transport and freight services, making it more difficult to implement high-performing distribution solutions (Martikainen et al. 2013, Pearson et al. 2011). Some studies have focused on horizontal and vertical collaborations between producer and partners in the supply chain, including terminal operations, shared production facilities, and product development (Pieniak et al. 2009: Matopoulos et al. 2007; Cadilhon and Fearne 2005). Such collaboration alleviates the impact of low order quantities and capacity limitations (Abatekassa and Peterson 2011; Matopoulos et al. 2007; Cadilhon and Fearne 2005), and strengthens labels and designated food regions (Pieniak et al. 2009). The literature on physical operations addresses the availability of logistical infrastructure, transport service, cross-docking operations, and inventory services (Martikainen et al. 2013; Nordmark 2012; Ilbery and Maye 2006). In sum, we include order quantities, lead time, distance to market, and physical distribution as the most important variables to describe distribution-related characteristics.

2.3.3 Analytical framework linking strategic fit and characteristics of speciality food supply chain

The present study focuses on the elements of strategic fit in supply chains (operationalised as customer needs, level of uncertainty, and supply chain capability) and characteristics of the speciality foods supply chain (operationalised as product, market, production, and distribution variables). The analytical framework, presented in Table 1, builds on the relation between these two aspects.

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3 Research methodology

This study elaborates on existing theory and applies the theory of strategic fit (Chopra and Meidl 2013; Hayes and Wheelwright 1984). However, as the context of the speciality foods supply chain is not sufficiently understood for testing of established theories, it was decided to extend an existing theory. We therefore developed an analytical framework for investigating the relationship between the elements of strategic fit and supply chain characteristics (see Table 1). Analysis of the case studies is accompanied by a literature review that focuses on the

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interplay between theory and data to illustrate and elaborate the concept of strategic fit in the context of supply chain configuration (Ketokivi and Choi 2014).

The case study research method (Yin 2014) was used for data collection and analysis. This approach produces detailed and in-depth knowledge of the study object (Eisenhardt 1989) by asking 'what' and 'why' questions (Yin 2014) and allowed us to study speciality foods supply chains in their natural context, utilising the participating companies' experience and knowledge (Barratt et al. 2011). Additionally, when there is uncertainty in the definition of constructs (e.g. understanding speciality foods as a food niche), the case study method can help to clarify the context (Stuart et al. 2002). By using multiple exploratory cases, each case served to deepen the context while the collection of cases served to broaden the scope. The use of multiple cases enabled us to identify and describe critical variables related to product, production, distribution, and market (Stuart et al. 2002), as well as the constraints experienced by niche speciality food producers.

3.1 Selection of case supply chains and interview respondents

The case study environment was Mid-Norway region, which is a major food producing region, encompassing almost all types of speciality food produced in Norway. There are about 3,500 farms and growers in this region, and the sector employs nearly 24,000 people (11% of the total number of employees in the region). The number of small and medium-sized food producers is about 150 (Handlingsplan for matspesialiteter i Trøndelag), and the sector creates value of nearly EUR 0.7 billion (www.slf.dep.no).

Five cases (including individual producers and clusters of producers of speciality food) were selected for this study (Table 2).

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[Table 2 about here]

The criteria for selecting the case supply chains were as follows. First, production, logistics, and distribution should be among the main value-creating activities (including the criteria specified in section 2.1) of one or more of the supply chain participants. Three supply chains comprised individual producers and two were clusters of individual producers, collaborating on logistics. Second, the supply chains should be comparable in terms of size and rural location. Most speciality food producers in Norway are small to micro-sized companies; for that reason, it was decided to focus on companies with less than 15 employees (Kvam et al. 2014). Third, production should include processing of raw material into finished products, with a mix of fresh and long shelf life speciality products. Fourth, we wanted to ensure representativeness of geographical market and distribution channels. Fifth, the case supply chains should include conventional customers in their overall customer portfolio (i.e. retailers, hotels, and restaurants in the medium to premium market segment). We discussed the selected sample with a trade organisation and industrial representatives from the sector, who confirmed its quality.

3.2 Data collection method

To obtain in-depth information and to clarify nuances in the material provided by the subjects, semi-structured interviews (telephone and face-to-face) were used as the main data collection technique. Following Yin (2014), an interview protocol was designed and then tested in three

pilot interviews prior to use in the data collection process. The protocol was designed to engage with the four main supply chain configuration variables and the main actors in the supply chain (producers, distributors, and customers). As six researchers were involved in the study, the protocol helped to ensure that all shared the same understanding of the basic concepts, terminology, and issues of relevance to the study. Weekly telephone discussions were arranged with all researchers for mutual updates and to discuss any challenges in data collection or analysis. During company visits, researchers were shown around production sites, which provided complementary data.

Basic facts about the case supply chains were collected and reviewed prior to case visits. In total, 24 interviews were conducted (see Table 2), involving customers (two hotels, one restaurant and one store), one distributor, one wholesaler, and 18 speciality producers/processors. All interviews involved key personnel such as chief executive officers (CEO), sales and operations managers, and store managers. Each interview lasted between two and four hours and was supplemented by reviews of archival data (e.g. blueprints and PowerPoint presentations) and annual reports. At least two (and up to four) researchers were present during each visit. Interviews were recorded, and notes were also taken. Immediately after each visit, the interview was transcribed and summarised by the researchers; transcripts were subsequently sent to the companies concerned for approval and verification (Yin 2014).

