

UNIVERSIDADE DE LISBOA
Instituto Superior de Agronomia



**INNOVATION DYNAMICS IN RURAL AREAS: CONTRIBUTIONS TO CAPTURE
AND MEASURE INNOVATION, VALUING TERRITORIAL SPECIFICITIES**

TERESA MARIA ALLEN GAMITO

ORIENTADORA: Doutora Lúvia Maria Costa Madureira

COORIENTADOR: Doutor José Manuel Osório de Barros de Lima e Santos

**TESE ELABORADA PARA OBTENÇÃO DO GRAU DE DOUTOR
EM GESTÃO INTERDISCIPLINAR DA PAISAGEM**

2015

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2015

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RESUMO

As zonas rurais não são, normalmente, consideradas inovadoras, apesar da sua crescente multifuncionalidade, da crescente diversidade de inovações e inovadores (do individual às grandes empresas e associações sem fins lucrativos, incluindo inúmeros tipos de atividades) e da ampliação da gama de recursos rurais. Mas os padrões e dinâmicas de inovação no meio rural e a sua relação com as especificidades territoriais, incluindo o conhecimento e os recursos locais, não são detetados pelo atual sistema de identificação e medição da inovação, baseado no Manual de Oslo e, por isso, são subvalorizados, sendo também subvalorizado o seu contributo para as economias rurais.

A investigação realizada nesta tese, através da análise dos padrões de inovação rural, detetou recursos rurais inesperados e evidenciou a sua relação com *clusters* de inovadores e o seu contributo para as respetivas inovações. A investigação incluiu também a concepção de um sistema de indicadores de inovação em meio rural que permite medir o processo seguido para obter inovação, por qualquer tipo de organização localizada em meio rural, e destacou a necessidade de um sistema que retrate, de forma abrangente, os padrões de inovação e valorize as especificidades territoriais que, contribuindo para a inovação, geram vantagens competitivas nestas regiões.

Palavras-chave: Especificidades territoriais; Inovação em meio rural; Medir inovação; Recursos rurais; RUR@L INOV

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ABSTRACT

Rural areas are, in general, not perceived as innovative areas, in spite of an increasing multifunctionality related to new activities, a growing diversity of innovations and innovators (from individual to large businesses and non-profit organisations and practising all types of activities) and a wider range of rural resources. But the rural innovation patterns and dynamics and their relationship with territorial specificities, such as local knowledge and local resources, are not captured by the current framework to identify and measure innovation, based on the Oslo Manual, and thus are undervalued as well as is undervalued their contribution for the rural economies.

The research undertaken in this thesis, through the analysis of the rural innovation patterns, uncovered unsuspected rural resources and evidenced their relation and their contribution to clusters of rural innovators and the related innovations. The research included also the design of a rural innovation indicators system able to measure the innovation processes implemented by all the types of organisations settled in rural areas and highlighted the need for an alternative framework capable to gather an inclusive picture of the innovation patterns and to value the territorial specificities whose inputs for innovation shape the competitive advantages of these regions.

Key-Words: Innovation in rural areas; Territorial specificities; Measuring innovation; Rural resources; RUR@L INOV

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* este texto de agradecimento não segue o novo acordo ortográfico.

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I. INTRODUCTION

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“Believe me my young friend, there’s nothing - absolutely nothing - half so much worth doing as simply messing about in boats... In or out of them it doesn’t matter. Nothing seems really to matter, that’s the charm of it. Whether you get away, or whether you don’t; whether you arrive at your destination or whether you reach somewhere else, or whether you never get anywhere at all, you’re always busy, and you never do anything in particular, and when you’ve done it there’s always something else to do, and you can do it if you like, but you’d much better not”. Says the Water Rat to the Mole in an English river bank.

Kenneth Grahame in “The Wind on the Willows”

This is one of my favourite sentences that can represent one vision of the “rural”: a place where we have time, lots of thing to do or nothing at all, a place where life runs at the pace that we want, enjoying the charm of it.

“On the Oeste and Vale do Tejo region (O-VT), according to our estimates, there are conditions to be viable, in the future, agriculture production systems economically competitive or environmentally oriented practiced within about 27 thousand farms occupying a UAA¹ of 257 thousand hectares and giving employment to 39 thousand AWU², which is anticipated to be mainly located in the sub-regions of Oeste and Lezíria do Tejo.”

Francisco Avillez in “Strategic Diagnosis/Vision for the Agro-Forestry Sector. Oeste and Vale do Tejo Land-Use Regional Plan. 2007” (PROT-OVT)

On the opposite side is this vision of an agricultural rural, where food production and employment are the main objectives.

