Matching recent innovations and SMEs needs in the durum wheat and Mediterranean vegetables sectors: the French example

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ABSTRACT

In the European Union, small and medium enterprises (SMEs) in the food sector have to be sufficiently competitive to face various current challenges, such as changing governmental regulations, competition with large-scale manufacturers, increased pressure of retail, environmental restrictions, *etc*. Based on the assumption that traditional products and recent innovations could be complementary vectors to boost economic growth, this work seeks to establish a relationship between tradition and innovations from a SME point of view. After an identification of traditional products and innovation from research topics in the durum wheat and Mediterranean vegetable chains, SMEs were interviewed to get insight in their needs and the hurdles they are facing within the entire value chain (at agronomic, technological, product-related, marketing, and organizational levels). Using both qualitative and quantitative questionnaires, results showed that interviewed enterprises appeared as dynamic businesses, willing to innovate and invest, but occasionally facing financing issues. The high-rated topics of interest correspond to quality management, regulations, new products, packaging, and process technology trainings. Potential innovations are compared with the identified SMEs needs revealing a keen interest of interviewed SMEs for recent research innovations (*e.g.* mixed crops, bio-based and functional packaging, novel preservation processes, eco-conception, *etc.*). The high values of ratings of training subjects demonstrate the need for an action plan dedicated to SMEs of the traditional food sector such as an online portal, a traditional food-oriented magazine, or a joint technology demonstration platform.

Keywords: Traditional food ; SMEs ; Innovation needs ; Durum wheat ; Mediterranean vegetables

INTRODUCTION

Small businesses are the majority of European food firms (Spillan and Parnell, 2006), especially in the traditional food sector. In Europe, SMEs are considered to have a high potential for employment creation as the Small Business Act for Europe adopted in June 2008 recognized the 'central role of SMEs in the EU economy' (Commission of the European communities, 2008). However, it becomes more and more difficult for SMEs to face current challenges, such as competition with large firms, changing consumer preferences and retailer demands, changing governmental regulations, competing high quality and added value food products and mass production, environmental restrictions, *etc*. To keep growing in the future, innovation can be used as a source of competitive advantage (Banterle et al., 2011). The TRAFOON European project (Traditional Food Network to improve the transfer of knowledge for innovation) started in November 2013 to support traditional food SMEs by establishing a knowledge and innovation transfer network with a focus on food products made of grains, fish, fruits, vegetables and mushrooms. In this context, INRA has focused first on recent innovations and research topics in the French durum wheat and Mediterranean vegetables sectors. Traditional products of the durum wheat and Mediterranean vegetable sectors are respectively pasta, couscous, *bulgur*, a large diversity of breads, pastries, *etc.* and food products based on tomatoes, zucchini, eggplant, pepper, used in a wide variety of recipes (*ratatouille*, eggplant riste, *tian*, *escalivade*, *piperade*, soups, sauces, *etc.*). Second, SMEs were interviewed to get insights in their needs within the entire value chain (at agronomic, technological, product-related, marketing, and organizational levels). Using both qualitative and quantitative questionnaires, SMEs directors were asked to rate their interests regarding a list of current research topics and innovations, and a list of training subjects. Finally, novel innovations and developments are compared with the identified SMEs needs in order to propose policy recommendations for future research agendas and new technical support programs.

MATERIALS & METHODS

Major research topics and innovation in both durum wheat and Mediterranean vegetables sectors were identified by collecting information from current and past research projects (at national, European and global levels) and by conducting interviews with researchers, experts and other stakeholders (SMEs association, technology transfer agencies, *etc.*) of the two sectors. In parallel, a survey has been performed to identify SMEs needs in terms of innovation and training along the entire value chain (production, processing, food safety, food quality, packaging, marketing, *etc.*) of the two types of traditional food products. Two questionnaires were established. The first qualitative one allows collecting major problematics of SMEs thanks to semi-structured face-to-face or telephone interviews. The second questionnaire (accessible online) provides quantitative results and allows identifying the business direction as well as the main barriers to innovation and development of SMEs. In addition, SMEs directors were asked to rate their interests regarding a list of current research topics and innovations in five categories (agronomic, technological, product-related, marketing, and organizational) and a list of training subjects by attributing a score from 1 (low interest) to 5 (strong interest). Thanks to open-ended questions, respondents were encouraged to enrich the two lists with suggestions.

