

INTRODUCTION

In Europe, rural areas cover nearly 90% of its territory and are home to more than 50% of its population (Knickel et al., 2009). The effects of globalization, coupled with social, political and environmental changes, have left rural socio-ecological systems at high risk (Bardsley & Bardsley, 2014). Rural regions are, in fact, facing numerous and complex challenges to their economic viability and sustainability. Common features of rural areas, such as population ageing, out migration, low-waged and low-educated workers and cuts to public services, are all contributing factors to the social and economic decline of these regions (Slight et al., 2016; Ward & Brown, 2009).

The effects of external shocks are most evident in marginal rural areas, where low population density, a lack of economic diversification and a lack of control over economic policies imposed by national governments (Freshwater, 2015), undermine their resilience, defined as the ability of rural economies to resist disturbances and/or return to a pre-shock state (Pike et al., 2010; Perrings, 2006; Wilson, 2012). As a result, current rural system analysis in developed countries is focused on creating the conditions to support and increase local resilience in the face of external changes (Fielke & Bardsley, 2013; Milestad & Darnhofer, 2003) and the crucial role that the public and private sector can play in these transformations (Lemos & Agrawal, 2006). In particular, decision makers are increasingly asked for innovative policies (Bardsley & Bardsley, 2016).

State support for agriculture has also undergone a progressive reduction in the last thirty years, in line with the increasing predominance of neoliberal policies. Price support mechanisms for agricultural commodities have been significantly reduced in OECD countries and there has been a tendency to move away from a productivist model of agriculture to a model based on rural multi-functionality, without sufficient investment in innovation and economic growth (Marsden & Sonnino, 2008).

In order to face these challenges and relaunch their economies, rural communities are looking for new opportunities for growth and innovation. Promoting economic growth is, therefore, a priority in rural regions, and the tools needed for this objective are largely considered to be better access to financial capital and, most importantly, innovations (Sarkkinen & Kässi, 2013).

European policies have increasingly tried to promote interaction between farmers, researchers and rural businesses in an attempt to produce an interactive model of innovation, which is inclusive of all the various rural actors (EU, 2009). The European Union's interest in innovation arises from its positive contribution to growth, but especially from the realization that production systems in Europe are not sufficiently innovative and have not yet started moving down the desired path towards a knowledge-based economy.

Innovation is considered important to tackle issues such as response to climate change, conservation of biodiversity, maintaining water quality, exploiting renewable energy sources and has an important role to play in restructuring the European dairy sector. Innovation is also considered essential to meeting objectives for competitiveness, quality of life, diversification and territorial cohesion, all of which are key issues in the EU agenda.

Despite working with a reduced budget, the EU is still highly committed to supporting innovation and research across all sectors, including agriculture (Bonfiglio et al., 2015). In fact, research and development is one of the EU's five priority targets in its ten year strategy launched in 2010 for sustainable and inclusive economic growth (the Europe 2020 Strategy).

This chapter aims to add to the policy debate surrounding innovation in agriculture through a case study within the NOVOROD Project, which has successfully developed innovation in the struggling Italian dairy sector by building an economic and scientific partnership. The case study analysis shows how the success of the project was more to do with innovations in governance in the production chain and the makeup of the project's partnership rather than innovations in the product. The project added new and innovative figures to the traditional actors involved in introducing innovations (producers/adopters of innovation) who were able to produce organizational models capable of increasing the competitiveness of this sector, which is currently in crisis.

BACKGROUND

The progressive recognition of the multi-functionality of agriculture and rural areas, now freed from the mono-function of food production, is changing the traditional idea of agriculture and, with this, the role of farmers. To respond to these changes in the European Union's new Common Agricultural Policy (CAP) has redefined its objectives, both in Pillar I, aimed at market measures, and in Pillar II, policies on Rural Development (RD). In this revised approach to rural development, economic diversification and environmental sustainability have taken an ever more central role in defining processes for territorial development.

As Knickel et al. (2009) outline, in order to be coherent with the objectives of the new agricultural agenda, policies on rural innovation must abandon the old models and adopt "second order" innovations, meaning innovations that involve a systemic approach based on new objectives and new frameworks. If first order innovations are developed from existing results and pursue well-trodden paths, "second order" innovations involve adopting new paradigms and a new set of rules. Innovation policies should nurture "second order" innovation so that they may better adapt to system shocks by implementing already experimented alternatives (Knickel et al., 2009).