¹ Utilised Agricultural Area

² Agricultural Work Unit

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I.1 - Introduction

Between the contrasting visions from an idyllic countryside and a competitive agriculture, there are a multiplicity of “rurals” that include: an agriculture capable to produce beautiful landscapes and natural values; a growing participation of hunting, recreation, industries and agritourism; some interconnected practices like organic farming and the production of high quality and region-specific products; new activities such as care-farms (van der Ploeg *et al.*, 2000).

At least one from this diversity of “rurals” is part of the career of the 120 persons that were interviewed on the scope of the RUR@L INOV project. This project main objective was to capture the different types of innovation that are being developed and implemented by the organisations and other stakeholders located in the Portuguese rural areas (Madureira, *et al.* 2013). These persons from the North to the South of Portugal, or even coming from abroad, with ages from 27 to 74 years old, that give employment to more than 6 thousand people, have one thing in common: they are innovators.

Innovation is defined by the Organisation for Economic Cooperation and Development (OECD) as the implementation of a new or significantly improved product (good or service) or process, a new marketing method or a new organisational method in business practices, workplace organisation or external relations. All innovation must contain a degree of novelty but not necessarily created by the firm: innovations can be new to the firm, new to the market, or new to the world (OECD and Eurostat, 2005).

Although there is a growing awareness that innovation is a broader concept than the referred above, including social value, non-technological outputs and non R&D inputs, the current framework to identify and measure innovation, based on the Oslo Manual, only applies to business innovation and leaves aside very small firms (with less than 10 employees), non-firms organisations and several of the relevant economic activities that happen in rural areas such as: agriculture, forestry and fishing; tourism and recreation; public administration; human health and social work activities (Eurostat, 2014).

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This gap is relevant because in the EU27, the enterprises with less than 10 employees (and excluding, among others, those from the primary sector, public administration, education and other services) represented, in 2012, 92.1% of the total number of enterprises, 28.7% of the employment and 21.1% of the gross value added (GVA) (Gagliardi *et al.*, 2013). In Portugal these figures grow, respectively, to 94.8%, 39.4% and 22.8%. To these must be added all the enterprises related to the activities that are not considered by the CIS. For example, also in the EU27, the primary sector, in 2012, represented 5.2% of the employment (11.0% in Portugal) and 1.7% of the GVA (2.3% for Portugal) (EC DGARD, 2013) while the Tourism (accommodation and food service activities) accounts for 8.5% of the enterprises, 7.7% of the employment and 3.4% of the GVA in the EU27 (respectively 9.8%, 9.0% and 4.7% for Portugal) (Gagliardi *et al.*, 2013).

In addition, this methodological referential is based on a sectoral matrix leaving no room for the territorial dimensions of innovation, including local specificities and local knowledge, which support rural innovation. Therefore, there isn't so far an inclusive referential, both in theoretical and methodological terms, to capture, measure and leverage all the innovations that happen in rural, and other peripheral, areas, and give a substantial contribution for their sustainability and competitiveness. Furthermore, when searching to gather the innovations that happen in rural areas, a multiplicity of unsuspected resources is uncovered widening the range of rural resources, which potential as resources for rural development, as far as we know, is not yet fully seized because many of them are not even perceived as resources.

So the main objective of this thesis is to present evidence on the innovation dynamics and territorial specificities that exist in rural areas, which are neglected by the main measuring frameworks and therefore not included in innovation and rural development policies. To reach this objective a three folded research was undertaken, in order to answer the following groups of questions:

What is the relationship between the increasing multifunctionality of rural areas and the widening of rural resources typology? Would it be pertinent to extend the rural resource concept? What is the relevance of rural resources for the innovation patterns that can be found in rural areas? In short, does rurality and its specificities matter in a rural innovation context?

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How can we measure and understand the innovation diversity that is practiced in rural areas? Which further information should be added to the current measuring framework? Could a sole measuring tool cover all the aspects of the innovation process and compare the innovators performance? In short, is it relevant the design of a Rural Innovation Indicators System?

What are the limitations of the current framework to identify and measure innovation when addressing the rural innovation diversity? Which relevant territorial specificities are left aside? Can they be measured and valued in order to have a complete picture of the rural innovation patterns? In short, how can we capture the neglected innovation that happens in rural areas and their territorial dimensions?

The thesis is divided in three Parts. In this first Part we present a synthesised literature review on the matters under analyse to confirm the pertinence of the research undertaken, the research goals, and a brief description of the steps followed. The research is integrally presented in the second Part, divided in three chapters, and finally, on the third Part are described the main findings obtained, some general conclusions and a proposal for further research on this subjects.

This research was prepared on the scope of the project RUR@L INOV - Innovation in Rural Areas (Madureira et al., 2013), which main objective was to capture the different types of innovation that are being developed and implemented by the organisations and other stakeholders located in the Portuguese rural areas. The research adopted the conceptual and methodological framework for capturing and measuring innovation developed by the project in particular for the conception and construction of the RIIS. The information gathered by the project, namely the database of Portuguese rural innovators and innovations, was also the main data source for the research developed by this thesis, which was designed and implemented to answer the original research questions referred above.