The targeted companies were SMEs of the durum wheat and Mediterranean vegetables sectors. In the European Union, SMEs are defined as enterprises with fewer than 250 employees, provided that they are independent (of other enterprises) and do not have sales that exceed 50 million € or an annual balance sheet that exceeds 43 million € (Official Journal of the European Union, 2003). Out of the 52 contacted SMEs, 30 SMEs directors were interviewed (13 on site and 17 by phone). In the durum wheat sector, among the 19 interviews, 9 are pasta makers, 7 are grain producers and pasta makers, 2 are cooperatives and 1 is a miller. In the Mediterranean vegetable sector, among the 11 interviews, 3 are vegetable producers, 7 are processors and 1 is selling own brand products which are manufactured and packaged by a provider. Among the 30 interviewed SMEs directors, 22 also completed the online quantitative questionnaire.

RESULTS & DISCUSSION

<u>*Quantitative analysis*</u> – Preliminary questions of the online questionnaire allow defining the nature and typology of interviewed SMEs. The average number of full time equivalent employees is 28 persons with a maximum of 140 employees and some small enterprises with a single person. The most represented turnover range is 50k€ - 500 k€ (54%), followed by 1000k€ - 5000k€ (27%), 500k€ - 1000k€ (9%), 0k€ - 50k€ (5%) and > 5000k€ (5%). The majority of questioned SMEs (59%) sell products on nearby markets, at local and/or regional levels. Only 25% (respectively 16%) of these SMEs declares selling their products on national (respectively international) market. A third of the interviewed SMEs exclusively sell organic products, another third sells both organic and conventional products whereas the last third sells only conventional products. 96% of the interviewed enterprises consider their food products as traditional, based on the TRAFOON definition. The rare enterprises that do not consider their product as traditional frequently place tradition and innovation in opposition. From their perspective, the innovative aspect of their product is not compatible with the notion of tradition.

Interviewed enterprises appeared as dynamic businesses, willing to innovate and invest. Actually, almost 80% of these enterprises consider to invest in the near future and 70% has recently made investments. Concerning the status of the equipment, 46% declare having up-to-date materials and 42% respond that their facilities are mature. Interrogated on their development strategy and business direction, 86% of the respondents wish to increase their level of business and more than 85% of interviewed SMEs wish to sell more current products in existing markets and to develop new products for existing markets (Figure 1). In particular, 48% strongly agrees with developing new products for existing markets. In general, to grow business by either further developing existing markets or searching for new markets appear as essential ("strongly agree" and "agree") for at least 71% of the respondents. The main barriers to innovation and business development are related to financial issues with either the lack of access to external finance (24% of respondents strongly agree with this) or the lack of in-house funds (19% of respondents strongly agree) (Figure 2). The lack of knowledge on new technology arrives in third position (in agreement with 53% of respondents), followed by the difficulty to find partners for co-operation (in agreement with 39% of respondents). Only 14% of respondents think that there is little demand for innovative products in their market. Either there is a lack of in-house management (respectively technical) qualified personnel or not, is a question which is dividing the respondents with 39% (respectively 34%) who disagree and 29% (respectively 34%) who agree (Figure 2). Questioned on their position relative to sustainable development (*i.e.* local sourcing, reduction of energy usage and reduction of waste), between 64% and 77% of respondents agree or strongly agree that each of the three propositions is a key priority.

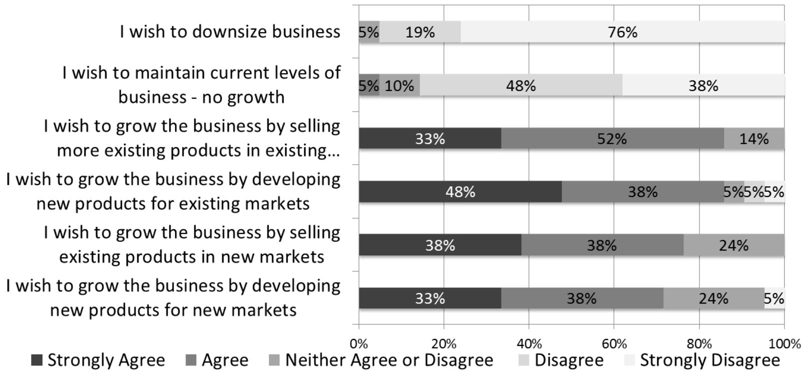

Figure 1. Business direction of the questionnaire respondents.

