

RURAL SMALL AND MEDIUM ENTERPRISES DEVELOPMENT IN MOLISE (ITALY)

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Abstract: Small and Medium Enterprises (SMEs) are a key economic sector in Molise, a region in central Italy, characterized by a high level of rurality. This paper uses descriptive survey research to discuss the findings of a study of the innovation process in a sample of SMEs located in rural areas of Molise. It explores the aims of the innovation and any barriers encountered. Data were collected from 30 respondents with the aid of an on-line questionnaire. The sample was drawn from a database made available by the Chambers of Commerce in Molise. The database includes 165 firms that, in recent years, have introduced innovative technologies. The findings of the study revealed that there is a high level of awareness of the importance of technology among the managing bodies of SMEs. Most rural firms prefer to use new production technologies and new processes, rather than invest in research and development activities. Furthermore, there is a low propensity to set up partnerships with other enterprises along the supply chain and to participate in collaborative networks designed to stimulate innovation. Most owners and/or managers interviewed lamented the lack of financial resources necessary to make technological innovations. They also highlighted the considerable difficulty in accessing public and private funding. The paper concludes with some brief prospects by recommending a few implications for policy. The results of this study are important for both researchers as well as those involved in small business (including government, agencies and owner/managers).

Keywords: barriers, benefits, innovation, Molise, new technologies, rural SMEs, SME networks

Abstract: Le piccole e medie imprese (PMI) rappresentano un settore economico importante del Molise: una regione dell'Italia Centrale caratterizzata da un alto livello di ruralità. Il presente lavoro analizza le tipologie di tecnologie, gli obiettivi e gli ostacoli all'innovazione delle PMI nelle zone rurali del Molise. Hanno risposto al questionario, inviato per posta elettronica, 30 imprenditori e/o managers. Il campione è stato estrapolato dal database della Camera di Commercio del Molise. Lo stesso database comprende 165 aziende che, negli ultimi anni, hanno introdotto innovazioni. I risultati dello studio mettono in luce che vi è un alto livello di consapevolezza dell'importanza della tecnologia nella gestione delle PMI rurali. La maggior parte degli imprenditori preferisce utilizzare nuove tecnologie di produzione e nuovi processi produttivi piuttosto che investire in attività di ricerca e sviluppo. Dall'indagine è emerso anche che vi è una scarsa propensione da parte degli stessi imprenditori a creare partenariati con altre imprese lungo la catena di approvvigionamento e a partecipare a reti di collaborazione volte a stimolare l'innovazione. La maggior parte degli imprenditori e/o managers intervistati ha denunciato la mancanza di risorse finanziarie necessarie per realizzare innovazioni tecnologiche e la notevole difficoltà di accesso a fonti di finanziamento pubbliche e private. Il problema principale del finanziamento delle PMI non è rappresentato tanto dalle fonti di finanziamento, ma piuttosto dalla loro accessibilità. Alla fine il lavoro offre alcuni spunti di riflessione non solo per approfondire la ricerca ma anche e, soprattutto, per meglio indirizzare le politiche al fine di innalzare la capacità produttiva e la competitività delle PMI che operano nei territori rurali del Molise. **Keywords:** barriere, benefici, competitività, innovazione, Molise, nuove tecnologie, piccolo e medie imprese rurali

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1. Introduction

Small and medium-size enterprises (SMEs), pillars of modern market economies, are at the forefront of the industrial policy agenda owing to their role in creating jobs, stimulating innovation and promoting entrepreneurial skills (David and Audretsch, 2004; Rigtering et al.,

2014). Indeed, with 23 million SMEs operating in the EU, which provide jobs for more than 75 million Europeans and represent 99.8% of all European enterprises, it is well justified that SMEs have been described as the heart of Europe's economy (Ntaliani et al., 2009). However, they often face market imperfections. SMEs frequently have difficulties in obtaining capital or credit, particularly in the early start-up phase. Their restricted resources may also reduce access to new technology or innovation. These difficulties are even more obvious when considering SMEs in rural areas, which are situated far from decision-making centers and public authorities. Thus, these enterprises often do not have physical access to the required public services for doing business with government or public agencies.

In light of the above, of particular interest for this study were the ways in which rural SMEs innovate, their aims, the barriers they face, their support needs, and the types of policies they require to encourage and support innovation. The main objective of this paper was to identify the factors that induced rural economy SMEs to invest in new innovations (product/process/market) and be involved in new models of collaboration (organizational). This analysis led to the identification of enablers and barriers to adopting innovation that aimed to support the rural economy. It also provided policy recommendations, useful for public authorities, concerning how to establish favorable conditions and offer incentives to SMEs to integrate innovative solutions into their business models.

The research questions that this paper hoped to answer were:

- What types of innovation were adopted by rural SMEs that operated in Molise from 2002 to 2016?
- What aims were most crucial for them?
- What were the enablers and barriers to adopting such innovation to support the rural economy?
- How can we establish favorable conditions and offer incentives to SMEs for the integration of innovative solutions?

In order to address these questions, this article reports the first results of the INNOGROW European Project, carried out by nine partners of eight countries (Bulgaria, the Czech Republic, Greece, Hungary, Italy, Latvia, Slovenia and the United Kingdom). The project promotes the adoption of innovation by rural economy SMEs, through sharing practices/experiences between regions and actors relevant to this sector. It also seeks to transform the lessons learnt regarding competitiveness and integration into regional policies and action plans. The expected results should boost innovation support services by 5% for SMEs, by employing an additional 200 public administration officials to effectively implement policies to support the competitiveness of firms operating in rural economies and improve their horizontal and vertical cooperation. The building of territorial capacity and policy innovation involving all regional actors are critical factors for the promotion and the diffusion of innovation, maintaining and strengthening the competitiveness of SMEs and consequently, encouraging regional growth. The findings of this study are expected to help SMEs in Molise and other areas, by providing an insight into the benefits of the adoption and use of sound technology that can help maximize business margins. Furthermore, the findings of the study are expected to help planners and policy makers strengthen or adjust their position in business policy formulation.

This paper is organized in the following way: firstly, there is a literature review, which examines a selection of former studies from which the concept of innovation, the research questions and selected technologies are drawn (Part 2). Thereafter, the study area and the research methods are presented (Part 3). Following this, the results are analyzed and interpreted (Part 4). Finally, the conclusions, the discussion and political implications are presented, together with the limitations of the study (Part 5).

2. Theoretical framework: from the concept of innovation to its impact and benefits for rural SMEs

In order to provide a theoretical framework for the study, previous large and diverse studies on SMEs in the literature concerning innovation were reviewed. Innovation is an elusive concept,

which is difficult to define (Amara and Landry, 2005). There are several studies that attempt to provide a definition of innovation in relation to SMEs. Previous research indicates that in order to identify the determinants of innovation it is first necessary to distinguish between different types of innovation (Knight, 1967; Rowe and Boise, 1974; Downs and Mohr, 1976). Joseph Schumpeter (1961) is often recognized as the first economist to have focused on the importance of innovation for industries (Rogers, 2004). He defined five types of innovation, namely: the introduction of a new good or a change in the quality of an existing product; the introduction of a new production process; the introduction of a product into a new market; the acquisition of a new supply source of raw materials; and the implementation of a new industrial organization. However, Freeman (1971) adopted the view that innovation involves making fundamental or radical changes comprising the transformation of a new idea or technological invention into a marketable product or process. Porter (1990) argued that innovation includes improvements in technology as well as better methods or ways of doing things, which can be manifested in product changes, process changes, new approaches to marketing and/or new methods of distribution. Innovation that brings new ideas to market starts with strategic goals, then develops through product development, process development, marketing development and organizational development, or a combination of these factors (Earle, 1997). Linder et al. (2003) defined innovation as “implementing new ideas that create value”. From a business perspective, this means that the adoption of new products and/or processes to increase competitiveness and overall profitability is based on customer needs and requirements (Zahra et al. 1999). Furthermore, Forsman and Annala (2011) found that in micro and small enterprises, the development of incremental innovations is more common than the development of radical innovations.

New technology such as Information and Communication Technology (ICT) and biotechnology, are cross-sectional technologies and their application to traditional agricultural, manufacturing and service activities can revolutionize both processes and business methods, increasing both productivity and competitiveness (Krugman, 1994; Altenburg et al., 1998). The concept of systemic competitiveness seeks to capture both the political and the economic determinants of successful industrial development. The enterprise must supply products of adequate quality on time and at competitive prices. It must also have the flexibility to respond quickly to changes in demand and successfully manage product differentiation by building up innovative capacity and an effective marketing system. The globalization of the economy is forcing many enterprises to change in order to survive. To compete in global markets, many manufacturing SMEs need to develop new business strategies and employ new technologies. However, manufacturing SMEs in traditional industries usually have poor human and financial resources (Bridge et al., 1998; Welsh et al., 1982). As a result, they are more likely to be less prepared and less able to change. In a liberalized and open economy, competitiveness increasingly depends on the ability to adopt new technology and management practices. According to Clemons and Row (1991), ICT applications have a positive impact on a firm's communication with its trading partners, by, for example, increasing the degree of vertical collaboration. These technological communication setups can eliminate geographical barriers and facilitate the forming of (vertical) collaboration with new firms (Ozer, 2004). Firms increasingly obtain competitive advantage by developing trading relationships with other regions or countries beyond their own locality. Consequently, policy assistance should be tailored closely to the needs of the SMEs rather than the geographical area (Bennett and Smith, 2002). In order to innovate, firms need to draw from and collaborate with a large number of actors from outside their organizations (Laursen and Salter, 2005). Once a firm introduces a new product, a change must be considered not only in terms of technical processes, but also in relation to administration (Utterback and Abernathy, 1975; Hayes and Wheelwright 1979; Kim et al., 1992). Other studies consider innovation as the most fundamental element to a firm's success and survival (Cho and Pucik, 2005; Abbing, 2010).

The types of innovation adopted by firms that operate in rural economies have received relatively little scholarly attention. As a result, an additional aim of this paper is to seek to fill this gap. For this purpose, the concept of technological innovation has been divided into three categories: modernization of products or processes where products are mainly physical systems (commodities or production capital); processes that relate to administrative improvements; and innovation in relation to production, distribution and organization. The definition of innovation suggested by the OECD's Oslo Manual (OECD and Eurostat, 2005) was used as a reference

point. It states: An innovation is the implementation of a new or significantly improved (product or service), or process, a new market method, or a new organizational method in business practices, workplace organization or external relations [...]. The minimum requirement for an innovation is that the product, process, marketing method or organizational method must be new (or significantly improved) to the firm. This includes products, processes and methods that firms are the first to develop and those that have been adopted from other firms or organizations”.

In accordance with this definition, the technologies analyzed and selected for the empirical analysis were innovative production technologies and technologies supporting product distribution and external relationships (organizational method). Attention was focused on innovation and technologies adopted by SMEs operating mainly in the traditional sectors of rural areas (agriculture, food industry and tourism).