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3.3 Procedures for case data analysis

The theoretical framework developed in Section 2 was used to structure the analysis, following the procedures for qualitative data analysis described by Miles and Huberman (1994). The interview field notes were converted to detailed case stories; as suggested by Yin (2014), key interviewees were asked to review these case stories to ensure their validity. The transcripts were coded by three researchers, following Miles and Huberman (1994) and using the analytical framework described in Table 1 and the case study protocol as the main structure. Additionally, results of the analysis and proposed strategies were presented and discussed in four meetings and workshops with representatives from the case companies and the speciality food sector. These discussions were of great value for detecting nuances relating to the case supply chains, which increased the quality of the findings. In each of the cases, we identified the supply chain variables (as in Table 1).

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Cross-case analysis helped to identify similarities and differences among cases and to understand the nature of the individual challenges, as well as variations among supply chains (Eisenhardt 1989). To summarise the data related to supply chain variables, we conducted a comparative evaluation of cases. Subsequently, we analysed market requirements, level of uncertainty, and supply chain capability before discussing the relationship between demand and uncertainty and capability of the niche food supply chain.

4 Case supply chains

This section summarises the case studies. Data are structured according to the framework in Table 1.

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The Seashell supply chain is characterized by narrowness of product range and customer scope and the distribution system is aligned to this constraint. (See Table 3.) Seashells are sold to a

few specialised food wholesalers, located within a concentrated geographical area. Product shelf life is only a few days, and product is distributed directly to customers, with daily deliveries and a short order lead time. As demand varies, a method for buffering mussels before specific orders are known is used to maintain a high service level.

[Table 3 near here]

As in the case of Seashell, the Cheese supply chain is characterized by premium quality, uniqueness, and narrow product range (Table 4). However, Cheese differs in customer range, which is wider in terms of number of customers, customer categories (stores, restaurants and hotels), and customer location. Products are consolidated at a hub and are kept in stock, to meet demand variability and to exploit the benefits of using a single distributor, which delivers to each individual customer. Product shelf life is restricted, with distribution a few times a week, according to delivery quantity.

[Table 4 about here]

The Meat supply chain is characterized by broad product and market scope, with several product types and different categories of customer (Table 5). Nearly all customers are located within a few hours driving distance. The producer delivers to each individual customer, offering frequent deliveries (according to a fix schedule) and short order lead time. The products, which are mostly frozen or dried, are kept in stock to manage demand variability and production capacity.

[Table 5 about here]

The Potato supply chain has narrow product and market scope. Products are sold through speciality wholesalers (Table 6). The Potato supply chain consolidates volumes from several potato growers. The main market is local and regional customers, including stores and a few hotels, restaurants, and private consumers. Product is kept in stock at the packaging unit for sorting and packing to order. From date of packaging, the product's shelf life is 18 days.

[Table 6 about here]

The Miscellaneous supply chain offers a broad product range to retail, hotel, and restaurant customers (Table 7), using the same distributor as the Cheese supply chain, who delivers directly to customers around Norway. Products, which are fresh/chilled, frozen, or dry, are kept in stock at a hub unit. Orders are consolidated at the hub and are then picked and packed for shipping three times a week.

[Table 7 near here]

The tables confirm that the products in the five speciality supply chains are unique, with added value features. The products are attractive because of their niche features. Product range varies, and some supply chains (Meat and Miscellaneous) offer both chilled and frozen products, requiring suitably designed distribution systems. In all cases, orders are served from stock, which acts as a buffer against demand and seasonal variability. Volume per order is low, and

several of these supply chains have broad market scope. Volume and distribution area impact on distribution frequency. The Seashell supply chain offers daily deliveries to a few customers located in the area. Some supply chains (Cheese, Meat and Miscellaneous) deliver directly to customers while Seashell and Potato deliver to wholesalers.

5 Analysis of speciality food supply chain configuration

In this section, the supply chain configuration of case companies is analysed.

5.1 Customer needs

The order-winning criteria in Tables 3 to 7 indicate that customers include speciality foods in their product offerings or menus because of the distinctive market attributes of these products. They are willing to pay for uniqueness in terms of raw material, recipe, processing method, and region, as well as for value added by quality, taste, and label, all of which may be used as a means of attracting consumers. This observation aligns with findings reported in the existing literature (Kvam et al. 2014; Menozzi 2014; Visser et al. 2013; Mintell 2012; Abatekassa and Peterson 2011; O'Reilly and Haines 2004), highlighting the importance of raw materials, production processes, and region of origin. As opposed to industrial food producers, these attributes contribute to the attractiveness of niche products, giving speciality producers a strong position in the food supply chain.

Although these customers commonly prefer suppliers who offer a broad product range, which keeps the number of suppliers and transaction costs low, we found that breadth of product range was of less importance as an order-winning criterion when considering speciality foods and selecting suppliers. However, these customers emphasised that supplier selection criteria depend significantly on product, total sourcing cost, and the supplier's ability to deliver. Visser et al. (2013) and Abatekassa and Peterson (2011) reported similar findings, and our study points more specifically to reliability, frequency, and lead time as issues of particular importance. Interestingly, we observed that store, restaurant, and hotel customers buy speciality foods for their ability to attract consumers. Previous studies have focused more on conventional customer and decision criteria such as local economy, environment, and hedonic and health issues (Pieniak et al. 2009; Chambers et al. 2007; Roininen et al. 2006; Weatherell et al. 2003).