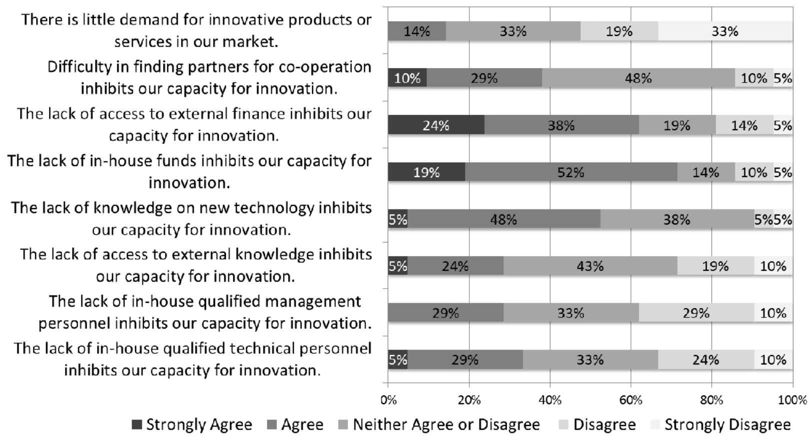

Figure 2. Innovation barriers as perceived by the questionnaire respondents.

Panelists were asked to rate their training needs by attributing a score from 1 (low interest) to 5 (strong interest) to 10 training subjects (Figure 3).

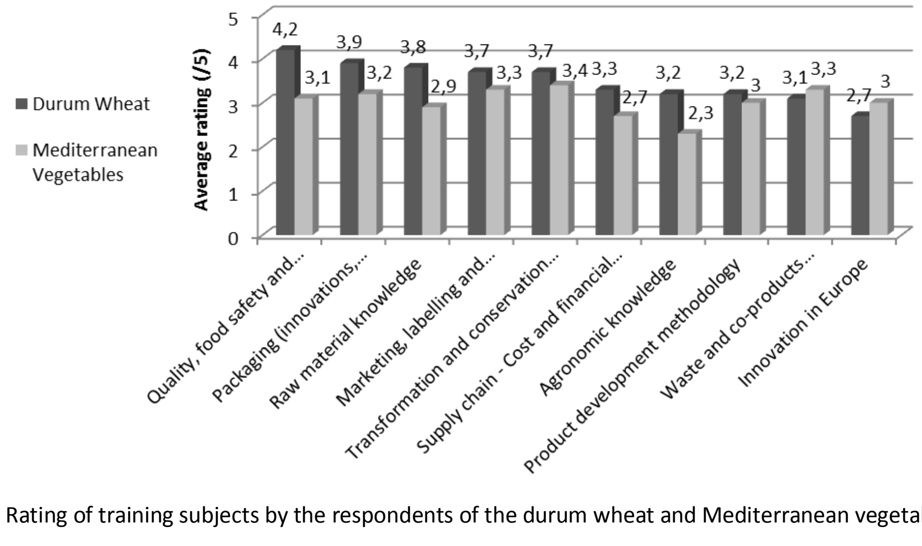

Figure 3. Rating of training subjects by the respondents of the durum wheat and Mediterranean vegetables sectors.

SMEs of the durum wheat sector are highly interested in “Quality, food safety and regulations” (average rating of 4.2/5), “Packaging innovations, functionalities and costs” (3.9/5), “Raw material knowledge” (3.8/5), “Marketing, labelling and consumer science” (3.7/5) as well as “Transformation processes and eco-conception” (3.7/5). The training subjects highly rated by SMEs of the Mediterranean vegetables sector are “Transformation and conservation processes” (3.4/5) followed by “Marketing, labelling and consumer science” (3.3/5). One of the major reasons could be relatively high losses in post-harvest and the direct interaction between producers/manufacturers and the consumer (direct selling). In the Mediterranean vegetable sector, results do not show a clear preference for one specific training subject. However, “Agronomy knowledge” (2.3/5) and “Supply chain – Cost and financial management” (2.7/5) are the lowest rated subjects in this sector.