There are various studies that have focused on the impact, the benefits and on the inhibitors for the adoption of innovative production technologies by rural SMEs operating in the agricultural sector. These include studies of organic farming (Niggli et al., 2008; Padel and Lampkin, 1994; Padel et al., 2017; Sanghi, 2007; Sima, 2009), renewable energy (Bergmann et al., 2006; Del Rio and Burguillo, 2008; Del Rio and Burguillo, 2009; Martinot, 2001; Tate et al., 2012), precision agriculture (Godwin et al. 2003; Seelan et al, 2003; Timmermann et al. 2003; Swinton, 2005; Dillon and Gandonou, 2007; Chavas, 2008; Gutjahr et al., 2008; Aubert et al., 2012), novel crops (Chandler, 2011; De Jong and Vermeulen, 2006; Pretty, 2001) and functional foods (Bigliardi and Galati, 2013; Mark-Herbert, 2004).

Tab 1. Selected innovative production and processes technologies and their impact/benefits for rural SMEs and the environment. Source: Author's elaboration of data from the literature

Innovative production technologies	Impact/Benefits for the SME and the environment	Inhibitors for adoption
<p>Organic farming</p> <p><i>Definition</i> It is defined as a farming system seeking sustainability, enhancement of soil fertility and biological diversity while avoiding synthetic pesticides, antibiotics, synthetic fertilizers, genetically modified organisms, and growth hormones.</p> <p><i>Current situation</i> Organic farming is currently practiced in 179 countries around the world, on 50.9 million hectares of agricultural land, including conversion areas (FIBL and IFOAM, 2017).</p>	<ul style="list-style-type: none"> ▪ Lower input regarding use and costs (e.g. pesticides and fertilizers are avoided). ▪ Higher resistance to disease, pests and drought, which results in improved productivity. ▪ Higher prices and revenues for rural SMEs that access the market of premium consumers, made up of customers who recognize organic food as having a greater value and are willing to pay a premium price for it. ▪ Increased exports reaching a large number of premium consumers in other EU countries, who make informed choices about organic products and their origin. ▪ Better energy efficiency compared to conventional farming. ▪ Less greenhouse gas emissions. ▪ Less soil erosion, water conservation, and improved soil organic matter and biodiversity compared to conventional systems. 	<ul style="list-style-type: none"> ▪ Weed control is frequently a problem for organic crops because the farmer is limited to mechanical and biological weed control. ▪ Mechanical weed control is usually less effective than chemical weed control under wet conditions. ▪ Limited financial resources to cover the organic farmers' needs during the transition period from conventional to organic farming. ▪ Less economically viable without premium prices. The premiums for organic food are very variable. ▪ Greater management knowledge needed; new practices and techniques; labor intensive.

<p>Renewable energy</p> <p><i>Definition</i> Renewable energy technologies allow the production of energy from resources, which are naturally replenished, such as sunlight, wind, rain, tides, waves, and geothermal heat.</p> <p><i>Current situation</i> SMEs in rural areas are increasingly involved in renewable energy technologies, such as solar photovoltaic systems, sea water air conditioning, solar air conditioning and solar water heating (Bergmann et al., 2006).</p>	<ul style="list-style-type: none"> ▪ Cost savings, derived from reduced energy costs. ▪ Stable operating costs, assisting rural economy SMEs with long-term business plans. ▪ Increased revenue for sustainable hotel business from eco-friendly travelers, who are willing to pay premium prices for sustainable tourism experiences. ▪ Helps accommodation businesses to increase tourist numbers of those who regard rural areas as more luxurious than before. ▪ Helps rural economy SMEs to reduce their environmental impact. 	<ul style="list-style-type: none"> ▪ Unfavorable perception of competitiveness of renewable energy compared to diesel power generation. ▪ Limited access of rural economy SMEs to capital; high cost of financing. ▪ Barriers related to the ownership status and potential different interests of the managing company. ▪ Lack of technical capabilities to install and manage renewable energy technologies; no simple investment projects. ▪ Inadequate capacity of building programmers, creating a gap between demand and supply of the skills needed. ▪ Lack of incentives and clear policy instruments, such as introduction of feed-in tariffs or tax rebates. ▪ Lack of dedicated institutional bodies such as coordinating agencies for renewable energy deployment.
<p>Precision agriculture</p> <p><i>Definition</i> A farming management system based on observing, measuring and responding to variability in crops, aiming to optimize returns on inputs, while preserving resources (Aubert et al., 2012).</p> <p><i>Current situation</i> Precision farming can be considered as “technology push” innovation. Although precision farming technology has been available for almost twenty years, there have been technological developments in recent years.</p>	<ul style="list-style-type: none"> ▪ The savings in pesticide use following the adoption of precision agriculture can be 30,000 tons per annum at EU level, reducing, at the same time, the environmental footprint of farming. ▪ The uncertainty of crop yields can be reduced, and the reliability of farmer income can be increased, using an appropriate combination of technological elements in crop production. ▪ The improved management of fertilizer usage and other inputs can boost the competitiveness of SMEs. ▪ The employment of better matching farming practices with the aid of precision technology results in better quality crops and livestock products. ▪ Improved or objectively documented animal welfare on farms leads to better product segmentation and better marketing of livestock products. <p>(Godwin et al., 2003; Timmermann <i>et al.</i> 2003; Swinton, 2005; Dillon and Gandonou, 2007; Chavas 2008).</p>	<ul style="list-style-type: none"> ▪ Limited availability of affordable, automated identification systems. ▪ Limited high-speed and affordable internet access in rural areas. ▪ Privacy concerns related to data captured on-farm. ▪ Lack of a consistent consulting service for farmers. ▪ Absence of clear cost-benefit data and returns of precision farming. ▪ Compatibility issues that do not allow widespread use of technology in the industry.
<p>Crop resistance systems</p> <p><i>Definition</i> Innovative crop protection mechanisms, such as the integrated pest management system (IPM) and biological pest control techniques minimize the use of conventional pesticides and consequently the environmental impact.</p> <p><i>Current situation</i> Currently, experience with IPM strategies in Europe is too limited to provide general guidance for rural economy SMEs on the most technically and economically efficient strategies. Presently in Europe, products grown using IPM are rarely identified as such in the market place and therefore end consumers do not have a clear understanding or knowledge of the technology, and are not willing to pay a premium price for IPM grown products.</p>	<ul style="list-style-type: none"> ▪ Reduced number of pests and pesticides. ▪ Cost savings associated with using less pesticides and improving production. ▪ Improved environmental safety and impact. ▪ Access to specific market segments characterized by strict environmental requirements. ▪ Reduced incidents of allergies and asthma. 	<ul style="list-style-type: none"> ▪ Experience with IPM is still not sufficient in some of the EU Members States to provide guidance on the best IPM strategies. ▪ Products grown using IPM are rarely labelled as such, and thus consumers have limited understanding of the approach and are less willing to pay the premium price. ▪ Lack of training and advisory services regarding IPM systems intensify the skeptical attitude of rural economy SMEs towards change and innovation.

<p>Novel crops</p> <p><i>Definition</i> Novel crops are a range of unusual crops such as oil crops, fiber crops and biomass crops, that can be grown for specific end markets, such as fiber production, dietary supplements, pharmaceutical and energy industries</p> <p><i>Current situation</i> Some non-food crop uses such as the making of textiles are widely known among the actors concerned, although other products may be less well-known, such as plastics made from starch-based polymers (Chandler, 2011).</p>	<ul style="list-style-type: none"> ▪ New business opportunities in rural areas, providing additional diversity and innovation beyond agriculture. - Although gross margins depend on the end price for the crop, which can be unstable, it is usually higher than conventional alternatives. ▪ Production of innovative, higher value-added products, which meet more consumer needs, can improve the competitiveness of SMEs in terms of use, pollution and waste. ▪ The whole industry's economic competitiveness can be improved due to the access to new markets and production of new products by SMEs specializing in novel crops 	<ul style="list-style-type: none"> ▪ Some novel crop markets, such as specialty and pharmaceutical crops, are high value-low volume markets. ▪ Limited potential for production for the global markets. ▪ Lack of knowledge and evidence on the impact of novel crops on business competitiveness and productivity due to the limited research in the field
<p>Functional food</p> <p><i>Definition</i> Functional foods are foods given an additional function, usually related to health-promotion or disease prevention, by adding new ingredients or more of existing ingredients.</p> <p><i>Current situation</i> There are at least 168 EU companies active in the field of functional foods, and the market value within the EU is estimated to be worth approximately 8 billion euros.</p>	<ul style="list-style-type: none"> ▪ Health conscious consumers are willing to pay premium prices for functional foods. ▪ Functional foods command an average 25% profit margin, which is well beyond the percentage that food companies make on many conventional food products. 	<ul style="list-style-type: none"> ▪ High costs related to research, product approval and marketing of functional foods ▪ Entry barriers created by large multinational functional food providers. ▪ Consumers that may be more sensitive to the higher prices at which functional foods are typically sold.

For technologies supporting product distribution (Table 2), other studies from both international and national literature, such as (Baourakis et al., 2002; Henchion and McIntyre, 2005; Holt et al., 2007; Simpson and Docherty, 2004; Stratigea, 2011) were consulted.

Finally, studies related to collaboration with other small and large firms and with organizations (Universities and Research Centers) for technology purchasing (Narula, 2004; Edwards et al., 2005; Inkpen and Tsang, 2005; Vanhaverbeke and Cloudt, 2006; Lee, 2007) were examined. As is well-known, relationships with external organizations have the potential to assist business development, survival, and the growth of rural SMEs. Attention has been focused mainly on two common types of external relationship: networks and partnerships with other firms along the supply chain. Participation in innovation networks has been offered as a solution for increasing an SME's ability to transform its new ideas into practice (Jørgensen and Ulhøi, 2010; Watson, 2007). For many firms operating in rural areas, it is very difficult to acquire new market knowledge about innovation, so they seek some form of collaboration with other firms and/or institutions (Morone and Taylor, 2012). In general, some authors have argued that networking is beneficial for the overall performance of firms in terms of survival, growth, and innovation (Littunen, 2000; Littunen and Virtanen, 2009).