The interviews also confirm that the features of speciality foods allow producers to sell in the high-end segment, leading to high expectations of quality and service level (reliability, order fulfilment rate, order lead time, frequency, and shipment directly to store or restaurant). This observation echoes findings reported in previous studies (Visser et al. 2013; Abatekassa and Peterson 2011). Additionally, we observed that customer order quantities were generally low—often involving only a few items at a time. As noted by Hingley et al. (2010), producers commonly had to organise deliveries to each specific store, restaurant, or hotel because they could not efficiently handle the shipment (packaging size, load carrier, and volume) within their existing system. These remain ongoing issues for speciality food suppliers. High service level requirements are associated with high costs for speciality food producers because the volume shipped is low, and the availability of suitable distribution services is limited. Customers confirmed that, in combination with a short shelf life, if the cost of buying speciality food products became too high, they would not buy the product, or they would find a supplier nearer by. This demonstrates that supply chain effects hinder conventional customers' access to

speciality foods and aligns with the findings of previous studies (Visser et al. 2013; Abatekassa and Peterson 2011; Hingley et al. 2010).

As in earlier studies, we found that customers emphasised speciality food suppliers' reliability and ability to deliver (Visser et al. 2013). Interestingly, we observed a slight difference in the service level required by retailers and restaurants/hotels. While retailers declared 97% performance (ranking availability, reliability, and remaining shelf life) to be the most important criterion, restaurants and hotels prioritised quality, uniqueness, and delivery service. Restaurants and hotels are more flexible than retailers regarding availability because while menus can be adjusted, the retailers' assortment is focused on a longer time period.

5.2 Supply chain uncertainty

Variability in peaks of demand, supply, and seasonality, as well as length of lead time, service level requirements, limited communication, demand for information exchange, and product shelf life are the most important factors affecting the level of uncertainty in supply chains. These problems remain to be overcome by speciality food producers.

Demand and supply vary with seasonal peaks in the availability of raw materials and finished products, and with weather and growth conditions, as in the Shellfish and Potato cases (affecting quality and volume of raw material). In all the cases here, seasonal variability was an issue. The interviews with retailers revealed that because speciality foods are high-end products, they are consumed in small quantities and are often purchased for special occasions such as weekends and holidays. For that reason, demand for these products will vary within and between weeks and depending on where the products are sold (e.g. close to resorts and recreation areas as against city centres). Menozzi 2014 made a similar observation in relation to producers of extra virgin olive oil.

The Shellfish producer claimed that their decision to sell to only a few customers in the same category (i.e. speciality food wholesalers) was a way of levelling demand variability. The other producers had vague market strategies in terms of customer segments and geographical spread, echoing findings reported by Kvam et al. (2014). This latter strategy offers a means of handling uncertainty by having many customers to choose from; the associated risk is an inability to fulfil customer requirements, especially if delivery flexibility and capacity are low. Serving multiple customer segments in different geographical areas increases variability of requirements and the need to offer different delivery systems; it also increases out-of-stock or delayed delivery risks.

Despite the variability in level of demand, the only information exchange between producer and customer in these case studies was the customer's order. The speciality food producers confirmed that they planned their activities on the basis of historical information and market forecasts as they did not know what the customer would need or how many items the store, restaurant, or hotel had in stock. This is generally the case in the conventional food supply chain as well. However, for speciality food products (which are sold and delivered directly to the store or the restaurant), information about demand or stock level could have been easily obtained. Reporting this lack of information exchange, Abatekasse and Peterson (2014) noted its importance for the success of speciality products in the conventional supply chain.

Although speciality food products often have an anonymous profile by comparison with the high market recognition of well-known brands of conventional food products, the stores did

not offer in-house sales support such as promotions or product information. While some stores designated a specific area for speciality foods, the main operating principle was that the product should sell without any particular promotional efforts from store personnel. The interviews showed that producers were concerned about the impact of this lack of sales support on demand, which would improve if the products were promoted in the store. Ilbery and Maye (2005) and Kvam et al. (2014) demonstrated the importance of communicating the quality of speciality products, which could be achieved by labelling and certification. We observed that the Cheese producer deliberately built credibility and brand recognition through international and national food competitions and awards, enabling them to choose which stores they wished to sell to.

5.3 Supply chain capability

While the two cluster cases and the Meat producer offer more varied product ranges, the Cheese and Shellfish producers sell only a few products because of resource limitations. Cheese is delivered by a distributor; a few products are delivered to national customers, but delivery time can be up to a week. Because of its narrow product and customer range, the Shellfish producer has arranged a distribution system with high delivery frequency (daily) and short delivery time, while the Meat producer (who operates only in the local area), handles their own deliveries as required. The two cluster cases (Miscellaneous and Potato) consolidate volumes and products in the cluster and can offer national deliveries three times a week. In the case of Miscellaneous, it can take up to a week to deliver products to national customers.