SMEs of the durum wheat sector were asked to rate 20 different innovations. The table 1 presents the highest-rated innovations (*i.e.* average rating > 3.5/5) related to durum wheat. New food products based on durum wheat is the innovation that received the highest interest from the respondents, with an average rating of 4.0/5. It has to be noted that all the product-related innovations were highly rated with an average rating higher or equal to 3.5/5. Among the marketing innovations, new communication strategies seem necessary for the respondents (average rating of 3.8). On the contrary, precision farming (1.9/5), new fractioning processes (1.9/5) and the concept of agro-technological parks are the lowest-rated innovations. However, the relative small size of the panel (13 respondents to the online quantitative questionnaire related to the durum wheat sector) imposes a careful interpretation of results.

Table 1. Highest-rated innovations related to durum wheat (*i.e.* average rating ≥ 3.5/5)

Expected innovations in the durum wheat sector	Average rating (/5)
New food products based on durum wheat	4.0
Durum wheat grains with an optimized protein potential	3.9
Improvement of nutritional and preservation properties of end-products	3.9
Set-up of quality indicators of durum wheat grains	3.8
New communication strategies	3.8
Innovative packaging	3.6
New short supply chain system	3.6
Innovative crop management techniques	3.6
New durum wheat varieties	3.5
Lowering the energy consumption of transformation equipments	3.5

Qualitative analysis – The qualitative analysis was conducted based on interviews with 30 SMEs and representatives of various organizations (BioCivam of the Aude region, Qualiméditerranée and Terralia competitive clusters, Chamber of Agriculture of the Languedoc-Roussillon region, LRIA, French National Institute for Agricultural Research, FranceAgriMer, FranceExportCéréales, industrial technical centers CTCPA and CRITT of the Provence-Alpes-Côte d’Azur region, *etc.*). Based on these interviews, a SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) of the SMEs in the French durum wheat sector was carried out (Table 2).
Concerning the agricultural production, there are extreme variations in opinions depending on whether the SME is engaged or not in the organic sector. The French organic durum wheat sector suffers from a lack of a certified durum wheat variety adapted to the organic farming and durum wheat processors have difficulties to secure supply of organic durum wheat grains and/or semolina. The temptation is strong to buy semolina from foreign countries whose prices are highly competitive. The upstream-downstream relations and the sector contractualization are at the heart of discussions. New sector-structuring concepts are thus much awaited. Moreover, in France, the recent apparition of durum wheat grain producers, who decided to diversify their activities by transforming their crops into pasta at the farm, attests of the innovation potential of small-scale producers. Occupying a niche market, this diversification allows them to better valorize the grain production, eliminating constraints linked to price fluctuations and matching the high demand from French consumers for artisanal and traditional food products. However, new product

launches on the durum wheat market, changing legislation, recruiting and keeping qualified personnel, etc. require appropriate training programs and the presence of a technical center for durum-wheat based product processing (as it exists for example for the canned goods French manufacturing). Such a structure could encourage entrepreneurship by training actions, innovation transfers, technical support and funding assistance.

Table 2. Strengths, weaknesses, opportunities and threats of the SMEs in the French durum wheat sector.

	Strenghts	Weaknesses	Opportunities	Threats
Technical	- High innovation potential - High flexibility and reactivity of processing units - Existing support from technical institutes and technology transfer agencies	- Difficulties for pest and nitrogen management (especially in organic farming) - Yield stagnation - Supply difficulties for French organic grains and semolina at competitive price - A lack of knowledge (processes, food properties) and R&D standardization - A lack of time and resources for the use of new media	- The improvement of milling and structuration processes - New technologies for production and processing - New crop management techniques - Innovative packaging - New processes for co- and by-products valorization - Creation of a training course of master pasta maker and a durum wheat-dedicated technical institute	- Difficulties for the certification of a durum wheat variety adapted to organic farming
Economical	- A niche market positioning (with a high added value) - A proximity of production and processing sites in France	- A lack of financial resources - A lack of sector contractualization - A business size limiting economies of scale - A lack of co- and by-products valorization	- Financial supports towards SMEs - Decrease of processing costs	- High cost of durum wheat and semolina and high volatility of the market - Competition with large firms (either French or not)
Political & regulatory	The proper use of labels and certifications	- The incorrect used of voluntary inscription on packaging - A weak participation in inter-professional (for processors)	- National and European projects supporting innovation transfer towards SMEs - Promotion of cereals and complex sugars (PNNS, Mediterranean Diet)	- Sanitary and environmental regulations (frequent changes, same rules applied to large and small firms, time-consuming and expensive) - The end of PAC support to the production of durum wheat in the traditional area
Environmental & societal	- The use of local ingredients - Traditional products with a regional anchoring - Clean label products - The positive image of pasta	- Energy-consuming processes - The few integration of sustainable development	Novel eating habits (heath foods, ethnic foods, etc.) and the perspective of new outlets	- Evolution of consumption patterns (gluten-free products, meat-based diets, etc.) - Consumers' anxiety towards additives, GMO and pesticides - Competition for land-use - Climatic changes and extremes in rainfall