Tab 2. Selected technologies supporting the increase market share and their impact/benefits for rural SMEs.
Source: Author's elaboration of data from the literature

Technologies supporting product distribution	Impact/Benefits for the SME	Inhibitors for adoption
<p>E-platforms for product promotion and exports</p> <p><i>Definition</i> Online platforms used as contact points among local producers / SMEs and big importers in other EU countries, supporting the entire range of transactions, i.e., demand and supply quantities, specifications and pricing agreements, closing agreements, monitoring of transfers and payments.</p> <p><i>Current situation</i> The adoption of ICT solutions is resulting in low levels of online platform integration in the rural economy because it requires considerable capital.</p>	<ul style="list-style-type: none"> ▪ Higher internalization and market expansion for goods/services ▪ Increased revenues ▪ Improved competitiveness ▪ Improved administration and financial planning. 	<ul style="list-style-type: none"> ▪ Limited provision of affordably priced high-speed internet access in rural and peripheral areas ▪ Lack of policy support and regional financial resources for the development of a common online platform available to rural economy SMEs operating in the region ▪ The language barrier, which deters many owners/managers of rural economy SMEs from participating in e-commerce to increase exports to other EU countries. ▪ Costs of using online platform reduces profitability. ▪ The lack of payment facilities (such as credit cards) and of a secure payment system. ▪ Questions of how legal disputes with suppliers and intermediaries are handled.
<p>Online orders and delivery tools</p> <p><i>Definition</i> Online orders and delivery tools are online systems allowing customers to place their orders remotely, track them, retain preferences, and receive information about availability of products of interest.</p> <p><i>Current situation</i> In 2014, 190 million Europeans shopped online, and this number is growing as internet and mobile technologies advance.</p>	<ul style="list-style-type: none"> ▪ Wider geographical reach achieved, when adopting ICT solutions for e-commerce. ▪ Higher speed of interaction between the participants of e-commerce. ▪ Lower costs of business transaction compared to traditional methods. ▪ The competitive advantage generated from an effective e-commerce strategy. 	<ul style="list-style-type: none"> ▪ A lack of trust among consumers about a lesser known company. ▪ Security issues for credit-card payments and the absence of a human interface in e-commerce. ▪ Often the lack of payment facilities such as credit/debit cards has prevented the completion of e-commerce transactions. ▪ The limited provision of affordably priced high-speed internet access in peripheral rural areas compared to companies operating in urban areas. ▪ Inadequacies in a range of entrepreneurial skills.
<p>Food traceability systems as marketing tool</p> <p><i>Definition</i> Food traceability systems are systems that provide greater transparency to customers, enabling them to trace the route of a business' products.</p> <p><i>Current situation</i> In the EU, food traceability has been mandatory since January 2005. In some EU countries, including Italy, consumers are ready to pay more for a well-traced product, if the difference in price is low.</p>	<ul style="list-style-type: none"> ▪ Traceability can be a buying criterion for consumers, and their willingness to pay more increases business sales, revenues and competitiveness in the sector. ▪ Consumer demand for traceability is expressed directly at the cash register of SMEs operating mainly in the agricultural sector. 	<ul style="list-style-type: none"> ▪ Lack of information about traceability systems. ▪ Lack of enough knowledge to implement traceability.

All the typologies of technology discussed can potentially be adopted by SMEs operating in rural locations.

3. Materials and method

3.1 The study area

The methodological approach to examining the types of innovation adopted by rural SMEs and the aims and the barriers encountered, was based on field research evidence from the case study of Molise. This region of central Italy, with a territorial extension of 4,438 km² is, after the Valle d'Aosta, the smallest region in Italy. With a population of 319,101 inhabitants, it has a population density of almost 71 inhabitants per km². The administrative territory of the region is divided into 136 municipalities (*comuni*). Most municipalities (82) are located in mountainous and marginal areas with an altitude of >600 meters above sea level, with the remainder (54), located in hilly areas (Figure 1).

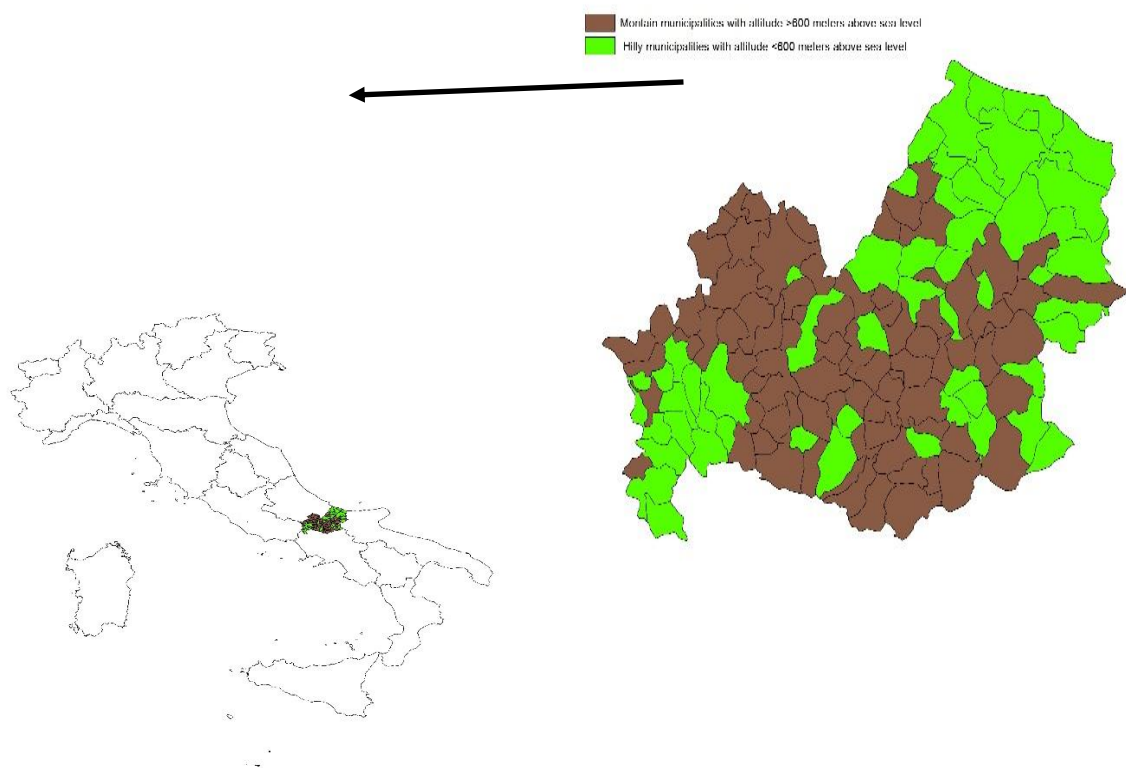


Fig 1. The 136 municipalities of Molise. Source: own elaboration

Over the years, these areas have been affected by a major depopulation phenomenon due to the lack of services and road and telematic infrastructures. The prevalence of mountainous areas continues to be one of the natural phenomena that limits economic development and significantly influences productive activities (Fanelli, 2005, 2007; Cannata et al., 2014). In this territorial context, SMEs constitute a major source of employment and are part of an important strategy for rural development. The share of employment in industry (including construction) is approximately 28%. The main areas of specialization include automotives, mechanics, textiles and clothing, agriculture and food. Industries are located in the industrial clusters of Termoli, Campobasso-Bojano, Campobasso-Ripalimosani and Venafrò-Pozzilli. Crafts are important, while tourism is not very developed. The greatest share of employment is absorbed by commerce and other services (e.g. public administration, catering services, information technology, water management and construction). Since 2008, economic crisis has strongly affected the regional economy and there has been a greater impact on sectors that were already structurally weak. For this reason, the importance of SMEs for economic growth has been a central element in recent programs and European projects, many of which have sought to introduce mechanisms that support SMEs (European Commission, 2018). One of the major programs has been Competitiveness of Enterprises and SMEs, 2014–2020 (COSMO), supported by Regulation (EU) n. 1287/2013 of the European Parliament and of the Council of 11 December 2013.

Regarding the state of firm innovation, the regional innovation system is fragile and characterized by low Research and Development (R&D) investment. Indeed, according to a database made available by the Chambers of Commerce in Molise and the Istituto Nazionale di Statistica (ISTAT), during 2012–2014, the percentage of enterprises with innovative activities was about 35%, far below the Italian average (45%). With regards to enterprises with innovative activities only in

processes and products, the share was about 16%, still below the national average (32%). Moreover, with reference to the latest data processed by ISTAT (2016) for the three-year period 2012–2014, the percentage of enterprises that introduced innovation activities in 2014 (i.e., activities aimed at the introduction of new products, processes, organizational or marketing methods) was 31.9%² (compared to 35.5% in the 2010–2012 period).

Successful innovators (i.e., companies that have introduced at least one product or process innovation on the market or internally), represent 28.5% of businesses that have implemented paths of innovation. As shown in Figure 2, in Molise, only 17.4% of companies undertook innovation activities in 2014, the lowest percentage among all Italian regions.

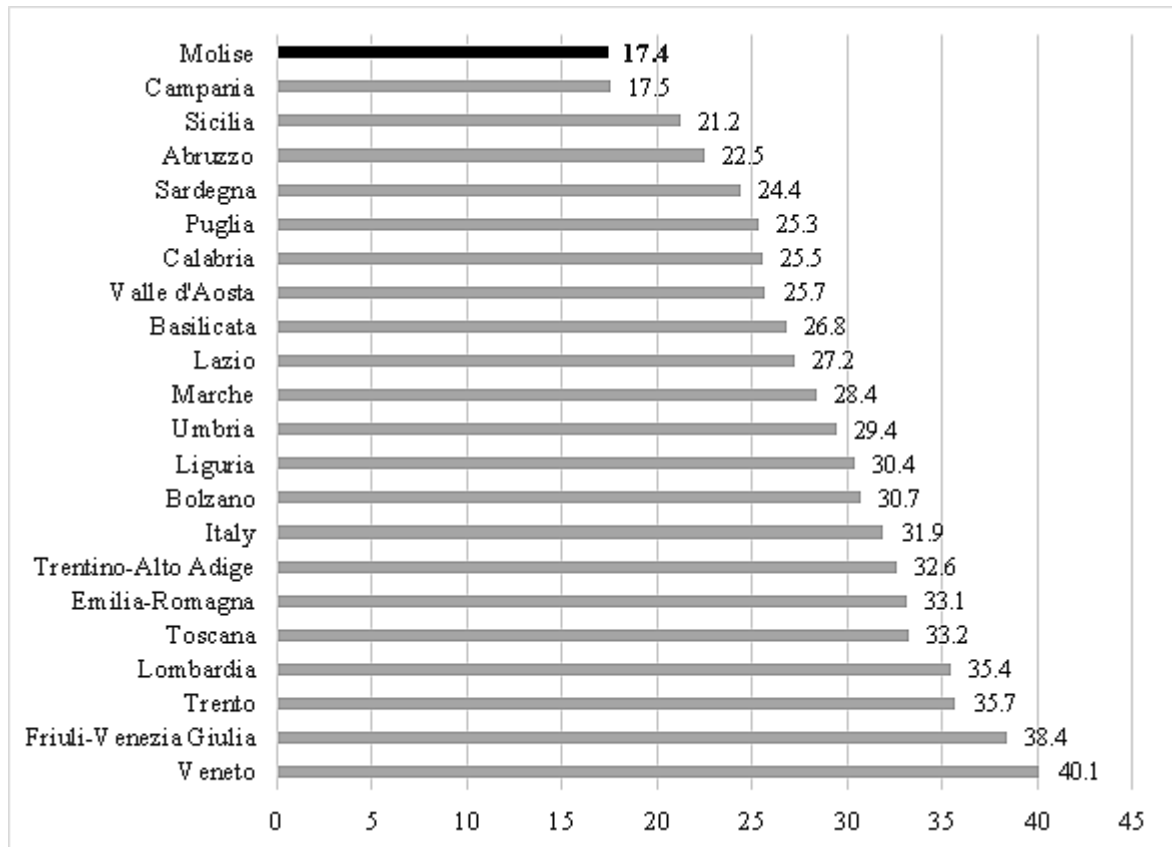


Fig 2. Companies with innovative activities of product/process (% on total businesses). Source: Author's elaboration of data from ISTAT and the Chambers of Commerce of Molise, 2016

These data point to the weak competitiveness and fragmentation of local industry. Moreover, the innovation system is also affected by the lack of collaboration between public research and business, as well as the weaknesses of local organizations in providing technology transfer and business services. The inadequacy of regional infrastructure (poorly developed broadband networks and logistic facilities, which contribute to the isolation of mountain and rural areas) and the low level of Information and Communication Technology (ICT) diffusion are other constraining factors that hinder the development of an innovation-friendly environment. In light of the above, the analysis took into consideration all of the 470 SMEs in Molise that had at least ten employees and who from 2012 to 2016, had adopted innovations (165).

