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Identifying viewpoints on innovation in low-input and organic dairy supply chains: A Q-methodological study

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ABSTRACT

In a rapidly changing ecological, economic and political environment, environmentally sustainable and energy-efficient farming systems are required (SCAR, 2008). The development and adoption of innovation are critical to improve the competitiveness of organic and low-input dairy systems. Understanding the viewpoints of dairy supply-chain members on acceptable innovation is important to be able to improve organic and low-input dairy supply chains. This study uses Stephenson's Q methodology to investigate the opinions of organic and low-input dairy supply-chain members in relation to innovation in the dairy sector. A sample of dairy supply-chain members (consumers, farmers, retailers, processors) was recruited from each European country involved in the study (Belgium, Italy, Finland, the United Kingdom). On the one hand, the data show a high degree of consensus across all of the participants within the supply chain, for whom innovations were deemed not to be acceptable in organic (from an ethical and/or regulatory perspective) and low-input dairy systems. On the other hand, the consumer views of acceptable dairy innovations were centred around animal welfare, while the farmers and processors/retailers preferred innovations related to feed quality, feed efficiency, and soil management. This study illustrates the value of Q methodology in eliciting subjectivities about food-policy-related issues.

Introduction

From a business perspective, innovation is commonly considered as an essential element of competition between companies, and innovation expenditure is usually considered as the main indicator of the innovative effort of a company. Data on the food and drink industry indicate that with its 956.2 billion euro turnover and 4.1 million people employed in 274,000 companies, this is the largest manufacturing sector (16%) in the European Union (EU) (CIAA, 2012); despite the current economic downturn, this sector remains an essential pillar of the EU economy. However, the intensity of research and development (R&D) within the food business has always been relatively low. According to the European Commission (2012), innovation growth in the food industry in 2011 was 1.9%, which was low considering the EU average (6.1%), and both the level and the rate of investment in R&D by the food sector have been relatively stable at this level. Patent applications are another indicator of innovation at the company level: only 2% of all patents submitted in the manufacturing industry in the EU were attributable to the food sector in 2011 (CIAA, 2012).

In the marketing literature, innovation is regarded as a broad process that aims to fulfil the customer needs. Innovation adds value to a company, organisation, or society, by converting knowledge into new products and services that are designed to satisfy the desires of potential consumers. According to Kotler (1994), innovation "refers to any goods, service, or idea that is perceived by someone as new. The idea may have a long history, but it is an innovation to the person who sees it as new." It is apparent from this definition that innovation does not only deal with a technological change, but it is connected to the context and to the different perspectives of the actors involved. As a consequence, innovation can be related to a product or to a process, and also to an organisation (Neely and Hii, 1998) when, for example, it refers to innovations in the market-orientation skills of a company (Grunert and Traill, 1997).

The distinction between 'product innovation' and 'process innovation' is somewhat fuzzy: a process innovation can lead to a product innovation, and *vice versa*, and different types of innovations do not mutually exclude each other. Also, it is of note that innovation goes beyond changes in the physical product; anything new in

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a product – distribution, price or communication – can lead to an innovation, either in a process and/or in a product, or in the eyes of one, or more, of the actors in a supply chain.

Depending on who perceives the newness, we can regard a given product as new or not. Newness in the eyes of the producer or the distributor does not necessarily translate into innovation in the eyes of the consumer (Grunert and Traill, 1997). In the food system, for example, innovations at the level of the farmer – maybe related to new technology or resources used in the field that were not previously available (e.g., a special harvesting machine) – or innovations at the level of the distributor – maybe related to new storage strategies, or time-saving changes – might not be perceived at the consumer level, unless they translate into price reductions or increased value for money.

The market is affected by consumer distrust in new products and by product failures. Failure rates for new products in consumer food markets have been reported to vary a lot, ranging from 33% up to 80% (Doan and Chambers, 2012; Jongen and Meulenberg, 2005). Many studies have extensively investigated the reasons for success or failure, across a wide range of new products and different industries. The results here have shown that the consumer level of acceptance of innovations is only part of the issue. Consumer needs should be taken into consideration as a point of departure for an effective new product-development strategy, but R&D is only one of the steps that determine whether innovations are successful or not (Grunert and Traill, 1997). Extensive knowledge of the marketplace, along with company skills and communication in cross-functional teams involved in new product development, and as well as communication along the supply chain, are all together the factors that will improve the chances of success of innovations (Jongen and Meulenberg, 2005; Capitanio et al., 2009). In particular, from among these strategies, cooperation along the supply chain, which has also been referred to as 'co-innovation', is an important element of success for innovations in the food industry (Omta and Folstar, 2005).