Farmers will also have to adapt to the new rules and redefine their roles. However, in many instances there is a gap between the changes farmers need to make and the capacity of the institutional framework to support such changes through innovations (Knickel et al., 2009). The predominant model that governs the transfer of innovations tends, in fact, to follow the simplistic view of a linear "from creation to adoption" model. According to this system, innovation is the result of knowledge gained through scientific research, which is applied to a production process and, if economically viable, spread via imitation or via initiatives to promote knowledge transfer (Godin, 2006). This model is unsustainable because innovation is not linear, nor exclusively the result of formal scientific research but rather a social process which involves a multitude of social, economic and institutional actors and their formal and informal relationships (Camagni, 1991). An interesting approach to non-linear innovation processes is found from the review of the triple helix and learning region model (Wellbrock et al., 2012) which identifies three large structures (rural territory, system of knowledge and innovation support, public sector), each of which are home to important mechanisms and processes. However, rural innovation cannot come about solely via the actions in one of the three systems, but requires interaction among the various actors operating in each system in order to promote knowledge transfer, funding, market studies, valorisation of products, etc., which then result in processes of real rural innovation (Esparcia, 2014).

This territorial and systemic view of development and, therefore, of innovation overtakes the concept of "agricultural knowledge systems" (AKIS), developed in the 1990s and based on an interventionist agricultural policy which believed that in order to accelerate processes of modernization in agriculture, the transfer of innovations had to be highly coordinated and implemented by four main actors: research, extension services, education and training. However, as highlighted by Van der Ploeg (2003), if agricultural knowledge were simply the product of the work done by a team of experts, it would be far removed from farm level realities and could never provide a realistic representation of the correct path to follow.

For current systems of innovation to meet the real needs of farmers, they must distance themselves from the objectives of the so-called "productivist era" (Wilson & Rigg, 2003; Van der Ploeg et al., 2000; Knickel et al., 2005) and instead stick to the principals of economic, environmental and social sustainability, as formulated by European agricultural policies.

In recent years, innovation transfer in the agricultural sector has been increasingly led by user-centered research systems (Klerkx & Leeuwis, 2009; Neef & Neubert, 2011). There has also been increasing acceptance that innovation in agriculture has been just as much about changing organizational and institutional models as it is about introducing new technologies (Hounkonnou et al., 2012; Klerkx & Nettle, 2013).

According to the new approach, innovation does not involve technology alone, but is instead the combined result of technological, social, economic and institutional change (Kilelu et al., 2013). In

terms of agricultural innovation, this change could be the result of top-down interventions or bottom-up farmer's grassroots activities (Smith et al., 2014).

Whatever method is chosen to support innovation, research has clearly shown that successful innovation requires end users to be included in decision-making processes (Douthwaite, 2002; Klerkx & Leeuwis, 2008; Klerkx et al., 2006; Neef & Neubert, 2011; Poulton et al., 2010). Building on this comes the concept of social innovation, which promotes the active participation of end users in every part of the innovation process via built local connections and a common learning culture (Dargan & Shucksmith, 2008).

A good example of how the principles of social innovation can be applied to rural areas is the EU funded project C@R ("Collaboration@Rural: a collaborative platform for working and living in rural areas") (Schaffers et al., 2010). C@R applies the research concept of 'living labs', user-centered innovation ecosystems capable of tailoring research and validation activities to the real needs of local stakeholders and users, to struggling rural regions with an aim to catalyze sustainable rural development.

Over its ten year implementation, the C@R project found that building strong stakeholder networks was key to exploiting the full benefits of living labs and ensuring their long-term sustainability.

THE CHALLENGE OF INNOVATING A SECTOR IN CRISIS IN A FRAGILE RURAL AREA

The initiative under study, the NOVOROD project (Validation of new dairy products and dairy cattle feed to improve the overall quality of the Dairy Cow Milk System), was implemented in Campania, a region in South Italy, and financed by the Campania region's Rural Development Plan 2007-2013 under measure 124 "Cooperation for the development of new products, processes and technologies in the agriculture and food sectors". This measure was set up to promote initiatives aimed at increasing the competitiveness of the agricultural sector and improving product quality, environmental performance and safety in the workplace through testing, adopting and disseminating technological, processing, product and organisational innovations in the pre-competitive phase, as well as supporting actions which promote cooperation between producers, farmers and processing industry representatives, research organisations and other economic operators.

The analysis focuses on the mechanisms that explain how the introduction of innovation in the dairy cow milk sector can prove crucial to its survival, especially in light of the competitive landscape of the sector and the new demands made of agriculture, namely the need to be environmentally friendly whilst simultaneously increasing productivity and efficiency. The introduction of elements of innovation in the sector has also required a reassessment of the best instruments to use for their dissemination.