² This percentage refers to companies committed to activities aimed at introducing product or process innovations. These activities may have been positively concluded with the introduction of product or process innovations at the end of the reference period, they may still be ongoing at the end of 2014 or started in the 2012–2014 three-year period, but they are then abandoned or temporarily interrupted in the same period.

3.2 Definitions

SMEs are defined as non-subsidiary, independent firms, which employ fewer than a given number of employees. This number varies across national statistical systems. The most frequent upper limit is 250 employees, as in the EU (European Union, 2003). However, some countries set the limit at 200 employees, while the United States considers SMEs to include firms with fewer than 500 employees. Small firms are generally those with fewer than 50 employees, while micro-enterprises have at most ten, or in some cases five, workers. Financial assets are also used to define SMEs. In the EU, SMEs must have an annual turnover of €40 million or less and/or a balance-sheet valuation not exceeding €27 million (OECD, 2000; Shi and Li, 2006). Other definitions of SMEs emanate from the 1971 Bolton Committee Report and define a small firm as independent, owner managed and with a small market share (Simpson and Docherty, 2004). Several authors (Storey, 1994; Rahman, 2001; Darren et al. 2009) argue that the number of employees, location, size, age, structure, organization, sales volume, worth of assets, ownership and innovation and technology are considered to be appropriate measures of SMEs.

Following the definition of the European Commission (2003), micro-enterprises are identified as firms that have up to 10 employees, small-enterprises as those that have up to 50 employees and medium-enterprises are those with up to 250 employees. As shown in Figure 3, this article focused on typologies of enterprise that are operating in the main sectors of Molise.

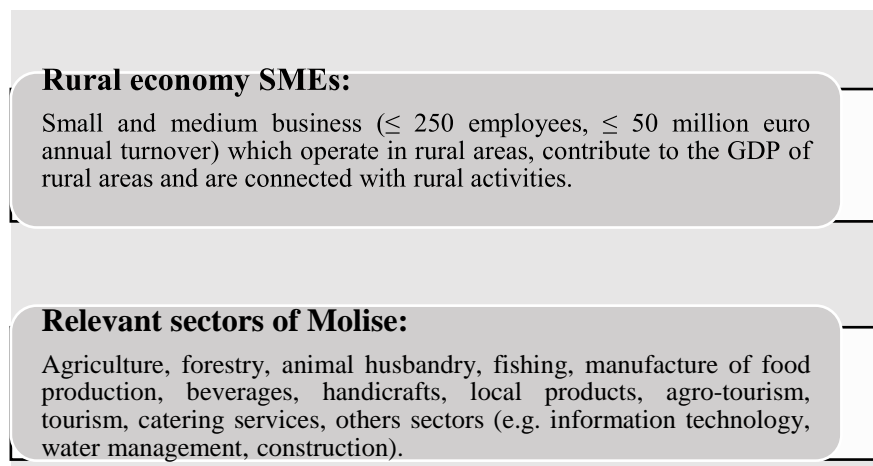


Fig 3. Rural SMEs definitions and relevant sectors of Molise.

3.3 Data collection and methods

To collect evidence and to draw on the expertise of target respondents related to cases of innovative technology adoption by firms in remote and inaccessible rural areas of Molise, a structured on-line questionnaire was designed. The questionnaire was divided into two main sections. Section A included questions to identify the municipality where the enterprises operate, their main core business and the dimensions of their rural SMEs; Section B dealt with issues related to the use of particular innovation technology, the type of innovation used, and what barriers and enabling factors can hinder and support the adoption and dissemination of new technology. A total of 165 questionnaires were sent to entrepreneurs of SMEs with at least ten employees located in Molise that have made innovative changes to their activities regarding product/process in recent years (CERVED, 2016; ISTAT, 2016). All respondents were informed of the purpose of the questionnaire by a letter of introduction and the firms invited to sampling were contacted by letter or telephone. The questionnaires were subsequently returned, 30 of which could be used for the analysis. This study reached a rather satisfactory return rate of 20%. The 30 respondents were owners and/or managers of SMEs active in the principal sectors of Molise (agricultural, food and beverage production, animal husbandry, hotel and restaurant services) and situated mainly in remote and marginal areas of sixteen municipalities (*comuni*) of Molise. General owners and managers generally have a greater knowledge of their innovation implementation.

Figure 4 shows that about 57% of the surveyed rural SMEs were located in municipalities classified as mountainous, the remainder were in hilly rural areas (Figure 4).

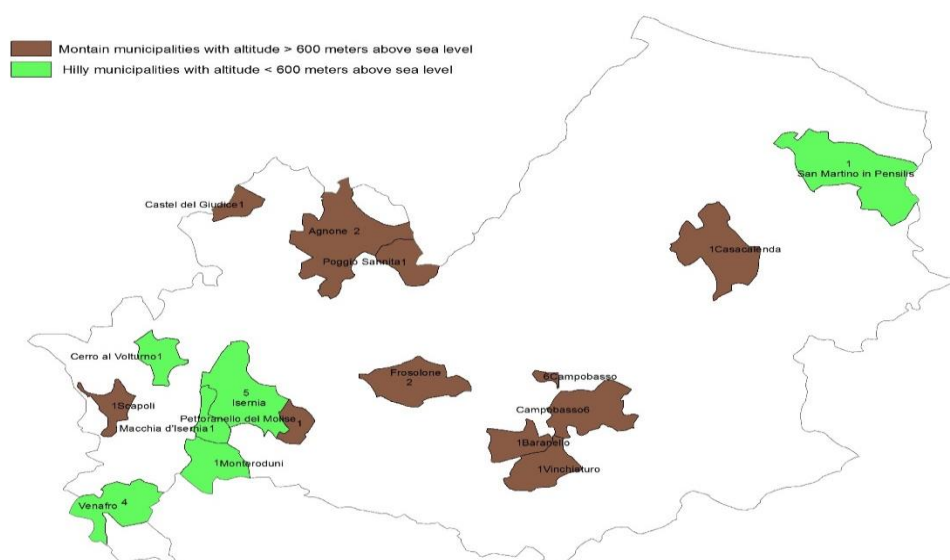


Fig 4. Geographical distribution and number of rural SMEs analysed. Source: own elaboration

4. Results

In this study, on the basis of European Commission definitions, the 30 surveyed enterprises (Figure 4) were classified as micro-sized enterprises (< 10 employees), small enterprises (10–49 employees) and medium enterprises (50–250 employees) (Table 3). The data shown in Table 3, reveals right skewness in the distribution, with proportionately more micro-sized (80%) and small enterprises (10%). It is possible to see that the micro and small enterprises have, respectively, a turnover of less than 2 million euro, with an average of between 2 and 10 million euro. This is due to the fact that the majority of SMEs in Molise are family-owned, with a low capital base, are located in rural and semi-rural areas, and are largely active in the food production and agricultural sectors.

Tab 3. The sample of rural SMEs analyzed. Source: Author's elaboration of data from the rural SMEs survey, 2016

The amount of turnover (EUR)	N. of rural SMEs	N. of employees	N. of rural SMEs	Classification
Less than 2 million	24 (80%)	Less than 10 employees	21 (70%)	Micro enterprises
2–10 million	3 (10%)	10–49 employees	6 (20%)	Small enterprises
10–50 million	2 (6.7%)	50–250 employees	2 (6.7%)	Medium enterprises
Not declared	1 (3.3%)	Not declared	1 (3.3%)	Not classifiable

Figure 5 shows that 28% of the surveyed SMEs are active in the food production sector, 25% in the agricultural sector, 19% operate in other sectors (e.g., information technology, water management, construction), 10% in manufacture of food and beverage products, 9% in animal husbandry and 9% in catering services.

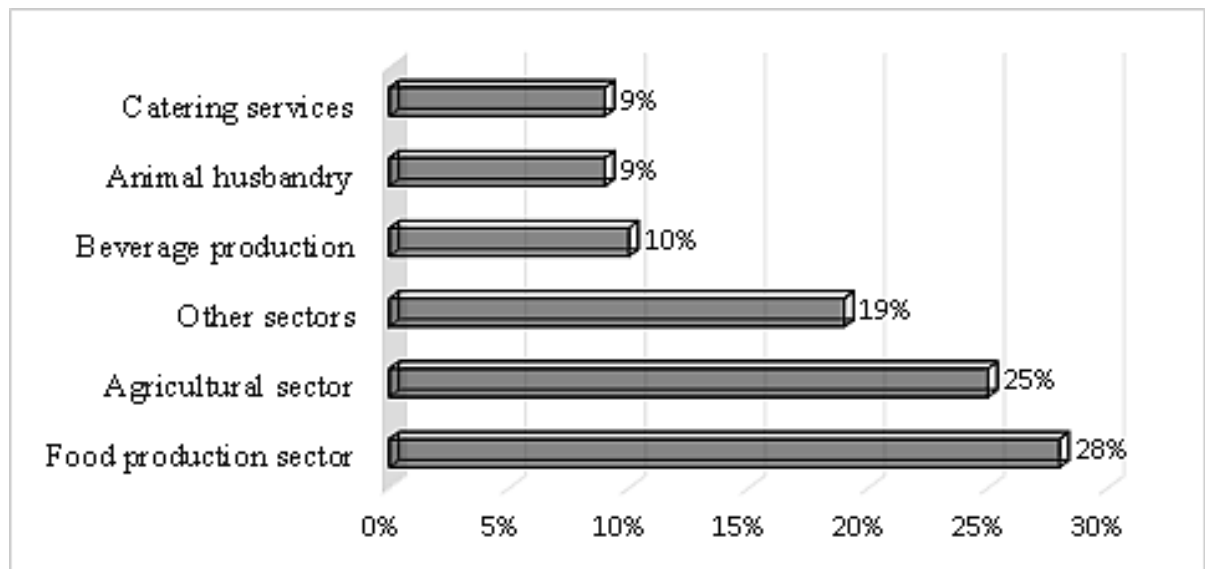


Fig 5. Core business of surveyed rural SMEs. Source: Author's elaboration of data from the rural SMEs survey, 2016

Using the date of reply, descriptive statistics were applied to aid understanding of the aims that influenced a firm's propensity to innovate, the barriers experienced and the enabling factors that can hinder and support the adoption and dissemination of innovation introduced by rural SMEs in municipalities from which each completed questionnaire came. The strategic decisions of the firm, including the innovation strategy, were specified by the entrepreneur. Over 60% of the entrepreneurs participating in this study were aged over 50 years.