In all these cases, a make-to-stock (MTS) strategy means that theoretical order lead time is low. However, as delivery frequency is confined to once or a few times weekly (Cheese, Miscellaneous cluster, and Potato cluster), actual order lead time depends on when the order is placed in relation to the shipment date, and on distance to the customer. In line with the findings of Martikainen et al. (2013) and Nordmark et al. (2012), all the producers told us that it was difficult to find distribution services that would allow them to provide satisfactory delivery frequency, delivery time, and cost. For fresh speciality foods, critical elements include lead time in relation to product shelf life and a temperature-regulated environment during handling and transport.

In retailing, there is a legal clause stating that at least one-third of a product's shelf life should remain when the product enters the store (STAND010). For products that are highly dependent on freshness (as in the Shellfish case), this means that transport time must be short, with few load transfers, to maintain high quality and prevent waste. If the geographical distance to customers is long, as in the case of the Food cluster, finding a high-speed solution that is not too expensive may be challenging. In the Food cluster, whose loads were often a mix of fresh and frozen products, we noted a difficulty in getting the distributor to carry both fresh and frozen products on the same transport unit, as the volume of frozen products was low and variable. Following Visser et al. (2013), we would argue that highly perishable products require short delivery times, high speed and throughput times, and fewer handling and terminal operations if high quality is to be maintained.

Supporting the findings of Visser et al. (2013), our interviews showed that retailers, restaurants, and hotels find reliability among speciality food producers more variable than among conventional suppliers. Serving several customer segments with low volume production and restricted capacity makes these producers vulnerable to variability in demand, impacting

on their ability to deliver. Strict capacity and resource limitations reduce their ability to increase volumes produced or to change the production mix. For instance, it was reported that sales of speciality food products during food events and farmer markets led to out-of-stock situations and delayed deliveries to other more regular customers.

6 Supply chain propositions

Analysis of the speciality food supply chains shows that their main characteristics are the high product quality and uniqueness, low production volume, low order quantity, demand variability, long lead time and, for some products, long distance to a broad range of customers, as well as a narrow range of specialised high-value products, a lack of suitable physical logistical services; against this, there is high customer willingness to buy their products. The analysis additionally identifies three categories of speciality food chains. Shellfish has a narrow product and customer range and has customized distribution on this basis. Similarly, the Potato supply chain distributes product through its customer's distribution system. The Cheese and Miscellaneous supply chains distribute a wide variety of products to many customers, and the Meat supply chain operates mainly in the local geographical area. Distribution is challenging in all cases and remains a problem, but of particular concern are cases with a wide product range involving different customer categories spread across long distances.

In line with previous research, the present study confirmed strong customer and market interest in speciality foods. However, three of the supply chains (Cheese, Meat and Miscellaneous) distribute their products to conventional customers but not within a conventional food distribution system, echoing Martikainen et al. (2013). We also found that the two cluster cases accrue benefits from collaboration and from consolidation of volume and products, as suggested by Abatekassa and Peterson (2011). However, previous research on speciality food producers has argued that such limitations in the niche food system should not be considered a disadvantage but must be used for profitable differentiation within the food market (Hingley et al. 2010).

To conclude the analysis the food speciality offered by the five producers has some very strong qualities, but the characteristics of operations and logistics makes it clear that the supply chain strategies should be different from the industrial food chain. We propose a set of supply chain strategies that speciality food producers can adapt in order to overcome supply chain obstacles. While each of the following propositions can be applied individually, application of propositions 3 and 4 requires the fundamental collaboration suggested in proposition 2. The propositions highlight the differences between a standalone producer and a food cluster.

6.1 Market and product strategy

The food market is broad and complex in terms of products, customers, and demand variability (Kittipanya-ngam 2010; Aramyan et al. 2007; van der Vorst et al. 2005), and requirements differ across customer segments (Mintel 2012). Previous studies have argued for a focus on the supply chain and differentiation to handle this diversity and complexity (Mintel 2012; Christopher and Holweg 2011; Godsell et al. 2011; Aitken et al. 2005). However, our study indicates a prevailing tendency towards a 'one-size-fits-all' approach—that is, in addition to

their rather broad market and product strategy, producers and cluster cases apply the same supply chain systems to serving stores, hotels, and restaurants.

Serving multiple segments (products and customers) can be used either as a strategy to mitigate demand variability by levelling demand or to gain volume benefits by selling to different customers. Gellynck et al. (2012) and Banterle et al. (2010) argued that small and medium size (SME) food companies find it difficult to develop a market and product strategy by analysing the market situation. This is supported by Kvam et al. (2014), who suggested that Norwegian speciality food producers have limited knowledge of customers and their preferences, which impacts on market strategy and services offered.

For speciality food producers serving different customer segments, the essential question is where to sell what product, as an already low volume must be divided across a large number of delivery points, affecting cost and service level. In line with earlier studies (Visser et al. 2013; Gellynck et al. 2012; Mintel 2012), we argue that producers should carefully decide their market objective, and where and how to sell which products. If a broad customer portfolio means a wide geographical area and long distances, the time dimension and product shelf life become relevant issues. This leads to our first proposition, which states the general need for a market strategy.