I.2 - Innovation dynamics in rural areas: the importance of rural innovation and the need for a measuring system able to capture it accounting for territorial specificities

On the last decades an increasing diversification of the activities that are practised in rural areas confirmed the new rural development paradigm discussed by van der Ploeg *et al.* (2000). Assets of rural regions, such as quality of life and environment, natural heritage and other amenities, combined with improved transport links and infrastructure, internet and increased leisure time are retaining and/or attracting people and businesses for rural areas (OECD, 2006). This movement, alongside with their growing multifunctionality, brought to rural areas a broader set of roles that are added to the conventional agriculture and forestry activities and include, for example: agricultural and forestry practices, environmental or nature related; a large group of activities including industries, dynamic SME clusters, rural tourism, hunting, angling, recreation, sports, etc.; and also opportunities related to the revival of traditions and crafts, quality local products, and other rural tangible and intangible heritage (*e.g.* Baptista, 2010; EC DGARD, 2010; OECD, 2006; van der Ploeg *et al.*, 2000).

Although rural areas are still associated with peripheral regions, low density and declining activities and, therefore, with territories where development, and innovation, are difficult to attain, in particular because innovation is mainly associated to R&D, technology and industry (*e.g.* Breil, 2007; DEFRA, 2004; EC DGARD, 2010; Shields, 2005; Smallbone, 2009, Kalantaridis and Bika, 2011), is becoming clear that innovation in rural areas is not necessarily connected to “new” technologies or to specific groups of actors or specific sectors. It can be defined as the outcome of “different ways of thinking and different ways of doing things” (Brunori *et al.*, 2007), in any sector, not just the primary sector, including new, to its context or setting: approaches to strengthen the capacity of local organisations; interactions between rural stakeholders and economic systems and the policy environments; practices and techniques deriving from re-invented traditions; services in logistics and supply chains; responses to emerging social needs; or collective learning or co-operation and actor-oriented networks (Cannarella and Piccioni, 2011; InterAction, 2012; Läßle *et al.* 2015; Neumeier, 2012; Tompson and Maguire, 2012).

Innovation is also at the core of the Europe 2020 strategy for growth and jobs (EU, 2010) and of the flagship initiative “Innovation Union” (European Commission, 2010) that brings to

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innovation a much broader concept than science, research and development. And, more recently, the smart specialisation (RIS3) approach includes in the concept of innovation design and creative industries, social and service innovation, new business models and practice-based innovation. It also determines that all regions have a role to play, for what they need to identify own competitive advantages, namely engaging entrepreneurial local actors (European Commission, 2012b). The interest to engage local actors in the enhancement of local territories is also confirmed by the multi-funded support from the European Structural and Investment Funds to the community-led local development (CLLD) approach, where innovation has to concentrate on those actions that have a multiplier or snowball effect on local development (European Commission, 2015; European Union, 2013; Soto and Ransden, 2014).

It is also relevant to mention that the capacity to gather contributions from innovation to rural development is different among regions, confirming a territorial nature of innovation and the need to identify specific regional “innovation patterns”, further than what is proposed by the smart specialisation model, as they depend on the nature of each region traditional knowledge base and productive specificities (Asheim, 2011; Camagni and Capello, 2013; Cannarella and Piccioni, 2011; Capello and Lenzi, 2013; Gülümser *et al.*, 2011; Roper *et al.*, 2014).

For example, the changes brought by the new rural development paradigm, that conduced to the diversification of the rural economy, also brought the reconfiguration of the usually assumed rural resources (land, arable soil, fresh water, nature, eco-systems, animals, plants, crafts, traditions, rural and agricultural infrastructures, ...), that gained new value or importance, and originated or uncovered “new” resources like landscapes, environmental quality, gourmet or quality local products, arts, design, networks, market partners, certifications, etc.... The conventional and the novel rural resources are of extremely importance for the development of innovation and the dynamics of local systems and rural development (*e.g.* Bosworth 2012; Camagni and Capello, 2013; Cannarella and Piccioni, 2011; Capello and Lenzi, 2013; Esparcia, 2014; Gülümser *et al.*, 2011; Roper *et al.*, 2014) and include: physical and natural resources; natural and cultural amenities and cultural heritage; restored or re-invented traditions including local/regional quality agro-food products and handicraft; local agriculture and forestry and other local economic activities; rural populations, territories and settlements (Baptista, 2010; Bosworth, 2012; Breil, 2007; Brunori *et al.*, 2007; Cannarella and Piccioni, 2011; Copus *et al.*, 2011 & 2013; Copus and