In Figure 6, the main types of innovation already adopted by the surveyed SMEs are shown. Following the Oslo Manual, the innovations implemented in the rural SMEs operating in Molise were regrouped into 3 categories. The classification shows that approximately 53% of surveyed firms, operating mainly in the agricultural and food industry sectors, preferred to adopt process and product innovations (e.g., organic farming, renewable energy, precision agriculture, novel crops and functional foods). Approximately 14% of firms, operating in catering services and in other sectors (e.g., information technology, water management, construction), aimed to develop market innovations (e-platforms for product promotion and exports, online orders and delivery tools, food traceability systems as a marketing tool) with the aim to expand new market segments for current products, rather than invest in research and development activities (8.6%). In contrast, regarding organizational innovation, there was a low propensity to set up partnerships with other firms along the supply chain (8.6%) and to participate in collaborative networks designed to stimulate innovation (10.3%). Just over 5% of entrepreneurs answered that no suitable options were provided in the questionnaire (Figure 7). It should be noted that the concept of innovation in the surveyed area was rather broad, and strongly related to what was perceived as 'new' by the enterprises.

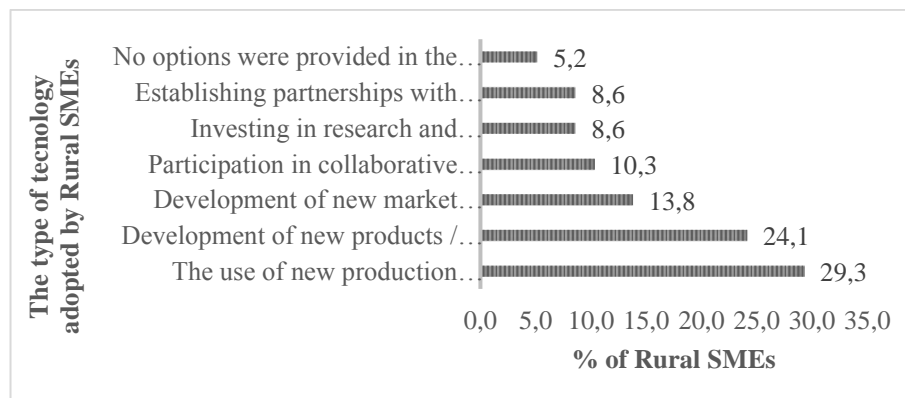


Fig 6. The type of innovations adopted by surveyed rural SMEs. Source: Author's elaboration of data from rural SMEs survey, 2016

These types of innovation had been adopted in different years. Table 4 presents the years in which firms adopted their new technologies. Rural SMEs were more likely to have started implementing new technology recently, from 2012 to 2016. The highest proportion of the firms adopted new technologies in 2016 (13.7%) followed by 2014 (13.3%) and 2015 (10%).

Tab 4. The years in which the technologies were adopted by rural SMEs. Source: Author's elaboration of data from rural SMEs survey, 2016

Year	The number of rural SMEs	%
2016	5	16.67
2015	3	10.00
2014	4	13.33
2013	2	6.67
2012	1	3.33
2011	2	6.67
2010	2	6.67
2009	2	6.67
2008	1	3.33
2007	1	3.33
2006	2	6.67
2005	1	3.33
2004	2	6.67
2003	1	3.33
2002	1	3.33
Total	30	100

The survey revealed the main aims the enterprises themselves pursued and the requirements they needed to support the adoption and dissemination of innovation. Approximately 26% of rural firms stated that their top priority was to increase their market share with the utilization of technologies supporting product distribution (online orders and delivery tools). Around 22% of the rural SMEs aimed to increase consumer satisfaction with food traceability systems and 20.5% wanted to access new markets with e-platforms for product promotion and exports. For 17% and almost 15%, it was important to improve business profitability and firm efficiency, respectively (Figure 8).

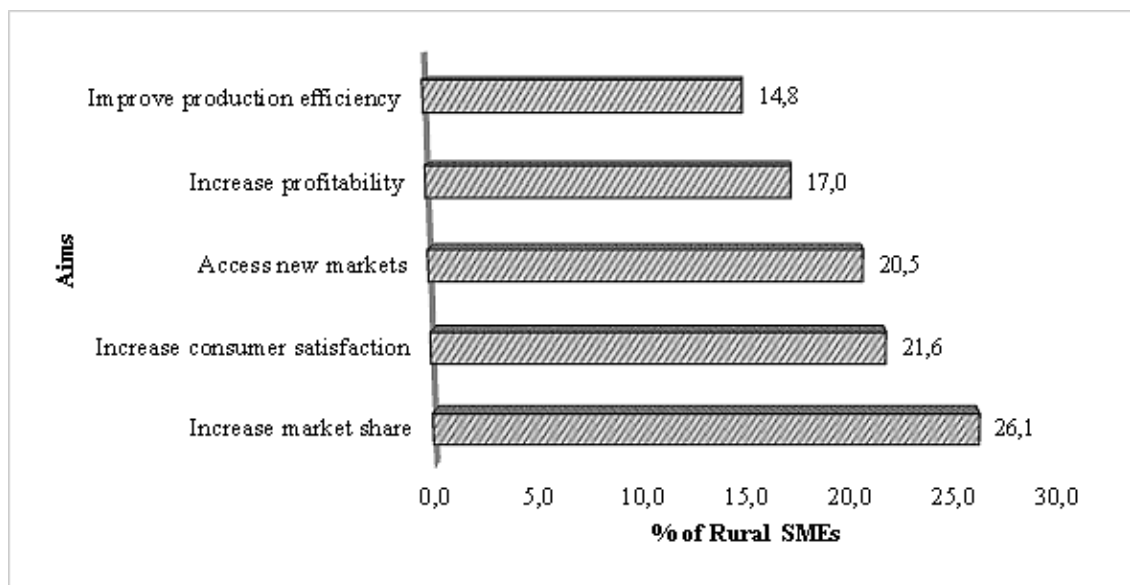


Fig 8. Main aims of rural SMEs surveyed to support the adoption of innovation. Source: Author's elaboration of data from the rural SMEs survey, 2016

However, these same aims were difficult to pursue because of the existence of innumerable barriers. A large number of SMEs interviewed (28%), lamented the lack of financial resources available, which are necessary to make technological innovations. They also highlighted the considerable difficulty they encountered in accessing public and private funding. Indeed, it became clear that problem of financing SMEs was not so much related to the source of funds but rather their accessibility. Factors identified as inhibiting fund accessibility were the stringent conditions set by financial institutions, lack of adequate collateral and credit information and the cost of accessing funds. The funding problem of SMEs was primarily due to the behavior of banks and the imperfection of the capital markets (Binks and Ennew, 1996). Approximately 21% of rural SMEs complained of poor regulation and therefore low support from regional Authorities. Other obstacles highlighted were the skepticism concerning the benefits that may arise from the adoption of new technologies (10%), and the lack of, or even the inadequacy of, existing technological infrastructures (10%). The government has not done enough to create the best conducive environment for striving SMEs, nor has it tackled the problems related to infrastructures. Rural entrepreneurs considered investments in infrastructure as highly desirable, and also highlighted the necessity for the development of entrepreneurship in rural areas, due to cultural issues related to tradition (8.5%). Indeed, most entrepreneurs operating in Molise did not have the investment culture to claw back profits and also highlighted other barriers, shown in Figure 9.

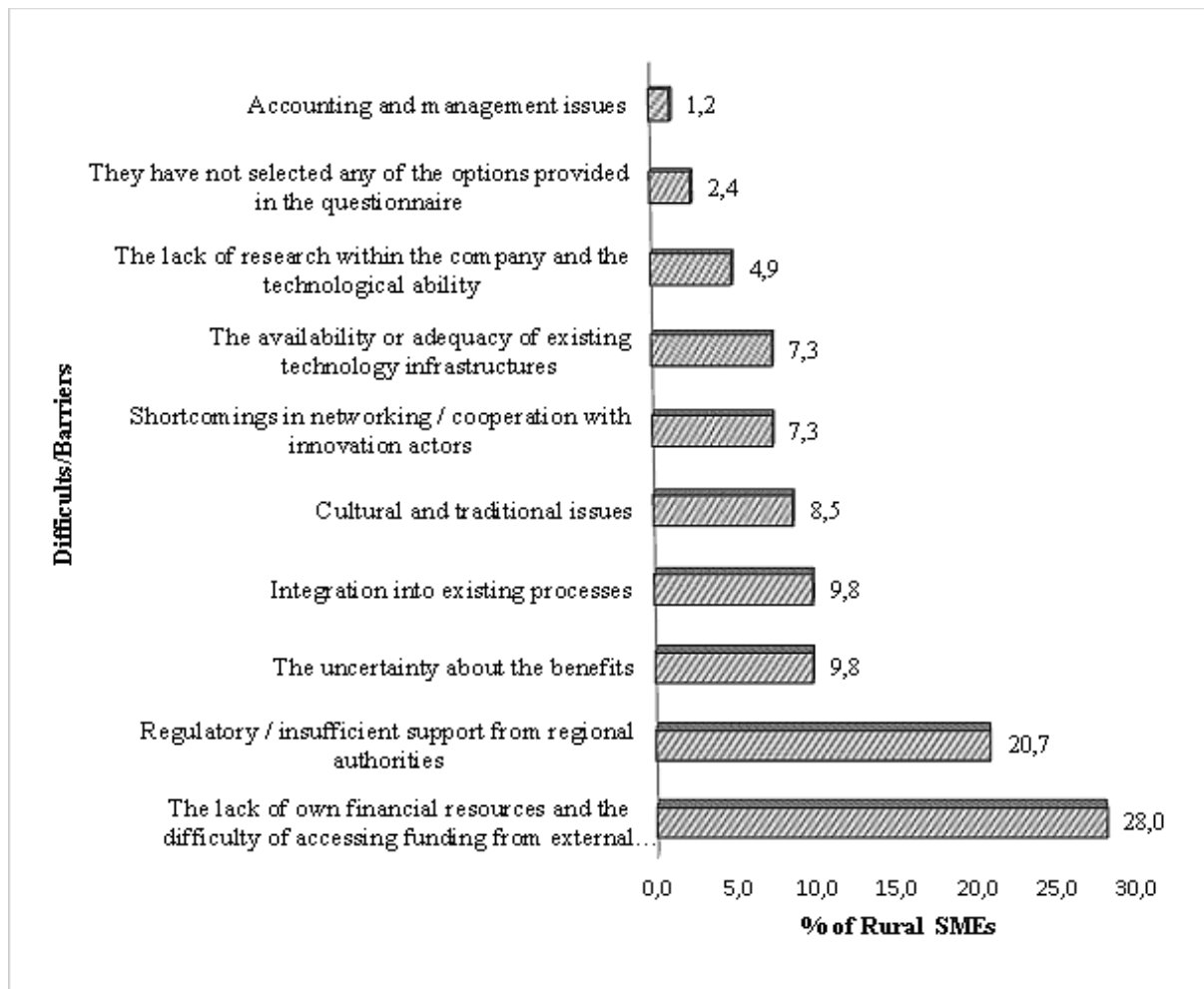


Fig 9. The difficulties/barriers for Rural SMEs in the adoption/integration of new technology. Source: Author's elaboration of data from the rural SMEs survey, 2016