The choice of which innovations disseminate and support becomes, therefore, an increasingly complex task that goes beyond the technical aspects to also consider a range of variables relating to economic, social and environmental sustainability.

1. The Milk Sector: Reference Context and Problems on the Ground

a. Competitive Landscape

The global cheese market, although mature, is expanding rapidly and the sector is showing signs of significant innovation, diversification, concentration and investment.

At a European level, medium term prospects for the sector are also good as increased global demand should boost exports and help maintain price levels, (EU-DG Agri, 2012; EU-DG Agri 2013).

The international cheese market will, however, be strongly affected in the coming years by the 2015 abolition of milk quotas. Since the beginning of April 2015 EU milk production has been liberalized and European dairy farmers are therefore no longer constrained by production caps. Although effects should be contained in Europe as a whole, the end of the milk quota system could further expose the domestic market to fluctuations in world milk prices and put less efficient dairy farmers at risk. To

soften the anticipated effects of the milk quota abolition, the EU introduced policy instruments such as “The Milk Package” and the “The Quality Package”. These new measures deal with contractual relations in the sector and strengthen the market power of dairy farmers by giving them the possibility to negotiate contract terms and prices collectively through Producer Organizations (POs). The packages also provide possibilities for the supply management of cheese covered by PDO or PGI (Inea, 2013) and seek to simplify the process for certification under geographic indication schemes for food and dairy products, as well as strengthen legal safeguards (Inea, 2013).

i. The situation in Italy and in the Campania Region

The dairy sector is a very important part of Italy’s agri-food sector. In terms of value, dairy farming represents over 9% of Italy’s agricultural output and Italy’s dairy processing industries contribute to around 12% of the total value of the Italian food industry (Inea, 2013).

The dairy sector also plays a crucial role in Italian food export markets. The Italian cheese sector alone represents 88.3% of the total value of products destined for foreign markets (Pieri, 2014), with products with Protected Designation of Origin certification proving especially desirable abroad.

The sector has been subject to a deep structural re-organization over the last few decades, largely focused on concentration and re-organization of production.

In recent decades the dairy sector in the Campania region has largely mirrored national and European trends. On the plains, production has seen more concentration and specialization thanks to the larger financial returns obtained through economies of scale and investments in innovation. The restructuring of the sector in inland hilly and mountainous areas, however, has been greatly hindered by geographic constraints, linked to the nature of the terrain, climate and environment, and socioeconomic barriers, linked to the fragility of the local production system.

In Campania, the number of dairy cows is going down whilst the number of buffalo, sheep and goat in the dairy sector is going up. The reverse is true on a national level (ISTAT, 2016).

The dairy processing industry in Campania counts 1,210 plants and is heavily localized with most dairies concentrated in the provinces of Naples, Salerno and Caserta (CCIAA, 2016).

The region mainly produces fresh cheeses (15% of national production comes from the region) and semi-hard cheeses (8% of the national production).

In terms of import and exports, Campania has seen an inverse trend than that of Italy with net exports generally higher than imports.

b. Profile of demand for dairy products

Consumer demand and consumer behavior are key variables for evaluating agri-food systems, and are decisive in successfully orientating research and development and innovations. Understanding trends in consumption and consumer demand for innovative foods is much more complex today than it was in even the recent past because postmodern consumers often display contradictory behaviors (Cicia et al., 2012). On the one hand, there is a preference for “all natural” foods, and, on the other, demand for enriched products that promise health benefits. Demand for convenience foods has also risen dramatically, in line with the huge societal changes seen in recent decades (population ageing, dual career families, urbanization etc.).

The features that shape demand for dairy products are the same of those that drive demand for food products generally. Over time, patterns of cheese consumption have changed as well as consumer preferences. There has been a significant increase in innovative products, aimed at meeting demand for a wider range of consumption options.

The Italian cheese market is characterized by a high level of per capita consumption. There are a vast array of products; although the majority of sales are for a select few types of cheese, (aged cheeses are particularly in decline).

Noteworthy is the impact the financial crisis of 2008 had on average food expenditure in Italy, which was long thought to be immune to squeezes. Despite the negative picture that emerges from official data, food products with certified geographical indication, and certified cheeses, especially, have held their ground (Ismea-Qualivita, 2013). A significant portion (35%) of total expenditure on cheese went to cheeses with denomination of origin certification (Ismea-Qualivita, 2013).

c. Institutional framework and instruments

The EU has committed to increasing the spending on research and development to 3% of GDP in the European countries by 2020 under the renewed Lisbon Agenda of 2004, which sought to boost Europe's innovation and competitiveness (EC, 2010). The Lisbon Agenda helped promote innovation as a socioeconomic process rather than just a technological one, although critics are quick to point out that the policy framework adopted an unrealistic linear model of innovation (formal knowledge passed on to industry to adopt) which did not leave space for informal knowledge sharing or bottom-up approaches (Kronjee and Nooteboom, 2008).