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Hörnström, 2011; DATAR, 2010; DEFRA, 2004; DGDSMR, 2011; Esparcia, 2003; Frangenberg, 2008; Garrod *et al.*, 2006; Ilbery *et al.*, 2005; Lee *et al.*, 2005; Madureira, 2008; Mitchell, 2013; OECD, 2006; van der Ploeg *et al.*, 2000; Sánchez-Zamora *et al.*, 2014; Shields, 2005; Shucksmith, 2010; Smallbone, 2009; Soto, 2014). But it must also be referred that there are other resources used for innovation purposes by the rural innovators that, as expected, are not specifically rural (*e.g.* non-rural technologies and functioning and marketing related resources) and that there are some innovating organisations settled in rural areas which functioning is not directly related to specifically rural resources (*e.g.* Bosworth, 2012; Copus, *et al.*, 2013; DATAR, 2010; Kalantaridis and Bika, 2011; Mahroum *et al.*, 2007; Smallbone, 2009).

The importance of “learning”, networking and other partnerships for innovating and for innovation dissemination to other regions or contexts, must also be retained. Many of the innovations result from tacit knowledge (learning by doing) which cannot be easily translated through codification and, therefore, their replication or translation in different environments implies learning processes and adaptation to the specific socio-technical contexts (Camagni and Capello, 2013; Dargan and Shucksmith, 2008; Knickel *et al.*, 2009).

It can be retained from the above that the monitoring and evaluation of the innovation that happens in rural and peripheral areas and the related supporting policies should be strengthened and that local knowledge and local specificities as well as local networking must be taken into account if it is intended to appreciate these areas sustainability and competitiveness.

It is also clear that although OECD and the European Union are aware of the need to encompass broader and diverse innovation strategies (EU SCAR, 2012 & 2013; OECD, 2010a; OECD and Eurostat, 2005), they maintain their sectoral (industry or agriculture) and technology related definitions and measurement systems which are not sufficient to discuss innovation in the rural economy context.

The importance of the effects from innovation on economic growth and on its promotion through incentives policies triggered the need to measure the first and to evaluate the seconds. This context has mobilised significant efforts of researchers and international institutions,

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including the OECD, towards the construction of operational concepts of innovation that would allow their identification and measurement.

Innovation is measured since the 50's, with the use of the first indicators, soon followed by sectoral surveys, and the adoption, in 1992, of the Oslo Manual with the purpose to harmonise OECD countries national methodologies and to collect standardised information (OECD and Eurostat, 2005). Some improvements to the Oslo Manual followed and, since 1998, it was adopted by Eurostat as the official European methodology to measure innovation and therefore to design and put into practice the Community Innovation Survey, known as CIS. The CIS, carried out every two years, reports data on product and process, and also, although less detailed, on organisation and marketing innovation, but it applies only to business innovation, leaving aside very small firms (less than 10 employees), non-firms organisations and low technological innovation, as well as, among others, activities important for rural areas like agriculture, forestry and fishing; tourism and recreation; public administration, human health and social work activities. In addition, due to its sectoral matrix, the CIS doesn't account for the territorial dimension that is important to enhance innovation in rural areas.

This framework has been updated, or derived through new regulations, new areas of action and new sectoral measuring systems like the “five key areas of action for a forward-looking, longer-term, international measurement agenda for innovation”, the Agricultural Innovation Systems (AIS), the Agriculture Knowledge Innovation Systems (AKIS), the new European Union regulation concerning the production and development of Community statistics on science and technology, the Innovation Union Scorecard (IUS) and the Regional Innovation Scorecard (RIS) but this systems cover mainly the science-based and technological aspects of innovation or are focused on the improvement of the agriculture and agro-food sectors (European Commission, 2012a; European Union, 2014a & 2014b; EU SCAR, 2012 & 2013; OECD, 2010b & 2012).

Furthermore it has been recognised that measuring innovation based only in inputs and outputs is not enough to an extensive characterisation of the innovation process and some proposals arisen to solve this drawback like the use of innovation performance measurement (IPM) systems, cluster key performance indicators (KPI), innovation management best practices and Balanced Scorecards, but none of these seem to be effective in addressing the complete needs of an innovative enterprise or are only related to the manufacturing industry

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or social enterprises (Boly *et al.*, 2014; Cruz-Cázaresa *et al.*, 2013; Dewangan and Godse, 2014; Ivanov and Avasilcăi, 2014; New Profit, Inc. referred by Kramer, 2005).

This outline of the literature review, used to position this research, confirmed that there is a growing diversification of rural economies and an increasing diversification of the activities that are practised in rural areas. Moreover, and although rural areas are still associated with peripheral regions, low density, declining activities and non-innovative regions, the rural diversification paradigm created room for new entrepreneurial views, creative ideas, new ways of thinking and new ways of doing things that widened the innovation concept.