Proposition 1

Speciality food producers and food clusters can increase service levels and fulfil market requirements by scoping their market and product strategy, prioritising what product to sell, to what customers, and in which geographical area.

6.2 Supply chain collaboration

The present study confirms that scale and volume affect supply chain configuration. In the two cluster cases, the producers collaborate on such matters as order management, warehousing, and inventory in order to consolidate volume and product range. This approach makes it easier for local producers to increase frequency, volume, price, and availability (Martikainen et al. 2013; Bosona and Gebresenbet 2011; Hingley et al. 2010). The alternative, non-collaborative model is exemplified by the Shellfish, Meat, and Cheese supply chains.

Previous studies have shown that, unlike the conventional food supply chain, volume and size are not the speciality food chain's main objectives. Further, small food producers preferred to remain small and had no ambition to grow as they anticipated that this would affect them negatively and eliminate the artisanal elements of their operations (Menozzi 2014; Abatekassa and Peterson 2011; Banterle et al. 2010). In terms of flexibility and responsiveness, smallness of scale is considered beneficial (Gellynck et al. 2006). According to Oglethorpe and Heron (2013), issues of scale burden and resource scarcity impact cost efficiency as well as flexibility and responsiveness, leading to inefficiency.

One strategy for mitigating scale burdens and reducing uncertainty is to explore vertical and horizontal collaboration (Menozzi 2014; Pil and Holweg 2003). In the fast-moving consumer goods sector, emerging collaborative concepts such as vendor-managed inventory (VMI) can help to integrate and reduce lead time, uncertainty, inventory level, cost, and service level. Removing market barriers and improving purchase arrangements to expand market share would help farmers to provide a broader product range and better customer service levels

(Abatekassa and Peterson 2013; Martikainen et al. 2013; Nordmark et al. 2012; Bosona and Gebresenbet 2011; Cadilhon et al. 2005), leading to the second proposition.

Proposition 2

Speciality food producers can mitigate scale burdens through horizontal and vertical collaborations in the supply chain by developing joint arrangements for supply, production, and distribution operations.

6.3 Information sharing

The present analysis shows that speciality food producers/clusters mainly use historical sales information to plan and control the supply chain. To mitigate the impact of demand variability, an efficient strategy would be to access demand information at an early stage, to include planned orders, stock levels, market activities, and campaigns. Shared demand information and the necessary insight to plan, control, and make the right decisions related to customers, orders, and processes will have a positive impact on supply chain flexibility, responsiveness, and capacity utilisation—especially in an environment characterized by limited resources, demand variability, and products with a short shelf life. For example, the Shellfish producers noted that store managers tended to order too much because they lacked the necessary information to make the right decisions about quantity. These high stock levels occasionally meant a decrease in product quality and bad will towards the producer. Although sharing demand and supply information is not confined to the speciality food supply chain, the strategy is highly relevant in this context because of strict capacity restrictions, demand variability, and seasonality.

These findings align with previous studies such as Baihaqi and Sohal 2013, Trienekens and Wognum (2013), Abatekassa and Peterson (2011) and Cadilhon et al. (2005), highlighting the importance of information-sharing capability for speciality food supply chains in reducing uncertainty and creating a trust-based atmosphere of collaboration. None of the case producers here had access to their customers' future order plans. The way forward, then, is to acquire information from collective bodies such as hubs or producers' organizations, directly from customers, or by the use of forecasting systems for subsequent analysis and incorporation into planning systems. Visser et al. (2013) suggested that the electronic communication of information would make the order process more time-efficient while simultaneously increasing flexibility and service level. This leads to the third proposition.

Proposition 3

Speciality food producers and food clusters can reduce supply chain uncertainty by sharing information about stock levels, delivery status, sales, production plans, market activities, and events in the supply chain.

6.4 Integrated supply chain control model

We observed that each company in the supply chain was planned and controlled individually, independent of other participants, functioning mainly on the basis of MTS and planned activities rather than real demand. As argued by Dreyer et al. (2014), this approach is likely to affect lead time, stock level, food wastage, cost, ability to prioritise orders, and reliability.

A strategy to increase performance in the food supply chain and improve indicators such as lead time, reliability, stock level, and food wastage requires adjustment of the supply chain to plan and control the model according to demand patterns (Chopra and Meindl 2013). This means allowing market and product strategy and demand and order patterns to determine when, what, and how to produce, when and what products to pick, pack, and deliver, and how frequently, systematically prioritising customer orders and deciding stock level size. Once these principles are set, operations need to be coordinated and integrated across the different participants in the supply chain (Simchi-Levi et al. 2008), developing a configuration that exploits flexibility (Romsdal 2014).

By allowing the actual order or the customer's order plan determine how to differentiate the production, what to have in stock, which order to serve, and how to deliver, producers would be able to control the supply chain more precisely. Analysis of where to place the customer order de-coupling point (CODP), where the product is connected to a specific order, further increases flexibility and differentiation between product and customer categories (Olhager, 2010). In the Food cluster, the CODP is moved from the producers to the cluster company, creating flexibility in terms of what orders are fulfilled, and how. A model in which the producer assumes responsibility for replenishment of products based on information about the customer's stock level is known as an alternative pull strategy. This leads to the fourth proposition.