More broadly speaking, the EU provides an array of measures to promote knowledge transfer and the creation and dissemination of innovation under its Rural Development Policy. The objectives for rural development set out by EU policy are achieved by individual Member States under national Rural Development Plans (RDPs), which are in turn defined and implemented at a regional level.

In Italy, the Campania region's Rural Development Plan 2007-2013 provided funding under Measure 124 to promote initiatives aimed at increasing the competitiveness of the agricultural sector through experimenting, adapting and disseminating technological, processing, product and organizational innovations in the pre-competitive phase, i.e. before the product is ready for market. The measure also intended to support actions, which promote cooperation between producers, farmers and processing industry representatives, research organizations and other economic operators.

The measure came about from the realization that one of the biggest obstacles to innovation in the agricultural sector is the lack of integration between operators in the sector, both horizontally, within supply and production chains, and vertically, between the different sectors of production, processing and sales and, especially, between research, consultancy and training bodies.

The implementation of the Measure 124 in Campania varied from that in other Italian regions, extended its scope, and reach so much so that this measure unintentionally became a precursor to Measure 16, the new measure aimed at tackling competitiveness in the primary sector in the next RDP planning period 2014/2020.

The main features that made Measure 124's implementation so successful in the Campania region were:

- The inclusion of a research body, public or private, in the partnership to work alongside farm, processing and retail sector representatives was compulsory;
- Research bodies were not excluded from taking a leadership role in future Temporary Associations of Companies (*ATS-Associazione temporanea di scopo*) that may form, thereby giving associations greater freedom of self-organization;
- The Measure could be implemented directly, with projects promoted by individual ATS, and also through so-called Integrated Supply Chain Projects (*PIF- Programmi Integrati di filiera*), and a territorial approach (LEADER projects).

Measure 124 was designed as a model to foster the creation of networks. At its heart is the recognition that policy intervention must start from the needs of local stakeholders and that the uptake of innovations should be seen as a shared learning experience, which involves farms, agri-food businesses, scientific and research bodies, institutions and technicians. Unlike previous dissemination models, which were based on a top-down approach, the current model for Measure 124 in the Campania region forces innovations and innovators to adapt to different local contexts. Consumers too are given an ever greater role in this process.

2. The NOVOROD Project: The Concept Idea and the Planned Activities

The idea for the NOVOROD project was inspired by a mix of social, economic and environmental needs. The current crisis in the bovine milk and processing sector in the region has had serious economic effects, in terms of attention to cost structures (e.g. farmers looking for reductions in the cost of dairy waste disposal methods or cattle feed), environmental effects, especially on the degree of extensive grazing in cattle farming and on use of pastures, and social effects, in that the dismantlement of such a labour intensive sector exacerbates the problem of depopulation. The NOVOROD project set about to address each of these issues, as well as address the needs of new

health-conscious consumers looking for natural products and ethical production (e.g. demand for cheese products made with non-animal derivatives or reconstituted elements (GMO)).

The project, therefore, foresees actions intended to introduce elements of innovation along the entire production chain of the cattle, dairy sector, thereby helping to increase the sector's competitiveness with new technologies and innovations to both products and processes.

The project involved the following phases of the production chain:

BREEDING. Farming systems have been implemented that view livestock as sources of "cheese" and no longer just "milk". This was done through: valorisation of dairy cattle breeds which are better suited to cheese production (*Bruna* and *Pezzata Rossa*) and less intensive farming models; the trial of cattle feed based on forage crops which can modify the nutritional content of milk; the trial of cattle feed which is high in polyunsaturated fatty acids; the trial of protocols for the production of forage crops.

PROCESSING. Innovative production lines have been tested regarding: vegetable rennet cheeses, produced using the white artichoke of Pertosa (Slow Food Presidium); the innovative (re)use of a milk processing waste by-product, whey, into creamy whey-cheese spreads / whey-desserts with berries from the Alburni area (found within the project area); naturally enriched cheese, thanks to cattle feed based on forage with a high potential to modify the nutritional content in milk.