However, in spite of OECD and the European Union awareness of the need to encompass broader and diverse innovation strategies, the existing strategies and measuring systems don't account for the relevance of rural innovation, namely when considering the diversity of the regional innovation patterns, that depend on each region local specificities, including traditional knowledge and local resources. Therefore it also confirms the need of a new rural innovation measuring system, the RIIS, capable to measure this rural innovation dynamics and to capture the value that exists in rural and peripheral areas.

I.3 The Research Undertaken

As it was referred above, the aim of this thesis is to analyse the innovation dynamics in rural areas and to bring contributions to capture and measure innovation, valuing the territorial specificities that underpin the diversity of innovation patterns.

The research undertaken is grounded on the evidence that rural areas have undergone significant changes along the last decades, with the decline of traditional land-based activities and a shift to a growing multifunctionality, and that this multiplication of activities broadened the diversity of innovations and innovators and widened the concept of rural resources, that however are not comprised by the existing conceptual and methodological frameworks to measure and valuate innovation.

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Considering the relevance of the innovation that happens in rural areas for these areas sustainability and competitiveness and thus the importance to bring into evidence this relevance, this thesis includes a three folded research that is described in three papers:

“Innovation dynamics in rural areas uncover a multiplicity of resources, confirming that rurality matters”

“Capturing and Measuring Innovation: introducing the Rural Innovation Indicators System (RIIS)”

“Neglected innovation in peripheral areas: the added value of frameworks and tools enabling to capture territorial specificities in innovation”

The first part of the research - **Innovation dynamics in rural areas uncover a multiplicity of resources, confirming that rurality matters** - presents evidence on the unsuspected multiplicity of rural resources that can be found in rural areas and shows how the resort to both traditional and uncovered rural resources brings a contribution to the definition of different innovation patterns that, in turn, reveal novel productive specialisations in rural areas grounded on those rurality-related resources. This multiplicity of unsuspected resources that widen the scope of rural resources arises due to the recent dynamics of rural economies, and in special from the analysis of the innovations that happen in rural areas. Based on the analysis of the information obtained through a rural innovation survey (the RUR@L INOV survey), which gathered information on 647 innovations carried out by 120 organisations, the innovations introduced by each organisation were allocated to a number of categories of rural (and non-rural) resources. The resultant data matrix of the relationships between innovating organisations and the resources used to innovate was analysed through a cluster analysis and grouped into six clusters that confirm that rural resources, as a concept, have clearly broadened their scope and that these resources are the basis and the inspiration for most of the innovations developed in rural areas.

The second part of the research - **Capturing and Measuring Innovation: introducing the Rural Innovation Indicators System (RIIS)** - had as an objective the conception of a new Rural Innovation Indicators System, built on a methodology which goal was to capture and measure the innovation that happens in rural areas and to support a framework to disseminate

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good innovation practices in rural areas, near both existent and potential innovators and policy and decision makers, and thus to contribute to include them in rural development and innovation policies and to enhance innovation in these areas. To identify the RIIS variables and indicators it became necessary to analyse the several existing and diversified systems designed to measure innovation as a whole and/or to measure good practices on rural development and then to select the key variables and indicators that could be adapted to characterise the development and implementation of good practices of innovation in rural areas and to measure the results that could be obtained through these good practices. Besides the usual input and output indicators, a group of indicators was selected to understand and measure the processes followed by the rural based organisations to develop and achieve innovation. The use of the RIIS on the results obtained through the RUR@L INOV database confirmed that innovation is developed regardless of the organisations legal nature or dimension, that all the types and sizes of rural organisations are important for the rural areas sustainability and competitiveness and, furthermore, that it is feasible to obtain data to different types of organisations using a single conceptual and methodological reference and a single data collection tool.

Finally, through the third part of the research - **Neglected innovation in peripheral areas: the added value of frameworks and tools enabling to capture territorial specificities in innovation** - evidence is presented on the actual need of wide-range surveys to capture and measure the innovation patterns that happen in rural and other peripheral regions to support the design and implementation of those areas' development and innovation policies. By comparing the innovation data on rural innovation gathered by the RUR@L INOV survey with the results that would be attained using the data collected by the CIS in its more recent version (CIS 2012), using as a reference the innovation measurement system RIIS, it is made clear that there are several types of information that cannot be obtained through the CIS, namely some details that help to characterise the innovators, the innovation patterns and dynamics, the internal impacts of other innovations than product innovation, the level of resort to internal skills and cooperation and, in particular, most of the information related to local specificities. It is also confirmed that most of the innovation carried out by the Portuguese rural innovators is left aside, including innovation related to the growing diversification pattern of rural economies, due to their small-scale and low-technological innovation patterns but also that this drawback could be solved resorting to the RIIS.