Proposition 4

Speciality food producers and food clusters should apply integration planning and control to reduce lead time, stock level, and food waste, and to increase flexibility and responsiveness by designing control principles for what, how, and when to produce and deliver speciality food products.

6.5 Specialised distribution services

The present study shows that the obstacles to distribution are issues of frequency, cost, and volume and a lack of access to suitable transport services. Previous studies support our finding that the local supply chain is fragmented and inefficient (Visser et al. 2013; Normark et al. 2012; Bosona and Gebresenbet 2011). However, our findings additionally indicate that the high value of speciality food products can justify customised and sophisticated services, as previously noted by Martikainen et al. (2013) and Normark et al. (2012). The appropriate solution for speciality food producers is one that allows flexibility in mode of transport, type and number of logistics and transport services (storing, transport, planning and administrative, etc.), and price and cost model, which is similar to Martikainen et al.'s (2013) proposal. The higher a product's value, the greater is the margin for a specialised delivery system, ensuring product quality and high service level in terms of speed, direct deliveries, few transhipments, high frequency, small load size, and flexibility.

Proposition 5

Speciality food producers and food clusters should invest in the development of specialised distribution services and should use specialised service providers and logistical clusters

to reduce lead time, increase delivery frequency, and ensure high service level and product quality.

7 Conclusion

This study investigated the supply chain strategies of five Norwegian speciality food producers, using an established theory from the strategic fit literature. Our empirical observations indicate a misalignment between the configuration of the speciality food supply chain and the market requirements of retailers, hotels, and restaurants. We established that speciality food producers have specific markets, specific products, and specific production and distribution characteristics, and we argue that these characteristics should be incorporated in a responsive supply chain configuration to ease market access for speciality food producers. Among the most important of these characteristics are premium quality, small production and distribution volumes, long production lead times, and variability of supply and demand. Our analysis indicates that speciality food producers should move towards niche product supply chain strategies. We developed five propositions to suggest what the main elements of such a niche supply chain strategy should be: scope the market and product strategy; establish collaborations to gain scale benefits in inventory and distribution operations; share demand information in the supply chain; coordinate planning and control in the supply chain; and use specialised distribution services.

The theoretical contribution of the present study is to extend the strategic fit and supply chain configuration literature to the small-scale artisanal producer environment. The dimensions of strategic fit are operationalised in the analytical framework and are discussed by reference to data from the case studies. Additionally, the supply chain planning and control literature is enriched by the results of our analysis, which indicate how the features of niche products or products that do not fit into the conventional supply chain should be adjusted. Although previous studies have noted the weaknesses of speciality food sector supply chains, few have examined the entire supply chain or looked specifically at operational processes and their relation to bigger market requirements. The managerial insights of this study are also relevant, identifying important supply chain characteristics and strategies that can be used for analytical purposes and to align the supply chain to strengthen the position of speciality food producers. Previous studies reported that producers of speciality foods pay little attention to logistics. This study articulates a set of propositions that can improve market performance.

We investigated a limited number of cases in a specific region, and further research is required to validate the results for a broader sample of supply chains and for speciality products in other industries and regions. This study could be extended to include more customers, products, and producers. The study focused on speciality foods, illustrating the need for specific supply chain strategies for niche and small-scale producers. We anticipate that the results presented here can be extended to other niche environments that face similar challenges, such as handicraft production and other rural commercial activities, spare parts production, and specialised textile and clothing production. The results indicate that horizontal and vertical collaboration can strengthen the supply chain. This should be explored further by testing the propositions presented here.

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Table 1. Relationship between elements of strategic fit and supply chain configuration variables

Elements of strategic fit	**Variables: speciality foods supply chain characteristics**			
	Product	**Market**	**Production**	**Distribution**
Customer needs *(for each targeted customer segment)*	• Uniqueness • Value added	• Order-winning criteria	• Order quantity	

Level of uncertainty *(level of unpredictability that supply chain must be prepared for)*	• Shelf life	• Demand	• Supply	• Lead time
Supply chain capability *(ability to meet demand and uncertainty in the supply chain)*	• Product range	• Service level	• Capacity • Production strategy and technology • Collaboration	• Distance • Physical distribution

Table 2. Case companies.

Case	Supply chain partners	Focal speciality producer	Customers	Interview
Seashell supply chain	Producer of seashell (farming and harvesting); Two freight forwarder companies	Farming, harvesting and processing mussels; EUR 1.8 million; 13 employees	Two/three wholesalers of speciality food who subsequently sell to high-end restaurants, hotels, and stores in Norway; national agent who sell to customers in the international market	6 interviews in total: CEO and operations director of the mussel producer; Store manager (common for all cases); Restaurant owner (common for all cases); Hotel manager (common for all cases).
Cheese supply chain	Producer (farmer and producer) of cheese; dairy distributor with transport routes and terminals	Milk farm and cheese production. EUR 0.6 million; 9 employees	Selected stores, restaurants, and hotels located nationally	7 interviews in total: CEO and production manager of the cheese producer (2); Store manager (common for all cases); CEO of dairy distributor (see Miscellaneous supply chain); Restaurant owner (common for all cases); Hotel managers (common for all cases)
Meat supply chain	A producer (farmer and producer) of miscellaneous meat products. Local meat farmers.	Farming and meat production. 0.5 mill. EUR. 5 employees.	Mainly local and regional hotels and restaurants; additionally, products are sold directly to consumers (farmer markets, farm stores, etc.), to conventional food retailers/stores and to some local stores	5 interviews in total: CEO and operations director of the meat producer; Restaurant owner (common for all cases); Hotel managers (common for all cases)
Potato supply chain	Five potato farmers and one sorting and packaging company; a conventional food wholesaler	Storing, sorting and packaging potatoes. EUR 2.3 million; 8 employees	Customers are mainly national wholesalers and retailers; products are also sold directly to consumers from the farm store	8 interviews in total: CEO and chairman of the board of the potato packager; Potato farmers; Wholesaler/retailer (See miscellaneous supply chain)
Miscellaneous food supply chain	24 individual producers and one hub company. A	Hub company; stores, sells, and distributes miscellaneous food	Main customers are national restaurants and hotels, wholesalers/retailers	11 interviews in total: CEO and chairman of the board of the hub company (2); Speciality food producers (3); A wholesaler/retailer