The final product of the innovative project, **Carciocacio** valorises the milk produced in more extensive farming systems oriented towards the production of milk for cheese, making it quite different, in terms of microbes and nutritional content, from milk produced for general consumption. The production of this naturally enriched milk has significant organizational and managerial implications for cattle farms because it requires cattle feeding systems that favor fodder which is able to naturally enrich the milk to bring human health benefits. These types of forage crops are particularly suited to the Mediterranean productive context and could play an important economic and ecological role in the local and regional production system. In addition, some feeding protocols tested in the project involve recycling waste products left over from the processing of olives, which would contribute significantly to reducing the environmental impact associated with the production of olive oils. The use of artichoke rennet, and in particular the white artichoke of Pertosa, as a coagulant is another important element of connection within the production chain. The choice to use this type of vegetable based rennet helps valorise artichokes on their second or third crop of flowers, which have a lower commercial value. Their commercialization could represent an important source of extra income for artichoke producers in the territory.

In addition to Carciocacio, the project was also involved in the production of innovative whey based products. New processing machinery for producing whey concentrate was piloted in one of the partner dairies. The whey concentrate produced was used to make creamy whey concentrate based products (whey-dessert). The introduction of the machinery to produce the whey concentrate brought immediate benefits to the dairy that piloted the technology: a 30% reduction in disposal costs of whey, a by-product of cheese production, which is known to be problematic for disposal (Sepe et al., 2014). The products obtained from the concentrated whey were further processed by adding a seedless puree of berries (blackberries, raspberries, strawberries). The development of newer and high-quality whey-based products, made with recipes to appeal to a wider audience, will be subject to further evaluation.

VALORISATION AND COMMERCIALISATION OF INNOVATIVE CHEESES.

Implementation of measures that aim to contribute to the strategic repositioning of the bovine dairy sector through: the transfer of technological and product innovations to businesses; the strengthening of collaboration between firms and research organizations; the provision of training and the promotion of new products.

DISSEMINATION OF THE PROJECT'S RESULTS.

A summary of the results and the technological standardization of the innovative cheeses produced under the project was presented in a final booklet, prepared by the MEDES Foundation, entitled "Production of innovative cheeses: Carciocacio. Cheese with vegetable rennet, a result of a validation initiative supported by the RDP 2007-2013 Campania, Measure 124".

Training seminars and conferences were also organized as part of the dissemination, valorisation and commercialization of the innovations piloted under Project NOVOROD, aimed at transferring the techniques and results of the project to operators in the bovine dairy sector. Participants in the training initiatives included public bodies, local authorities, consumers, the media, primary producers, processing/marketing firms and economic and social partners, all in cooperation with the relevant regional authorities.

3. The Project as a Rural Living Lab and the Active Role of Consumers

The partnership that started the NOVOROD project and the partner roles are reported in Table 1. The partners already had good relationships from previous projects they had worked on together and so proved very effective in defining and implementing the project's activities. This allowed the research partners to respond quickly to producers' requests. The exchange was in no means one way, however, farmers and processors actively participated in adapting the innovations to their specific needs.

Table 1. NOVOROD Partnership

Members of Partnership		Role in the project
Lead Partner	MEDES Foundation	In charge of dissemination activities
Primary Producers, Farms	Azienda Agricola Pucciarelli Paolo, Azienda Agricola Alburni Natura di Turco Anna; Azienda Agricola Valitutto Antonio	Producing and supplying the artichokes and mixed berries for the project
Primary Producers, Cattle Farms	Azienda Agricola Sant'Antonio, Azienda Agricola Formentin Angelo, Azienda Agricola Catale Gerardo, Azienda Agricola Mario D'angelo, Azienda Agricola Tonino D'Iorio.	Producing and supplying the milk used in the project
Processing Industry/Sales	Caseificio Campolongo srl, Caseificio P. & P. srl, Caseificio F.lli Starace srl, Caseificio Senatore srl, Caseificio Mediterraneo snc	Processing the milk (dairies)
Research Bodies	CREA-ZOE, CREA-ORT, University of Basilicata	Producing the initial innovation (artichoke rennet) and adapting the innovation to the local context of the project
Territorial Actors	MIdA Foundation	Management body for natural and cultural patrimony

Consumers were involved at every stage of the project: their support helped shape the initial idea for the project and their contribution throughout helped inform the choices the partnership made in product development.

Table 2 summarises all the meetings where the product was tested by consumers.