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* * *

The first part of the research “Innovation dynamics in rural areas uncover a multiplicity of resources, confirming that rurality matters” was submitted to the Journal of Rural Studies including as authors Teresa Maria Gamito, Livia Madureira, José Manuel Lima Santos. The second part “Capturing and Measuring Innovation: introducing the Rural Innovation Indicators System (RIIS)” was submitted to Research Policy journal, including as authors Teresa Maria Gamito, Livia Madureira. The third part of the research “Neglected innovation in peripheral areas: the added value of frameworks and tools enabling to capture territorial specificities in innovation” was submitted to Papers in Regional Sciences journal, including as authors Teresa Maria Gamito, Livia Madureira.

Earlier versions of the methodologies adopted and some research results were presented in several congresses and workshops, namely: on the 19th APDR Congress “Place-Based Policies and Economic Recovery” joint initiative with Innovaflow Conference 2010-2013, 20-22 June 2013, Braga, with the title “Measurement of Good Practices of Innovation in Rural Areas”, including as authors Teresa Maria Gamito, Livia Madureira, Dora Ferreira, José Portela, and was published with the same title and authors on the book “Innovation for Sustainability and Networking” edited by Teresa de Noronha, Jorge F. S. Gomes; on the International Workshop “Multidisciplinary Approaches on Innovation”, 3rd September 2013, Porto, with the title “Assessing Good Practices of Innovation: the case of organisations in Rural Areas” and including as authors Teresa Maria Gamito, Livia Madureira (not published); on the Congress ESADR 2013 “*Alimentar mentalidades, vencer a crise global*”, 15-18 October, 2013, Évora with the title “Capturing Good Practices of Innovation in Rural Areas”, including as authors Teresa Maria Gamito, Livia Madureira and published on the Congress proceedings; and also on the 2nd and 3rd International Workshops of the RUR@L INOV project. Part of the research is also published in the book “*Inovação em Portugal Rural. Detetar Medir e Valorizar*” (Madureira *et al.*, 2013) that resulted from the RUR@L INOV project.

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II. RESEARCH

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**Chapter 1 - Innovation Dynamics In Rural Areas Uncover A
Multiplicity Of Resources, Confirming That Rurality Matters**

Gamito, T.M., Madureira, L., Lima Santos, J.M., 2015. Innovation dynamics in rural areas uncover a multiplicity of resources, confirming that rurality matters (*unpublished*)

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**Innovation dynamics in rural areas uncover a multiplicity of resources,
confirming that rurality matters**

Abstract

Rural areas tend to be not perceived as particularly innovative areas, in spite of a growing diversity of rural economies related to new activities and new types of innovation. The shift towards multifunctionality also brought a reconfiguration of rural resources from those traditionally used by productive agriculture to a wide range of “new” resources.

In this paper we demonstrate the importance of both conventional and “new” rural resources for the development of innovation. Through an analysis of innovation patterns, we also identify the categories of resources that do contribute the most to rural innovations and their relation to rural innovators.

Keywords: Clusters; Multifunctionality; Rural innovation; Rural resources; Rurality

1.1 - Introduction

Rural areas are, in general, not perceived as particularly innovative areas. This happens due to their usually assumed peripheral and low density characteristics and also because innovation is mainly associated to R&D, technology and industry, which are not associated to the characteristics of rural areas. Innovation is defined by the Organisation for Economic Cooperation and Development (OECD) as the implementation of a new or significantly improved product (good or service) or process, a new marketing method or a new organisational method in business practices, workplace organisation or external relations. All innovation must contain a degree of novelty but not necessarily created by the firm: innovations can be new to the firm, new to the market, or new to the world and, recovering Schumpeter’s view, they can be “radical”, when they create major disruptive changes, or “incremental”, if they bring continuity to the process of change (OECD and Eurostat, 2005). It is also set that innovation can occur in any sector of the economy including in those related to rural areas (OECD, 2010b).

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Rural economies have undergone significant changes along the last decades with the decline of traditional land-based activities and a shift to a broader set of roles that society (both urban and rural) expects for rural areas (van der Ploeg *et al.*, 2000). Rural areas' low density and peripheral location have been most of the time considered as constraints for rural business, but recent studies (*e.g.* Copus *et al.*, 2013) don't confirm the existence of these hindrances: rural innovation can have a large contribution to promote the competitiveness and sustainability of these areas. These new perceptions are grounded in the growing multifunctionality of rural areas and the diversification of their economies.