5. Conclusions and discussion

The results of the analysis on rural SMEs development in Molise indicated that between 2002 and 2016, the main technologies used by rural entrepreneurs were production technology and new processes (29%) and those related to the development of new products/services (24%). These results are in accordance with findings from the literature in which the most common type of innovation pursued, especially in the food production sector, was innovation in processes (Galizzi and Venturini, 1996; Grunert et al., 1997; Alfranca et al., 2002; Capitanio et al., 2010; Triguero et al., 2013). This is often primarily the result of marketing capabilities (Le Bars et al., 1998), of a reduction of costs (Scozzi et al., 2005) and of improved food safety and quality (Traill and Meulenberg, 2002). There are numerous reasons for this. Firstly, innovation in the food industry does not usually make use of scientific inputs as innovation in this sector tends to be more incremental than radical; there is also a link with the observation that consumers are typically conservative and reject radically novel food products (Martinez and Briz, 2000). Secondly, the food industry is characterized mostly by SMEs (Schiemann, 2008), a size typology that is often deemed to lack the internal resources necessary to undertake innovation.

From the analysis it emerged that the types of technology and innovation were difficult to define. There were different interpretations of what qualifies as an innovation or as a new technology. The results implied that the distinction between types of innovation and new technology is not straightforward and that it depends on the perception of innovation and or technology by the business owners interviewed. The main finding of this study was that, in the majority of firms, there was a coexistence between types of innovation and technology (the use and the development of new production and new process technology). This research showed that the use of new production/process technologies and the development of new products/services by rural SMEs operating in Molise was a recent process that was not widespread: 50% of rural SMEs surveyed had adopted innovations between 2012 and 2016.

In the literature, there is evidence that manufacturing SMEs in traditional industries (e.g., food production sectors) usually have poor human and financial resources (Welsh et al., 1982; Bridge et al., 1998) and they are therefore likely to be less prepared and less able to change. However, from this empirical study it emerged that the lack of independent financial resources and the difficulty in accessing funding from external sources remained one of the biggest barriers for 28% of rural SMEs surveyed. These results were in accordance with Smallbone and North (1999). Another barrier highlighted by owners was insufficient support from regional Authorities. In Molise, regional Authorities have a critical role to play in every sphere of innovation including access to finance and technology, building capacity and human resources, market linkages, availability of research facilities, and access to key information via different policies and schemes. Nearly 21% of the innovative SMEs interviewed saw government policy and meeting government regulatory requirements as a barrier to innovation. Rural entrepreneurs in Molise were not inclined to introduce innovation because they did not always tend to see innovation as an investment and were rather uncertain about the benefits.

Another failure factor of the poor introduction of new technologies was the low propensity of owners of rural SMEs operating in Molise to set up partnerships with other firms along the supply chain and to participate in collaborative networks designed to stimulate innovation. This demonstrated that rural SMEs rarely focus on organizational innovations (Humphreys et al., 2005). This is a weakness of rural SMEs operating in Molise since the literature highlights the great importance of networking for SMEs in the food sector and how firm size influences innovative behavior (O'Reilly et al., 2003; Colurcio et al., 2012; Olsen et al., 2012; Bhaskaran, 2013; Minarelli et al., 2014; Fanelli, 2018). Indeed, through alliances and collaboration, new product design and development and manufacturing capabilities are internalized (Banerjee, 2000). This utilization of organizational innovation presupposes the presence of a new and young class of entrepreneur with a different frame of mind and skills, making it possible for them to work not in isolation but in regional and national business networks. In accordance with previous literature, in order to achieve sustainable competitive advantage, it is necessary for SMEs to develop innovation competence, which is the capacity to innovate, now and in the future, along

the whole innovation process (Gellynck et al., 2007). The technological modernization of the SME sector requires appropriate organizational changes, which would lead to much greater flexibility.

Regarding the main aims that the enterprises themselves pursued, the results of the analysis showed that for above 26% and about 22% of firms respectively, it was very important to increase market share and customer satisfaction. On the one hand, the progressive and gradual opening of markets to SMEs is a driving factor for their sustainable development and for their survival. On the other hand, customer satisfaction means the same firms are able to respond to the needs of consumers in a fast and flexible manner. For 17% and approximately 15% of respondents respectively, the main aim was to increase profitability and to improve production efficiency. These findings were in accordance with previous literature, that states that market orientation has a positive effect on firm survival and competitiveness (Brooksbank, 1999; Siu, 2000).

In addition, this study found that some barriers were common to all sixteen municipalities while each municipality also had its own set of unique barriers. The common barriers were associated with the shared characteristics of rural locations such as inadequate infrastructure; lack of access to resources (skilled labor, technology and finance); and uncertainty about government policies, especially in relation to innovation. Policy initiatives aimed at encouraging the formation, growth, and survival of enterprises in rural areas need to consider the distinctive characteristics of businesses, as well as the difficulties that result from the characteristics of the rural environment itself. Ultimately, rural entrepreneurs have to deal with the effects of rurality on the entrepreneurial process.

In Molise, the development of SMEs and changes in their structure over time through innovation, output composition, market orientation and location are usually thought to be related to many factors, including the level of economic development and government promotion programs. The SME managers interviewed believed that rural locations were disadvantageous in terms of encouraging and supporting product and service innovation. Their location was judged to affect their ability to find skilled staff, made it more difficult to build sectoral contacts, and, because of the long distances involved, made it more difficult to develop non-local markets. Therefore, policy initiatives aimed at encouraging innovation in enterprises in Molise need to take account not only of the distinctive characteristics of the businesses in these areas (e.g., in terms of type of activity, size of the business, motivation of the entrepreneur) but also the difficulties resulting from the characteristics of the business environment itself. These characteristics might include the relatively small size of the local market, the limited opportunities for trade and networking with other local businesses, and the small size and restricted skill base of the local labor market. Finally, an effective way to overcome such obstacles, in line with the results of other related studies (Pratchett et al., 2006; Chen et al., 2007; O'Toole, 2007; Sengupta and Bandyopadhyay, 2009) would be to develop and deliver high-quality e-government services.

This paper contributes to the growing body of literature on the innovative activities and information sourcing practices of small firms in a rural context (Molise). Future research in the area could involve a quantitative survey, carried out to enhance the generalizability of the model. The results of the study would be important for both researchers, as well as small business operators (including government agencies and owner/managers). Distinguishing between different types of innovation and their impact on and benefits for rural SMEs and on the environment is an important issue. However, greater priority should perhaps be placed on clarifying the connections between the different elements of this process. The findings of this study add to the literature on SMEs, information technology, and innovation. They also help build a foundation for further understanding of the main barriers for the adoption of innovation by rural SMEs. The top priority for rural SMEs operating in Molise was to increase market share and consumer satisfaction and they also wanted to access new markets. Others aims were to improve business profitability and firm efficiency. Many of the business owners interviewed lamented the lack of financial resources available, which would be necessary to make technological innovations. They also highlighted the considerable difficulty in accessing public and private funding. For SMEs to fully develop and use their potential, they need specific policy measures to ensure that technological services can be provided, and the requisite infrastructure also needs to be available. As a result, research and development institutions that are publicly funded should be encouraged to target the technological needs of SMEs. Typical characteristics of the rural environment persist, such as those concerning

the availability of business premises, transport infrastructure, small size local markets, features of rural labor markets and access to information and finance (Smallbone and Welter, 2006). The study presented in this paper is only one part of a larger long-term project investigating the drivers and barriers to the adoption of new technology by SMEs. Further research is currently being undertaken in order to overcome some of the research limitations this paper has highlighted. The limitations of the study include the small size of the sample. Moreover, as the study was conducted in a single region with its own idiosyncratic features, the generalizability of the findings to other regional contexts remains somewhat ambiguous.

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Academic references

- [1] Abbing, E. R. (2010). *Brand driven innovation: strategies for development and design* (Vol. 21). Ava Publishing.
- [2] Alfranca, O., Rama, R. & Von Tunzelmann, N. (2002). A patent analysis of global food and beverage firms: The persistence of innovation. *Agribusiness* 18(3), 349–368. DOI: 10.1002/agr.10021.
- [3] Altenburg, T., Hillebrand, W. & Meyer-Stamer, J. (1998). Building Systemic Competitiveness: Concept and Case Studies from Mexico, Brazil, Paraguay, Korea and Thailand [Reports and Working Papers 3/1998]. Berlin: German Development Institute.
- [4] Amara, N. & Landry, R. (2005). Sources of information as determinants of novelty of innovation in manufacturing firms: evidence from the 1999 statistics Canada innovation survey. *Technovation*, 25(3), 245–259. DOI: 10.1016/S0166-4972(03)00113-5.
- [5] Aubert, B. A., Schroeder, A. & Grimaudo, J. (2012). IT as enabler of sustainable farming: An empirical analysis of farmers' adoption decision of precision agriculture technology. *Decision Support Systems*, 54(1), 510–520. DOI: 10.1016/j.dss.2012.07.002.
- [6] Banerjee, S. K. (2000). Developing manufacturing a management strategy: influence of technology and other issues, *International Journal of Production Research*, 64(1–3), 79–90. DOI: 10.1016/S0925-5273(99)00046-8.
- [7] Baourakis, G., Kourgiantakis, M. & Migdalas, A. (2002). The impact of e-commerce on agro-food marketing: The case of agricultural cooperatives, firms and consumers in Crete. *British Food Journal*, 104(8), 580–590. DOI: 10.1108/00070700210425976.
- [8] Bennett, R. J. & Smith, C. (2002). Competitive conditions, competitive advantage and the location of SMEs. *Journal of Small Business and Enterprise Development*, 9(1), 73–86. DOI: 10.1108/14626000210419509.
- [9] Bergmann, A., Hanley, N. & Wright, R. (2006). Valuing the attributes of renewable energy investments. *Energy Policy*, 34(9), 1004–1014. DOI: 10.1016/j.enpol.2004.08.035.
- [10] Bhaskaran, S. (2013). Structured case studies: Information communication technology adoption by small-to-medium food enterprises. *British Food Journal*, 115(3), 425–447. DOI: 10.1108/00070701311314237.
- [11] Bigliardi, B. & Galati, F. (2013). Innovation trends in the food industry: the case of functional foods. *Trends, Food Science & Technology*, 31(2), 118–129. DOI: 10.1016/j.tifs.2013.03.006.