	dairy distributor with transport routes and terminals.	products; also governing label of products EUR 1.8 mill 6 employees		(see Potato supply chain); Store manager (common for all cases); CEO in dairy distributor (see Cheese supply chain); Restaurant owner (common for all cases); Hotel managers (common for all cases)

Table 3: Shellfish: supply chain characteristics and configuration variables

	Product	**Market**	**Production**	**Distribution**
Customer needs	*Uniqueness:* Attributes of raw material (organic), growth condition (light, water quality and temperature) and farming and harvesting methods *Value added:* Taste, colour, cleanness, consistent product size, leak-proof and environmental friendly packaging	*Order-winning criteria:* Product quality and service level allows them to choose who to sell to	*Order quantity:* Variability in order pattern; volume and time; fairly high volume per order	
Level of uncertainty	*Shelf life:* 10-12 days from packing date. Kept in a strict temperature regulated environment.	*Demand:* Variability caused by seasonality and weather conditions	Supply: Variability in supply of raw material due to growth conditions (winter ice, birds eat seashells)	*Lead time:* Growth time of 3 years; harvesting takes 2-3 days; production takes 1-2 days; order lead time is 2-3 days
Supply chain capability	*Product range:* One variant of seashell	*Service level:* Daily deliveries of shellfish packed on the same day as shipped; 1-2 days delivery lead time; reliable deliveries	*Capacity:* Restricted production capacity but can produce 6 days/week and work overtime *Production strategy and technology:* Harvest-to-stock and pack-to-order Manual harvesting and semi-automated processing and packing *Collaboration:* Producer of distribution packaging/improving packaging	*Distance:* Distance to customers in Norway is 550 km. *Physical distribution:* Responsible for transport to customers in Norway using two freight companies (local and national)

Table 4: Cheese: supply chain characteristics and configuration variables

	Product	**Market**	**Production**	**Distribution**
Customer needs	*Uniqueness:* Recipe and production and maturing process *Value added:* High quality, international and national awards Characteristic taste	*Order-winning criteria:* Product quality and award winning label allows them to chose customers; high segment stores, restaurants and hotels	*Order quantity:* Small quantities, frequent; customers require product availability.	
Level of uncertainty	*Shelf life:* Varies but normally between 14 and 30 days; chilled products require stable temperature	*Demand:* Relatively stable demand but peaking during holidays and weekdays (high peak at weekends)	*Supply:* Stable supply of milk from own farm production Production plans based on forecasts	*Lead time:* Production lead time (maturing process) is 1-12 months; order lead time is 3-8 days; delivery lead time is 2-7 days
Supply chain capability	*Product range:* 6 different product variants	*Service level:* Delivery frequency 1-2 days/week; high order fill rate to prioritised customers; reliable deliveries but long delivery time to distant customers	*Capacity:* Limited production capacity; in peak periods lower than demand *Production strategy:* Make-to-stock based on artisan processes and a few mechanical operations *Collaboration:* Chefs and selected stores for product development	*Distance:* Customers located around Norway; long distances *Physical distribution*: Distribution by provider (25.000 delivery destinations); direct deliveries to each store, restaurant and hotel

Table 5: Meat: supply chain characteristics and configuration variables

	Product	**Market**	**Production**	**Distribution**
Customer needs	*Uniqueness:* Quality and type of raw material; recipe and processing method;geographical indications *Value added:* Product quality created by growth conditions and uniqueness of finished products	*Order-winning criteria:* Product quality; customers are mostly local stores, restaurants, hotels, and private households who value direct delivery, reliability and availability	*Order quantity:* Low volume per order line	

Level of uncertainty	*Shelf life:* Varies from a week for fresh meat to 24 months for dried and frozen variants	*Demand:* Varies between product types, seasons and weekdays; peak season in fall and winter and increasing around holidays such as Christmas and Easter	*Supply:* Fairly stable and mainly comes from own farm production Access to some categories of raw material varies Production is planned according to previous years' sales	*Lead time:* Production and maturing lead time varies between 2 days and several months; order lead time is 1-3 days
Supply chain capability	*Product range*: 33 different variants of meat products from sheep, deer and reindeer	*Service level:* High order fill rate and availability for frozen and dried product variants	*Capacity:* Restricted production capacity, but overtime is used to level production *Production strategy and technology:* Make-to-stock production with semi-automated processes *Collaboration:* Joint marketing with speciality food producers in the local area	*Distance:* Mainly local customers – short distance *Physical distribution:* Deliver orders themselves directly to each individual customer