When studying these recent dynamics of rural economies, and in special when analysing the innovations that happen in rural areas, a multiplicity of unsuspected resources are uncovered, widening the range of rural resources. Besides the traditional soil, water, and climate resources for the primary production of agricultural and forest outputs, there is a growing importance of local livestock breeds and plant varieties, wild resources, landscape and nature, and reshaped know-how associated to traditional agro-food and handicraft industries. Rural inhabitants, new comers or visitors, the rural settlements and even agriculture and forestry can also become considered as resources and opportunities for "new" rural services. However, and as far as we know, their potential as resources for rural development is not yet fully seized; many of them are not even perceived as resources.

This paper presents evidence on this unsuspected multiplicity of rural resources and how the resort to traditional and uncovered rural resources brings a contribution to the definition of different innovation patterns that reveal novel productive specialisations in rural areas, which are grounded on rurality-related assets. The evidence presented in this paper resorts on data collected in the scope of the project RUR@L INOV - Innovation in Rural Areas (Madureira *et al.*, 2013), which main objective was to capture the different types of innovation that are being developed and implemented by the organisations located in the Portuguese rural areas. The evidence obtained from the research presented in this paper can, with a large amount of confidence, be extended to other European and non-European rural regions affected by similar shifts of the rural economy towards multifunctionality.

Following this chapter we present, in section 1.2, a literature review focused on the existing limitations to development on rural areas, the role of rural innovation and which rural assets can be considered as rural resources. Section 1.3 describes the methodology developed to

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identify the “new” rural resources and the innovation patterns based on the importance of the rural resources employed. Section 1.4 presents the innovators clusters related to these innovation patterns, which are defined by different combinations of rural (and non-rural) resources. Finally, in section 1.5 some concluding remarks confirm that the concept of rural resources is not limited to those used by productive agriculture but covers a wide range of “new” resources, which are the base of most innovations developed in rural areas, and are actually a trigger for innovation and rural development.

1.2 - Literature review and conceptual framework

Innovation in rural areas

The term “rural” has numerous interpretations as there are many definitions and typologies categorising which places are rural and a diversity of criteria for defining rural environment (Bosworth, 2012; Halfacree 1993; Kalantaridis, 2007; OECD, 2010a; Sánchez-Zamora *et al.*, 2014; Smallbone, 2009). This difficulty in conceptualising rurality increases as rural areas across Europe have a deep diversity, from peripheral regions still heavily dependent on traditional agriculture, to peri-urban areas with diversified economic structures (*e.g.* Kalantaridis, 2007). This diversity of the rural economy results from a growing diversification of the activities that are practised in rural areas. In the new rural development paradigm discussed by van der Ploeg *et al.* (2000), multifunctionality brought new practices and networks and the “rural” ceased to be the monopoly of farmers: from a “space for agricultural production”, rural areas were increasingly converted into a “space for consumption”. Agriculture isn’t anymore the main economic driver of rural areas and the non-agricultural potential of the territory became the basis for a growing section of the regional economy. In the last decades, rural dynamics included a shift from the agricultural perspective of the rural to a broader set of roles that society (both urban and rural) expects rural areas to play, where environmental, agricultural and forest productions (not simply agriculture or forestry), territorial activities (industries, agritourism, hunting, angling, recreation, sports, etc....), and a link to the rural heritage (tangible and intangible heritage) have significant shares (Árnason *et al.*, 2009; Baptista, 2010; EC DGARD, 2010; Kalantaridis and Bika, 2011; Marsden, 1998; van der Ploeg *et al.*, 2000; Vitorino *et al.*, 2004). But, in spite of this evolution towards an

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increasingly diversified economy, “rurality” is still considered as a hindrance to the development of rural regions and rural economies, mainly as rural areas are associated with peripheral regions, low density and declining activities.

Some of the drawbacks related to low densities (and peripherality), with strong impacts on entrepreneurship and rural projects in general, happen both in Europe and in the United States, and can be synthesised as follows: the low supply of (and not specialised) labour associated with lower incomes and educational levels; unemployment and/or the declining employment opportunities in agriculture and primary industries; an ageing population in result of an out-migration of young people and an in-migration of retired people; a lower availability of capital than in urban centres; a smaller market potential; difficulties in maintaining a critical mass of facilities, business services and infrastructures to support economic development; reduced computer access and use and higher “per unit” cost of creating a local knowledge infrastructure, which impacts upon the flow of information and technological innovations; and slow external communications (*e.g.* Breil, 2007; Shields, 2005; Smallbone, 2009; Ward *et al.*, 2005).

A more balanced interpretation of the “rural” in Europe, was brought by Copus *et al.* (2013), who distinguish four types of “non-urban” regions, based on criteria of economic restructuring: Agrarian (where the primary sector accounts for an above average share of Gross Value Added (GVA) and employment); Consumption Countryside (where countryside public goods form the basis for a substantial part of the economy: tourism, recreation activities, access to “natural assets”, and the role of small-scale diversified forms of farming); Diversified secondary sector (where manufacturing accounts for a higher share of GVA); and Diversified services sector (Private Services, based on a strong market services sector). The authors conclude that if there is a tendency for a lower performance from the Agrarian regions and the Diversified Secondary regions, on an opposite direction there are higher performances, which will continue to grow in the immediate future, of the Consumption Countryside regions and the Diversified Services regions.