Table 2. Meetings with consumers

Date	Location	Participants	Objective
28 June 2011	MEDES Foundation Offices– Sicignano degli Alburni (SA)	18 partners from the project	Product tasting (fresh and semi-soft, caciotte cheeses made from vegetable rennet) to gather opinions/feedback and invite suggestions from partners
21 December 2011	MiDA Foundation offices - Pertosa (SA)	Mainly local consumers and local authority and administration representatives(around 50 people)	Product tasting and raising awareness of objectives of the NOVOROD project. Cheeses served were produced by cattle fed flax enriched diets. Participants were given a questionnaire to rate the products and were invited to leave comments.
25 February 2012	MiDA Foundation – Pertosa (SA)	Mainly “extra local” consumers and spectators to the production “Dante’s Inferno” held by the MiDA foundation (around 200 people)	Product tasting. Selection of cheeses served, produced by different cattle feed diets which had been piloted on the project’s cattle farms
March 2012	Vinitaly – Verona	Exhibition visitors and vendors	Many different consumers were invited to leave feedback on the cheese and also the name and logo (choice of the name Carciocacio) via a questionnaire
May 2012	Forum PA (2012) Public Administration Forum – Rome	Forum visitors and staff	Tasting of Carciocacio cheese paired with wines from the Campania region
October 2012	Salone del Gusto-International Food Exhibition Turin	Exhibition visitors and vendors	Tasting of Carciocacio cheese and whey-dessert
March 2013	Agrosud Exhibition – Naples	Exhibition visitors and vendors	Tasting of Carciocacio cheese and whey-dessert
May 2013	Forum PA (2013)–Public Administration Forum Rome	Forum visitors and staff	Tasting of Carciocacio cheese and whey-dessert
June 2013	Vitignoitalia Wine Tasting– Naples	Exhibition visitors and vendors	Tasting of Carciocacio cheese and whey-dessert
September 2013	“Back to Cheese” Trade fair–City of Bra	Exhibition visitors and vendors	Tasting of Carciocacio cheese and whey-dessert
April 2014	Agricultural Fair Pastorano	Exhibition visitors and vendors	Tasting of Carciocacio cheese and whey-dessert
May 2014	Cibus International Food Exhibition–Parma	Exhibition visitors and vendors	Tasting of Carciocacio cheese and whey-dessert

At all the meetings there was a high level of consumers participation, which allowed the project to gather a significant amount of feedback, which was subsequently used to refine and improve the product. On a scale of one to ten, Carciocacio showed an increasing trend in consumer acceptance from December 2011 (5.7) to July 2014 (8.1), thanks in part also to the standardization of the cheese

production technique. The product's name was chosen directly by consumers from a range of different options.

Training activities also helped make the project a real living lab. These sessions were designed to transmit the theoretical and also practical insights gained from the project and were held at dairies and on cattle farms with retail outlets that were located in areas of production considered to be representative of the wider regional context. The training covered all aspects of the project, from the production of the forage crops used for cattle feed, to the cultivation of the artichokes for the rennet and, finally, the processing of the milk into cheese.

4. The INNONATURA Consortium: the sustainability of the project in the future

The Consortium INNONATURA was set up in February 2014. Its purpose is to foster greater cooperation between the world of production and research organizations. It is made up of six partners (five actors in the Agri-livestock productive chain and one research organization specializing in sustainable development and innovations to products and processes for environmentally and health conscious products). All the INNONATURA actors had previously been involved in the NOVOROD project. INNONATURA began as a natural evolution to the NOVOROD project and continues its good work by safeguarding the production of Carciocacio and overseeing the correct application of the production protocols conceived during the initial project. The Consortium's mission, however, also includes promoting other innovative cheeses and local typical products, as well as represent/aggregating specific needs of regional/local supply chains for innovation, facilitating the dialogue with innovation centres and informing potential beneficiaries on the opportunity to invest in innovation. The success in establishing the INNONATURA consortium is proof of the very high levels of trust and cooperation that formed between the different partners during the NOVOROD project.

SOLUTIONS AND RECOMMENDATIONS

The key to the NOVOROD Project's success was the combination of innovative governance structures and the choice to develop the different phases of the project as a "living lab" with the active involvement of end users.

The MEDES Foundation, the lead partner, played a crucial role in governance. As has already been highlighted by other studies (Cristiano et al., 2013), the partner who acts as the mediator of innovation is usually the lead partner, who also plays another key function in coordinating and disseminating information regarding the project, at each stage of its execution. The management of the projects' activities, and the planning and implementation of awareness raising activities and dissemination of results, were two essential elements in consolidating and strengthening the integrated and systemic approach that was promoted by the NOVOROD project.