- [12] Binks, M. R. & Ennew, C. T. (1996). Growing firms and the credit constraint. *Small Business Economics*, 8(1), 17–25. DOI: 10.1007/BF00391972.
- [13] Bridge, S., O'Neill, K. & Cromie, S. (1998). *Understanding Enterprise, Entrepreneurship, and Small Business*, London, MacMillan.
- [14] Brooksbank, R. (1999). The theory and practice of marketing planning in smaller businesses. *Marketing Intelligence & Planning*, 17(2), 78–91. DOI: 10.1108/02634509910260931.
- [15] Cannata, G., Fanelli, R. M. & Di Nocera, A. (2014). Le analisi quantitative per uno studio dei sistemi agroalimentari territoriali. *Scritti raccolti per i 70 anni di Ennio Badolati*, (pp. 1–16) Dipartimento di Economia, Gestione, Società e Istituzioni, Università degli Studi del Molise. Campobasso: Libellula.
- [16] Capitanio, F., Coppola, A. & Pascucci, S. (2010), Product and process innovation in the Italian food industry. *Agribusiness* 26(4), 503–518. DOI: 10.1002/agr.20239.
- [17] Chandler, D., Bailey, A. S., Tatchell, G. M., Davidson, G., Greaves, J., & Grant, W. P. (2011). The development, regulation and use of biopesticides for integrated pest management. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 366(1573), 1987–1998. DOI: 10.1098/rstb.2010.0390.
- [18] Chavas, J. P. (2008). A cost approach to economic analysis under state-contingent production uncertainty. *American Journal of Agricultural Economics* 90(2), 435–446. DOI: 10.1111/j.1467-8276.2007.01118.x.
- [19] Chen, Y., Chen, H. M., Ching, R. K. H. & Huang, W. W. (2007). Electronic government implementation: a comparison between developed and developing countries. *International Journal of Electronic Government Research*, 3(2), 45–61. DOI: 10.4018/jegr.2007040103.
- [20] Cho, H. J. & V. Pucik, V. (2005). Relationship between innovativeness, quality, growth, profitability, and market value. *Strategic Management Journal*, 26, 555–575. DOI: 10.1002/smj.461.
- [21] Clemons, E. K. & Row, M. C. (1991). Sustaining IT Advantage: The Role of Structural Differences. *MIS Quarterly*, 15(3), 275–292. DOI: 10.2307/249639.
- [22] Colurcio, M., Wolf, P., Kocher, P. Y. & Russo Spena, T. (2012). Asymmetric relationships in networked food innovation processes. *British Food Journal*, 114(5), 702–727. DOI: 10.1108/00070701211229981.
- [23] Darren, L. & Conrad, L. (2009). *Entrepreneurship and Small Business management in the Hospitality Industry*. Jordan Hill, UK: Elsevier Linacre House.
- [24] David, B. & Audretsch, D. B. (2004). Sustaining Innovation and Growth: Public Policy Support for Entrepreneurship, *Industry and Innovation*, 11(3), 167–191. DOI: 10.1080/1366271042000265366.
- [25] De Jong, J. P. J. & Vermeulen, P. A. M. (2006). Determinants of product innovation in small firms. A comparison across industries. *International Small Business Journal*, 24(6), 587–609. DOI: 10.1177/0266242606069268.
- [26] Del Rio, P. & Burguillo, M. (2008). Assessing the impact of renewable energy deployment on local sustainability: Towards a theoretical framework. *Renewable and Sustainable Energy Review*, 12(5), 1325–1344. DOI: 10.1016/j.rser.2007.03.004.
- [27] Del Rio, P. & Burguillo, M. (2009). An empirical analysis of the impact of renewable energy deployment on local sustainability. *Renewable and Sustainable Energy Review*, 13(6–7), 1314–1325. DOI: 10.1016/j.rser.2008.08.001.
- [28] Dillon, C. R. & Gandonou, J. M. (2007). Precision timing and spatial allocation of economic fertilizer application. Selected Paper prepared for presentation at the *Southern Agricultural Economics Association Annual Meeting, Mobile AL*, 4–6 February 2007.

- [29] Downs, G. W. & Mohr, L. B. (1976). Conceptual Issues in the Study of Innovation. *Administrative Science Quarterly*, 21(4), 700–714. DOI: 10.2307/2391725.
- [30] Earle, M. D. (1997). Innovation in the food industry. *Trends in Food Science & Technology* 8(5), 166–175. DOI: 10.1016/S0924-2244(97)01026-1.
- [31] Edwards, T., Delbridge, R. & Munday, M. (2005). Understanding innovation in small and medium-sized enterprises: a process manifest. *Technovation*, 25(10), 1119–1120. DOI: 10.1016/j.technovation.2004.04.005.
- [32] Fanelli, R. M. (2005). Il sistema economico-produttivo molisano: un'analisi dell'evoluzione alla luce dei dati del Censimento del 2000. In Marino, D., ed *Nuovi percorsi per l'analisi della spesa pubblica per l'agricoltura* (pp. 39–62). Napoli: Edizioni Scientifiche Italiane.
- [33] Fanelli, R. M. (2007). "Quali funzioni per quanti e quali contesti agricoli territoriali "omogenei"?". *Rivista di Economia & Diritto Agro-alimentare*, 2, 127–167.
- [34] Fanelli, R. M. (2018). The Interactions between the Structure of the Food Supply and the Impact of Livestock Production on the Environment. A Multivariate Analysis for Understanding the Differences and the Analogies across European Union Countries. *Quality – Access to Success*, 19(167), 131–139.
- [35] Forsman, H. & Annala, U. (2011). Small enterprises as innovators: shift from a low performer to a high performer. *International Journal of Technology Management*, 56(1–2). DOI: 10.1504/IJTM.2011.042980.
- [36] Freeman, C. (1971). *The Role of Small Firms in Innovation in the United Kingdom*. [Report to the Bolton Committee of Enquiry on Small Firms]. London: HMSO.
- [37] Galizzi, G. & Venturini, L. (1996). Product innovation in the food industry: Nature, characteristics and determinants. In Galizzi, G. & Venturini, L., eds., *Economics of innovation: The case of food industry* (pp. 133–153). Heidelberg: Physica-Verlag.
- [38] Gellynck, X., Vermeire, B. & Viaene, J. (2007). Innovation in food firms: contribution of regional networks within the international business context. *Entrepreneurship & Regional Development*, 19(3), 209–226. DOI: 10.1080/08985620701218395.
- [39] Godwin, R. J., Richards, T. E., Wood, G. A., Welsh, J. P. & Knight, S. M. (2003). An economic analysis of the potential for precision farming in UK cereal production. *Biosystems Engineering*, 84(4), 533–545. DOI: 10.1016/S1537-5110(02)00282-9.
- [40] Grunert, K. G., Harmsen, H., Meulenberg, M., Kuiper, E., Ottowitz, T., Declerck, F., Traill, B. & Göransson, G. (1997). A framework for analysing innovation in the food sector. In *Products and Process Innovation in the Food Industry* (pp. 1–37). Boston, MA: Springer. DOI: 10.1007/978-1-4613-1133-1_1.
- [41] Gutjahr, C., Weis, M., Sökefeld, M., Ritter, C., Möhring, J., Büchse, A., Piepho, H. P. & Gerhards, R. (2008). Erarbeitung von Entscheidungsalgorithmien für die teilflächenspezifische Unkrautbekämpfung. *Journal of Plant Diseases and Protection*, Special Issue XXI, 143–148.
- [42] Hayes, R. H. & Wheelwright, S. C. (1979). Link Manufacturing Process and Product Life Cycles. *Harvard Business Review*, March-April: 127–136.
- [43] Henschion, M. & McIntyre, B. (2005). Market access and competitiveness issues for food SMEs in Europe's lagging rural regions (LRRs). *British Food Journal*, 107(6), 404–422. DOI: 10.1108/00070700510602183.
- [44] Holt, G. C., Henschion, M., Reynolds, C., Baviera, B., Calabrese, J., Contini, L. & Prugger, R. (2007). Research agenda for SMEs in electronic platforms for the European food industry. *Foresight*, 9(3), 42–53. DOI: 10.1108/14636680710754165.
- [45] Humphreys, P., McAdam, R. & Leckey, J. (2005). Longitudinal evaluation of innovation implementation in SMEs. *European Journal of Innovation Management*, 8(3), 283–304. DOI: 10.1108/14601060510610162.

- [46] Inkpen, A. C. & Tsang, E. W. (2005). Social capital, networks, and knowledge transfer. *Academy of Management Review*, 30(1), 146–165. DOI: 10.5465/amr.2005.15281445.
- [47] Jørgensen, F. & Ulhøi, J. P. (2010). Enhancing innovation capacity in SMEs through early network relationships. *Creativity and Innovation Management*, 19(4), 397–404. DOI: 10.1111/j.1467-8691.2010.00577.x.
- [48] Kim, J. S., Ritzman, L. P., Benton, W. C. & Snyder, D. L. (1992). Linking product planning and process design decisions. *Decision Sciences*, 23(1), 44–60. DOI: 10.1111/j.1540-5915.1992.tb00376.x.
- [49] Knight, K. E. (1967). A descriptive model of the intra-firm innovation process. *The Journal of Business*, 40(4), 478–496.
- [50] Krugman, P. (1994). Competitiveness: a dangerous obsession. *Foreign Affairs*, 73(2), 28–44. DOI: 10.2307/20045917.
- [51] Laursen, K. & Salter, A. (2005). Open for innovation: the role of openness in explaining innovation performance among U.K. manufacturing firms; *Strategic Management Journal*, 27(2), 131–150. DOI: 10.1002/smj.507.
- [52] Le Bars, A., Mangematin, V. & Nesta, L. (1998). Innovation in SME's: the missing link. In *High-Technology Small Firms Conference*, 1, 307–324.
- [53] Lee, C. W. (2007). Strategic alliances influence on small and medium firm performance. *Journal of Business Research*, 60(7), 731–741. DOI: 10.1016/j.jbusres.2007.02.018.
- [54] Linder, J. C., Jarvenpaa, S. & Davenport, T. H. (2003). Towards an innovation sourcing strategy. *MIT Sloan Management Review*, 44(4), 43–49.
- [55] Littunen, H. (2000). Networks and local environmental characteristics in the survival of new firms. *Small Business Economics*, 15(1), 59–71. DOI: 10.1023/A:1026553424833.
- [56] Littunen, H. & Virtanen, M. (2009). Differentiating factors of venture growth: from statics to dynamics. *International Journal of Entrepreneurial Behavior & Research*, 15(6), 535–554. DOI: 10.1108/13552550910995425.
- [57] Mark-Herbert, C. (2004). Innovation of a new product category-functional foods. *Technovation*, 24(9), 713–719. DOI: 10.1016/S0166-4972(02)00131-1.
- [58] Martinez, M. G. & Briz, J. (2000). Innovation in the Spanish food & drink industry. *The International Food and Agribusiness Management Review*, 3(2), 155–176. DOI: 10.1016/S1096-7508(00)00033-1.
- [59] Martinot, E. (2001). Renewable energy investment by the World Bank. *Energy Policy*, 29(9), 689–699. DOI: 10.1016/S0301-4215(00)00151-8.
- [60] Minarelli, F., Raggi, M. & Viaggi, D. (2014). Distinguishing the innovation behaviour of micro, small and medium food enterprises. *Journal on Chain and Network Science*, 14(2), 95–102. DOI: 10.3920/JCNS2014.x004.
- [61] Morone, P. & Taylor, R. (2012). Proximity, knowledge integration and innovation: an agenda for agent-based studies. *Journal of Evolutionary Economics*, 22(1), 19–47. DOI: 10.1007/s00191-010-0200-6.
- [62] Narula, R. (2004). R&D collaboration by SMEs: new opportunities and limitations in the face of globalisation. *Technovation*, 24(2), 153–161. DOI: 10.1016/S0166-4972(02)00045-7.
- [63] Niggli, U., Slabe, A., Schmid, O., Halberg, N. & Schlüter, M. (2008). *Vision for an Organic Food and Farming Research Agenda 2025*. Brussel: IFOAM EU Group.
- [64] Ntaliani, M., Costopoulou, C., Manouselis, N. & Karetos, S. (2009). M-government services for rural SMEs. *International Journal of Electronic Security and Digital Forensics*, 2(4), 407–423. DOI: 10.1504/IJESDF.2009.027672.