Fostering innovations in the food system should be profitable at the farm level, to produce competitive food products in the market place, as well as producing environmentally sustainable and energy-efficient products at the same time (SCAR, 2008). The capacity of a company to produce innovations that will be accepted and understood along the supply chain, until the final consumer, is of utmost importance. Hence, having a deep understanding of the levels of acceptance of innovations along the supply chain is just as important as understanding consumer acceptance. However, to date, most investigations into food innovations have been from the *consumer* side. There is little literature on acceptance of innovative technologies and products in the food area along the supply chain, compared to the literature on examining consumer acceptance of food innovations (Ronteltap et al., 2007).

The European dairy industry, with a turnover of 53 billions euros in 2011, of which 8.1 billion exported (DG Agri, 2012), contributes to 14% of total agricultural production (Marquer, 2013). Despite some country differences the milk production of the 28 EU Member States has been increasing over the last decade, making the EU one of the world's leading milk producers. According to Eurostat, the EU milk production in the year 2012 was forecasted to exceed 157 billion tons from over 23.1 million head of cattle.

Nevertheless, the European milk system, operating within the framework of milk quotas – set to address the issue of surplus production since 1984 but to be abandoned in April 2015 – is going to face new challenges. Dairy supply chain members are going to operate in a rapidly changing environment. Increased competitions on world markets, but also the need for a sustainable development of the European milk sector, are expected to affect the sector's competitiveness. This process will induce more innovation at both the farm level (e.g., organic milk) and the processing level (e.g.: high quality, branding and product innovation) (DG Agri, 2012).

Supply chain perspectives towards innovations that facilitate the use of breeds and feeding strategies to maintain productivity, improve animal health and welfare while meeting the market requirement for high quality milk, can be relevant.

The present study investigates the role of innovation in organic and low-input dairy supply chains as an instrument to improve the competitiveness of the dairy system. The purpose is to contribute to the understanding of the expectations of organic and low-input dairy supply-chain members in relation to innovations along the whole supply chain that enhance the sustainability of the farming systems.

We have applied Q methodology to investigate the perspectives of the supply-chain members towards innovations in organic and low-input dairy supply chains. This methodology is particularly suited to the study of the subjectivity and attitudes of people towards new issues. First, we provide a brief description of Q methodology and of our specific application to innovation in dairy systems. The data are then presented and discussed, with specific reference to the EU dairy sector. Our conclusions focus on both supply-chain member consensus and the differing viewpoints on innovations, to define how more sustainable farming systems can be achieved while enhancing the competitiveness of organic and low-input dairy systems.

Materials and methods

Q methodology was developed in the 1930s by William Stephenson, one of the most gifted students and assistants of Charles Spearman, the 'inventor' of factor analysis (Stephenson, 1935, 1936a, 1936b, 1953; Burt and Stephenson, 1939). Stephenson introduced his new method as a means of systematically identifying clusters of viewpoints about a topic.

In the Stephenson approach, we shift from *by-variable* factor analysis (the standard approach, which in Stephenson's papers was addressed as the 'R methodology') to *by-person* factor analysis (Q methodology) (Watts and Stenner, 2012). By inverting the rows and the columns of a typical factor analysis, Q methodology moves the focus from variables and patterns across variables to the inter-correlations and patterns across individuals (Previte et al., 2007). As Q methodology focuses on correlations between individuals (not between variables), factor analysis is used to group the people with similar opinions. The strength of Q methodology is the chance to use the data – e.g., opinions by different groups of people – to identify common or divergent patterns, while allowing subjects to explain their choices in their own words and possibly to interpret the subjects' point of view (Brown, 1980; McKeown and Thomas, 1988) to identify possible solutions in different fields (e.g., political, social, environmental).

Q methodology has traditionally been applied in psychology and medical research (McKeown and Thomas, 1988), although it is now used in a broader range of social sciences disciplines (Hall, 2008; Barry and Proops, 1999). The application of Q methodology in agricultural research is relatively limited to date (Brodt et al., 2006; Davies and Hodge, 2007; Eden et al., 2008; Hall, 2008; Kristensen and Enevoldsen, 2008; Fairweather, 2010; Kristensen and Jakobsen, 2011; Augustin et al., 2012; Nicholas et al., 2014), although its use is slowly expanding.

Q methodology was used to identify different farmer goals and management styles that characterise different farming approaches (e.g., Environmental Stewards, Production Maximizers, and Networking Entrepreneurs; Brodt et al., 2006) and different environmental management styles (e.g., Environmentalists, Progressives, Commodity Conservationists, Jeffersonians and