Table 6: Potato: supply chain characteristics and configuration variables

	Product	**Market**	**Production**	**Distribution**
Customer needs	*Uniqueness:* Raw material, geographical indication and sorting technique *Value added:* High product quality, growth conditions and taste	*Order-winning criteria:* Product type and quality, reliability, sorting and packaging method and flexibility	*Order quantity:* Order volume is variable and low (newly launched product)	
Level of uncertainty	*Shelf life:* 18 days from packing; sensitive to light	*Demand:* Variable demand as this is a seasonal and new product	*Supply:* Variable and dependent on weather in the growing period	*Lead time:* 3-4 month growth time; 1 week transport and packing process; order lead time 2-3 days

Supply chain capability	*Product range*: Several potato variants (this study focuses on one type only)	*Service level:* High product availability if not growth conditions restrict volume	*Capacity:* Dependent on growth conditions rather than packing capacity *Production strategy and technology:* Harvest-to-stock and packing-to-order; mechanical harvesting and optical automated sorting and packing *Collaboration:* Among different potato farmers and between the cluster and the manufacturer of optical sorting technology	*Distance:* Sold in regional and national markets – long distance *Physical distribution:* Collected at the packaging facility and distributed by the wholesaler

Table 7: Miscellaneous: supply chain characteristics and configuration variables

	Product	**Market**	**Production**	**Distribution**
Customer needs	*Uniqueness:* Geographical indication, growth conditions, and authentic processing techniques *Value added:* Quality of raw materials and finished products, taste, organic, processing methods; several of the products have won awards	*Order-winning criteria:* Premium quality and type of product make them attractive to customers; product label and geographical indication are recognized in the market	*Order quantity:* Varies significantly across different customer segments and depends on customer size	
Level of uncertainty	*Shelf life:* Varies from a few days to 1 year; products are chilled, dried and frozen	*Demand:* Fairly stable but varies for some products; seasonal demand (fall, summer, holidays) variation	*Supply:* Fairly stable supply with seasonal variability; most raw materials come from producers' farms; all products made to stock.	*Lead time:* Production lead time varies (several weeks for matured cheese); order lead time 2-9 days

Supply chain capability	*Product range:* 8 different product categories and more than 50 different products, ranging from dairy to meat, eggs, fish, berries, herbs, bakery and drinks	*Service level:* Deliveries 2-3 times/week; fairly high order fill rate	*Capacity:* Each producer has limited capacity *Production strategy and technology:* Make-to-stock and packing-to-order Artisan with some mechanical processes *Collaboration:* Between producers	*Distance:* Sold to customers on a national basis, making distance long *Physical distribution:* Shipment by a specialised distributor direct to customers

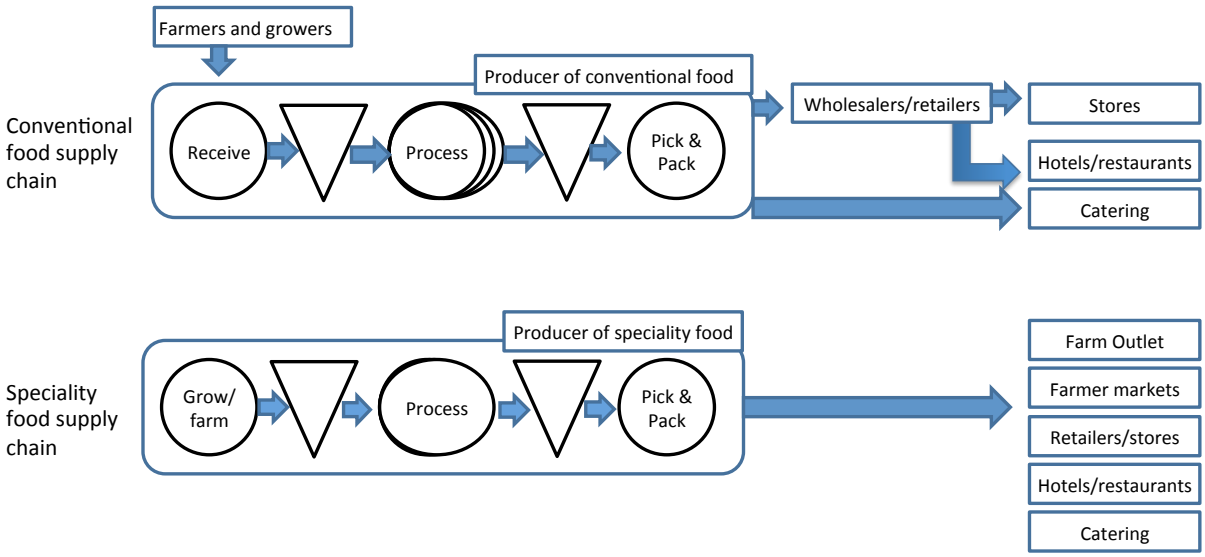

Figure 1. Conventional and speciality food supply chains.