The downstream sector exhibits a lack of monitoring and control of the processes, in particular for the smallest SMEs that primarily mobilize their artisanal know-how and empiric skills in order to adapt to natural variations (raw material, weather, *etc.*). Small-scale businesses of the durum wheat sector are suffering from a lack of scientific knowledge, notably for process management (*e.g.* pasta drying process). In both sectors, SMEs directors expressed reservations towards novel and emergent technologies, mainly because of associated costs (expensive equipment and maintenance) and in the case of organic products, due to the various restrictions imposed by the specifications and uncertainties in consumer choices. During interviews of SMEs, the opposition utilizing cutting-edge technologies (either perceived as "very" or "too" innovative) for artisan and traditional production was often revealed. In both sectors (durum wheat and Mediterranean vegetables), product innovation is guided by the desire to produce "something different", to "change routine" and by consumer feedbacks. Research and development activities are rarely formalized and frequently originate from ideas that come out of a closed circle of stakeholders. Moreover, it seems that some niche markets are still not fully exploited (legume-durum wheat mixed products, old varieties, flavored products, whole grains, *etc.*) or have to be reconsidered (sprouted wheat, sweet or fermented durum wheat-based products, beverages, *etc.*). Generally, interviewed SMEs intend to create added value by a differentiation based on the taste, the product origin, the nutritional composition, the type of process (using artisanal or "slow-processed" food in opposition to "ultra-processed" food) and the use of old

varieties for raw materials. Due to limited human and financial resources, only few small-businesses integrate new media in their communication and marketing toolbox, therefore being relatively 'low-tech' but at least existing (web site and sometimes a *facebook* page).
Nonetheless, SMEs benefit from several assets such as high flexibility and reactivity thanks to their ability to produce small and intermediate amounts of products allowing them to quickly adapt to the markets, to win some specific contracts and to launch product innovations at lower risk. In addition, the consumption of food products based on durum wheat or vegetables is promoted by the Mediterranean diet guidelines and the French national food-related campaigns (*e.g.* "Plan National Nutrition Santé"), which could help enhancing competitiveness of small-scale business within the two sectors. Changes in eating patterns toward origin-linked and healthy food products, new small-scale production schemes as well as recent and future research advances in the fields of packaging, process management, and improved production methods are the main opportunities for SMEs of both sectors.
To get additional feedbacks from SMEs, this study could be enriched by discussions in small debating groups with clear introductions of the innovations in order for the participants to understand the full potential. Moreover, interviews have shown that it is actually quite difficult to agree on a precise and clear definition of what is a traditional food product. Can we still consider a product as traditional if only the ingredients are changed but not the manufacturing process? How to agree on a general and objective rule? Despite the definition proposed by the TRAFOON project and based on both FP6 project Truefood and European Food Information Resource (EuroFIR) Consortium definitions (EuroFIR, 2005; Truefood, 2007), the way 'Traditional Food' is defined is still a tricky question lacking consensus at international scale (Jordana, 2000; Trichopoulou et al., 2007), thus requiring an international debate.

CONCLUSION

This study aimed at identifying and interviewing SMEs directors and representatives of SMEs associations and technology transfer agencies in order to collect their innovation and training needs. It was found that SMEs have limited ability to be part of mid- and long-term research and development strategies. Depending on the considered domain, their needs are relatively far from research questions, notably in the technological domain; the latter often address large firms' interests. Nonetheless, interviewed SMEs are dynamic and able to be innovative regarding their products, processes, distribution channels and markets. At artisanal and semi-industrial scales, the main challenge is to innovate without losing the traditional image of their products, furthermore frequently highlighted to the consumers. Although limited by their financial and human resources, interviewed SMEs have shown keen interest for recent research innovations (*e.g.* mixed crops, bio-based and functional packaging, novel preservation processes, eco-conception, *etc.*). The high values of ratings of training subjects demonstrate the need for an action plan dedicated to SMEs of the traditional food sector such as an online portal, a traditional food-oriented magazine, or a joint technology demonstration platform.

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