The Campania Region has, in fact, been strongly committed to disseminating of the project's results and promoting knowledge transfer so that the innovative production techniques piloted in the project could be made available to the widest possible audience. Having been financed under Measure 124 of the Campania Region's RDP, the innovation developed within the NOVOROD project was not protected nor designed to give only the participating dairies a market edge. Instead, the project was aimed at transferring the knowledge gained through the project's activities so that not only individual firms could benefit, but that they may then also lead the way to an overall increased market competitiveness of the local production chain. A successful dissemination of results also helps increase the uptake of the innovation and protects the investment made in its development. For this reason, choosing the right approach to dissemination is vital. The NOVOROD project favored a learning by doing approach, with all training and activities designed for maximum interaction between individual farmers and between farmers and other project actors. This approach proved very successful and helped foster trust between the project's actors and increased farmers' awareness of the benefits of introducing elements of innovation into their business.

Measure 124 was also set up to establish greater collaboration between researchers and farmers with an aim to persuade farmers of the importance of innovation in the current competitive landscape.

The living-lab that sprang up inside the project became the space in which the scientific know-how applied in the product development phase was married with the need for clear marginal benefits for participating firms in terms of competitive advantage, cost reduction and improvements to organizational efficiency and production processes.

A large part of the project's success can be attributed to the fact that the partners had a good working knowledge of the specific local challenges faced by the agricultural sector and had previously built good working relationships. This prevented any barriers to communication and made it much easier to reach a consensus on the initial idea for the project and to begin to build the partnership. Good relationships and communication are particularly important in rural areas where the fragmentation between different components of the social-ecological system can present real barriers to progress. Given the particular rural context of the agricultural sector, spatial clustering, which is often the key to success for the creation and diffusion of innovations, is not an option. Instead, there needs to be support for building and consolidating territorial networks, formal or informal, which bring together different economic, social and institutional actors. In the case of the NOVOROD project, the pre-existing relationship between the Research Centre that first developed the innovation and the MEDES Foundation, and their rooting in the local community, played a key role in every stage of the project, from evaluating the market feasibility and economic sustainability of the innovation to the implementation and coordination of the dissemination of results.

All of this was fundamental to the effective adaptation of the innovation to the real needs of farmers and helped ensure the aims of the project were met. The methodology adopted under Measure 124, the choice to put the results of research already carried out to the test on the farm floor, placed the needs of the partner farmers at the center of the project. It is also an example of how research centres translate the results of their research to farm scale. The case of Carciocacio, in fact, is emblematic of how support under measure 124 has been used to adapt techniques and practices to the individual requirements of local farms. There was good interaction between the project's researchers and cattle farmers during the experimental development phase of the product. The researchers provided made-to-measure technical support to partner farms in order to support the correct implementation of the innovation and frequent on-site visits also allowed researchers to troubleshoot and provide fast solutions to problems. Another aspect to highlight is the holistic and systemic approach the project adopted. The link the project created between milk/cheese production and processors, involving also artichoke farmers for the production of the rennet used, was designed to be both economically sustainable (reduce costs) and environmentally sustainable (recycling of whey waste product, pasture productivity, reuse of crop residues and pomace: encouraging more extensive livestock farming). In addition, increasing the nutritional properties of the cheese manufactured increased its value and opened up alternative markets.

Another key point of success was the project's ability to grow and strengthen networks of actors. Inclusive mechanisms that promote the transfer of knowledge and assist in managing change are essential. In other words, the link between local and extra-local actors, and the acquisition of skills *in itinere* prove decisive factors in adopting innovations.

Generating and transferring innovation in rural territories increasingly takes place through actions to increase farmers' capabilities, promote change in business models and improve the rural economy's propensity for innovation/adaptation. The NOVOROD project brought about real change in farmers' attitudes to innovation. Interaction inside a space where knowledge is co-generated, in fact, creates the right conditions for long-term forms of collaboration, which may continue knowledge exchange long after the current project has ended and promote copycat initiatives.

The establishment of the INNONATURA Consortium, which was strongly supported by farms, will channel the needs of farmers to the scientific community so that solutions may be jointly found and will help access the resources necessary to continue the process of innovation already started. The NOVOROD project helped consolidate relationships between partners and build trust by proving that collaboration promotes proactive investment in innovation and creates a dynamic business environment.

The more points of contact (potential sources of information) available to farmers, the greater the opportunities are for learning and consequently, the implementation of innovations. However, in this type of project, the full participation of all the various actors right from the very start of the project, and the clear definition of their respective roles in the trial/implementation phases is essential to achieving an effective application of the innovation, as well as a good dissemination of results. Furthermore, farmers who have already successfully implemented an innovation in their business prove to be the best advertisement to persuade more reluctant farmers to adopt innovation in their own businesses.