- [66] O'Reilly, S., Haines, M. & Arfini, F. (2003). Food SME networks: Process and governance- The case of Parma ham. *Journal on Chain and Network Science*, 3(1), 21–32. DOI: 10.3920/JCNS2003.x027.
- [67] O'Toole, K. (2007). E-governance in Australian Local government: Spinning a Web around Community. *International Journal of Electronic Government Research* 3(4), 58–83. DOI: 10.4018/jegr.2007100104.
- [68] Olsen, N. V., Elvekrok, I. & Nilsen, E. R. (2012). Drivers of food SMEs network success: 101 tales from Norway. *Trends in food science & technology*, 26(2), 120–128. DOI: 10.1016/j.tifs.2012.01.008.
- [69] Ozer, M. (2004). The role of the Internet in new product performance: A conceptual investigation. *Industrial Marketing Management*, 33(5), 355–369. DOI: 10.1016/j.indmarman.2003.09.002.
- [70] Padel, S. & Lampkin, N. H. (1994). Conversion to organic farming: an overview. *The economics of organic farming: An international perspective*, 295–313. Wallingford, Oxon, UK (1994), 295–313.
- [71] Padel, S., Vaarst, M. & Zaralis, K. (2017). Supporting innovation in organic agriculture: A European perspective using experience from the SOLID project. *Sustainable Agricultural Research* 4(3), 32–41. DOI: 10.5539/sar.v4n3p32.
- [72] Porter, M. (1990). *The Competitive Advantage of Nations*, New York, Free Press, Macmillan.
- [73] Pratchett, L., Wingfield, M. & Polat, R. K. (2006). Local democracy online: an analysis of local government web sites in England and Wales. *International Journal of Electronic Government Research (IJEGR)*, 2(3), 75–92. DOI: 10.4018/jegr.2006070104.
- [74] Pretty, J. (2001). The rapid emergence of genetic modification in world agriculture: contested risks and benefits. *Environmental Conservation*, 28(3), 248–262. DOI: 10.1017/S0376892901000261.
- [75] Rahman, S. U. (2001). A comparative study of TQM practice and organisational performance of SMEs with and without ISO 9000 certification. *International Journal of Quality & Reliability Management*, 18(1), 35–49. DOI: 10.1108/02656710110364486.
- [76] Rigtering, J. C., Kraus, S., Eggers, F. & Jensen, S. H. (2014). A comparative analysis of the entrepreneurial orientation/growth relationship in service firms and manufacturing firms. *The Service Industries Journal*, 34(4), 275–294. DOI: 10.1080/02642069.2013.778978.
- [77] Rogers, M. (2004). Networks, firm size and innovation. *Small Business Economics*, 22(2), 141–153. DOI: 10.1023/B: SBEJ.0000014451.99047.69.
- [78] Rowe, L. A. & Boise, W. B. (1974). Organizational innovation: Current research and evolving concepts. *Public Administration Review*, 34(3), 284–293. DOI: 10.2307/974923.
- [79] Sanghi, N. K. (2007). Beyond certified organic farming: An emerging paradigm for rainfed agriculture. In Kumar, R., ed., *New Paradigm for Rainfed Farming* (pp. 27–29). Secunderabad: WASSAN.
- [80] Schiemann, M. (2008). *Unternehmen nach Größenklassen-Überblick über KMU in der EU*. Luxembourg: EUROSTAT.
- [81] Schumpeter, J. A. (1983). *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*, revised ed. Piscataway, NJ: Transaction Publishers.
- [82] Scozzi, B., Garavelli, C. & Crowston, K. (2005). Methods for modeling and supporting innovation processes in SMEs. *European Journal of Innovation Management*, 8(1), 120–137. DOI: 10.1108/14601060510578619.

- [83] Seelan, S. K., Laguetta, S., Casady, G. M. & Seielstad, G. A. (2003). Remote sensing applications for precision agriculture: A learning community approach. *Remote Sensing of Environment*, 88(1–2), 157–169. DOI: 10.1016/j.rse.2003.04.007.
- [84] Sengupta, B. & Bandyopadhyay, M. K. (2009). Policy issues for e-government services for rural areas. *International Journal of Electronic Democracy*, 1(2), 136–148. DOI: 10.1504/IJED.2009.028543.
- [85] Shi, J. & Li, P. (2006, June). An initial review of policies for SMEs in the US, Japan and China. In 2006 IEEE International Conference on Management of Innovation and Technology (Vol. 1, pp. 270–274). Piscataway, NJ: IEEE. DOI: 10.1109/ICMIT.2006.26216.
- [86] Sima, E. (2009). Impact of organic farming promotion upon the sustainable rural development. *Agricultural Economics and Rural Development*, 6(2), 217–234.
- [87] Simpson, M. & Docherty, A. J. (2004). E-commerce adoption support and advice for UK SMEs. *Journal of Small Business and Enterprise Development*, 11(3), 315–328. DOI: 10.1108/14626000410551573.
- [88] Siu, W. S. (2000). Marketing and company performance of Chinese small firms in Hong Kong. *Marketing Intelligence & Planning*, 18(5), 292–307. DOI: 10.1108/02634500010343991.
- [89] Smallbone, D. & North, D. (1999). Innovation and new technology in rural small and medium-sized enterprises: some policy issues. *Environment and Planning C: Government and Policy*, 17(5), 549–566. DOI: 10.1068/Fc170549.
- [90] Smallbone, D. & Welter, F. (2006). Conceptualising entrepreneurship in a transition context. *International Journal of Entrepreneurship and Small Business*, 3(2), 190–206. DOI: 10.1504/IJESB.2006.008928.
- [91] Storey, D. J. (1994). *Understanding the Small Business Sector*. London and New York: Routledge.
- [92] Stratigea, A. (2011). ICTs for rural development: potential applications and barriers involved. *Netcom. Réseaux, communication et territoires*, (25–3/4), 179–204.
- [93] Swinton, S. M. (2005). Economics of site-specific weed management. *Weed Science*, 53(2), 259–263. DOI: 10.1614/WS-04-035R2.
- [94] Tate, G., Mbzibain, A. & Ali, S. (2012). A comparison of the drivers influencing farmers' adoption of enterprises associated with renewable energy. *Energy Policy*, 49, 400–409. DOI: 10.1016/j.enpol.2012.06.043.
- [95] Timmermann, C., Gerhards, R., Krohmann, P. & Kühbauch, W. (2003). The economic impact of site specific weed control. *Precision Agriculture*, 4, 249–260. DOI: 10.1023/A:1024988022674.
- [96] Traill, W. B. & Meulenberg, M. (2002). Innovation in the food industry. *Agribusiness: an International Journal*, 18(1), 1–21. DOI: 10.1002/agr.10002.
- [97] Triguero, Á., Córcoles, D. & Cuerva, M. C. (2013). Differences in innovation between food and manufacturing firms: An analysis of persistence. *Agribusiness*, 29(3), 273–292. DOI: 10.1002/agr.21335.
- [98] Utterback, J. M. & Abernathy, W. J. (1975). A dynamic model of process and product innovation. *Omega* 3(6), 639–656. DOI: 10.1016/0305-0483(75)90068-7.
- [99] Vanhaverbeke, W. & Cloudt, M. (2006). Open innovation in value networks. *Open innovation: Researching a New Paradigm* (pp. 258–281). Oxford University Press.
- [100] Watson, J. (2007). Modeling the relationship between networking and firm performance. *Journal of Business Venturing*, 22(6), 852–874. DOI: 10.1016/j.jbusvent.2006.08.001.
- [101] Welsh, J. A., White, J. F. & Dowell, P. (1982). A Small Business is not a Little Big Business *Harvard Business Review*, 59(4), pp. 18. DOI: 10.1177/026624268200100115.

- [102] Zahra, S. A., Nielsen, A. P. & Bogner, W. C. (1999). Corporate entrepreneurship, knowledge, and competence development. *Entrepreneurship Theory and Practice*, 23(3), 169–189. DOI: 10.1177/104225879902300310.

Other sources

- [103] CERVED (2016). Rapporto sulle piccole e medie imprese.
- [104] European Union (2003). Commission Recommendation of 6 May 2003 on the definition of micro, small and medium-sized enterprises (notified under document number C (2003) 1422) (OJ L 124, 20.5.2003, pp. 36–41).
- [105] FIBL-IFOAM (2017). The World of Organic Agriculture, 2017, www.organic-world.net.
- [106] INNOGROW, Interreg Europe (2014–2020). Regional policies for innovation driven competitiveness and growth of rural SMEs.
- [107] Istat (2016). L'innovazione nelle imprese, Roma.
- [108] OECD (2000). Small and Medium-sized Enterprises: Local Strength, Global Reach. Available from: <http://www.oecd.org/dsti/sti/industry/smes/index.htm>.
- [109] OECD & Eurostat (2005). *Oslo Manual: Guidelines for collecting and interpreting innovation data*. 3rd ed. OECD online bookshop.
- [110] Regulation (EU) n. 1287/2013 of the European Parliament and of the Council of 11 December 2013.