The final important aspect of the project was the role played by policy-makers and the financial support. Politicians still prove crucial to securing the funding needed to transfer, innovation to rural areas and setting up a framework of reference for greater communication between actors.

FUTURE RESEARCH DIRECTIONS

The project went far beyond a mere technical intervention in the dairy sector to improve farmer's general attitude to change, encourage collaboration between rural actors, build strong territorial networks, boost innovation in the sector and increase overall sectorial and territorial competitiveness. Naturally, the full effect of the project will have to be seen in the long term. It will be interesting to monitor the project's influence on similar and complementary actions, for example, investments in the certification/qualification of productions, in innovative solutions to gain better access to markets, and in generally fostering entrepreneurship in the rural territory, as well as investments to tackle the long-standing problems of rural under-employment and depopulation.

CONCLUSION

It is well known that in terms of experimentation and research the agricultural sector is characterized by a limited circulation of innovation and limited cooperation between different actors. This is particularly true in disadvantaged areas. There are also cases where the key strategic role of Universities and Research institutions in promoting innovation and long-term partnerships along and across agri-food chains is evident.

Given the trend towards social innovation, which relies on stakeholder involvement to produce collaborative actions, the EU highlights the fact that evaluation methods should be more geared to measuring outcomes in terms of sustainable benefits to local actors rather than empirical outputs in terms of technical efficiencies.

The European Union's Rural Development Plan 2007-2013 included a specific measure, Measure 124 "Cooperation for the development of new products, processes and technologies in the agricultural and food sector", to promote the greater diffusion of innovation in the agricultural sector. Through this measure, a group of cow milk producers in the Campania Region have promoted an initiative of cooperation to introduce a true innovation in the dairy sector with a product, which is completely different from traditional local products yet in line with new market demands.

The process involved the active participation of consumers and of research bodies, which developed innovations never before introduced into production, processing industries, and also a third party in the form of an organization whose role was to produce and create a tailor-made model of management and governance of the whole chain of production.

The result of this cooperation was a real *Living Lab*, which has not only been able to transfer, innovation from the laboratory to industry to create a brand new product, *Carciocacio* (cheese made with artichoke rennet), but has also brought the chain of production full circle and carries new and positive implications for the local economy, environment and social growth (through the creation of the Consortium *INNONATURA*).

This product innovation has also fostered the introduction of new sustainable technologies orientated towards energy production from the waste material left over after production and the constitution of a new organizational model, which has permanently altered the whole chain of production in the area. This initiative, which began in a highly economical and environmentally fragile area, has thus brought a new wave of innovation to an entire region eventually setting the stage for an increase in

entrepreneurship in the rural territory. Focusing on the process of building a network, which is able to connect all the various social and economic actors in a territory, the initiative has showed how the difficulties linked to very poor levels of collaboration and exchange between local actors could be reversed. This is particularly relevant in such as context where economic fragility results from various driving forces, mainly related to the depopulation and geographical and psychological marginalization. The remoteness of many rural businesses creates a competitive disadvantage (Hall & Williams, 2008) and a peripheralization of the local market compared to densely populated urban areas where demand is concentrated. This fuels a vicious circle of out-migration and lack of entrepreneurial opportunities (Veeck et al, 2006, Meccheri & Pelloni, 2006) and, also, the increased fragmentation and lack of coordination of rural activities (Hjalager & Johansen, 2013). The creation of an innovative and inclusive environment can help in mitigate the impact that the lack of infrastructure and those related to the high dispersion of the firms determine in rural areas, i.e. an exclusion of many rural enterprises from the benefits of the entrepreneurial embeddedness (Granovetter, 1985). These benefits include increased productivity and competitiveness and better access to information, a favorable environment for start-ups, virtuous links between the business sectors and the local context able to guide firms towards virtuous path of sustainable exploitation of available resources. These characteristics are found in many rural areas around the world, which makes the results of this study generally applicable to a wider context.

The management model adopted in the NOVOROD project could also prove a useful tool to develop future innovation projects in the next rural development programming period. In fact the co-generation of the innovation through a full participatory lab that was the keystone of the project, is going to pervade the new innovation measure of the RDP programme implemented in the Region. NOVOROD project has been included among the best practices of the Campania Region both for development of the innovation and its implementation and follow up. This has been particularly effective in a context where most of the innovation are either industry-sector driven or designed to meet general and local needs, turning in a quite poor diffusion and effectiveness.

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