From an innovation perspective, and taking into account the above referred constraints, some barriers to innovation can be found in rural regions due to: small settlements with a low population density and a relatively thin economic base; the dispersed distribution of business population, low business densities and low clustering; a weak knowledge sector outside of the

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agricultural/land management sector; a lower incidence of higher education and research institutions; and the distance to accessibilities (DEFRA, 2004; EC DGARD, 2010; Kalantaridis and Bika, 2011).

In spite of the hindrances and constraints referred above, that are usually associated to rural areas, it must be noted that rapid changes in the international economy clearly have an important effect on these regions: the assets of rural regions, such as quality of life and environment, natural heritage and other amenities, combined with improved accesses, infrastructure, internet and increased leisure time are retaining and/or attracting people and businesses for rural areas. According to the new rural development paradigm, new opportunities are identified including: an increased demand for rural amenities on the part of urban residents; sources of economic success, such as dynamic SME clusters; development of diversified agro-industries and rural tourism; and opportunities related to products that project traditions of quality and craftsmanship, connectedness with nature and a sense of place and culture (OECD, 2006).

OECD (2010b) highlights the importance of non-technological innovation and their contribution to the productivity performance, especially in countries whose industrial specialisation and structure limit the scope for technology-based R&D activities. It is set that innovation goes far beyond R&D, includes a wide range of activities like organisational changes, training, testing, marketing and design, and can be influenced by policy. It is also accepted that innovation can occur in any sector of the economy including in rural areas, where rural innovation systems and the development of clusters and value chains across sectors are central to promote rural areas' competitiveness and sustainability, generating growth and contributing to prosperity (OECD, 2010b). But OECD Agricultural Innovation Systems (AIS) are only focused on the improvement of the economic, environmental and social performance of the agro-food sector (OECD, 2012), and are only concerned with the rural environment because of a growing competition between agriculture and other uses for finite land and water resources.

According to the EU SCAR (2012 & 2013) Agriculture Knowledge Innovation Systems (AKIS), the concept of innovation should be enlarged to include the public domain, including the public aspects of agriculture (multifunctionality), and to accommodate the new rural

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development paradigm, which promotes optimal and balanced use of local resources and community engagement in development projects and includes social innovation.

In what concerns rural innovation, although OECD and the European Union (EU SCAR, 2012 & 2013; OECD, 2010b; OECD and Eurostat, 2005) are aware of the need to encompass broader and diverse innovation strategies, they maintain their sectoral (industry or agriculture) and technology related definitions, which are not sufficient to discuss innovation in the rural economy context. There is clearly a need for further expanding the innovation concept to capture the innovation that is occurring in rural areas.

Innovation in rural areas is not necessarily connected to “new” technologies or to specific groups of actors or specific sectors. It can be defined as an approach or technique, new to its context or setting, for strengthening the capacity of local organisations to address serious development challenges in agriculture and food security (InterAction, 2012) or to achieve increased production while simultaneously preserving the environment (Läpple *et al.* 2015). It can also be the outcome of “different ways of thinking and different ways of doing things” (Brunori *et al.*, 2007), the result of interactions between, for example, farming systems, supply chains and economic systems, policy environments, extension and societal systems (Läpple *et al.* 2015) or be linked to innovative practices and techniques deriving from re-invented traditions (Cannarella and Piccioni, 2011). Observations on innovation in “non-metro” regions show that non-metro innovation can be in any sector, not just the primary sector, with a particularly great potential in services, in special in logistics and services allied to manufacturing (Tompson and Maguire, 2012). Social innovation has also a growing importance in rural areas, aimed at improving service provision or at responding to emerging social needs, from working conditions and education to community development and health (Brunori *et al.*, 2007), as well as to induce collective learning or co-operation and to bring changes in the attitudes, behaviour or perceptions through actor-oriented networks (Neumeier, 2012).

Innovative practices and new policies for rural areas also led to the emergence of new patterns on the rural economy as economies of scope, diversification, added value, communication and organisation technologies, among other factors, grow in importance compared to more conventional ones, such as economies of scale, specialisation, and productivity of labour or industrial technologies. Improvements in the knowledge and quality of life of rural

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populations, environment and energy technologies, stakeholder cooperation between local actors as well as the resurgence of natural and cultural resources, the appreciation of local products and even new types of tourism and rural tourism activities related to environmental protection are also noticeable (Brunori *et al.*, 2007; DGDSMR, 2011; Esparcia, 2003; Knickel *et al.*, 2009).

Rural resources

A resource is “something that a country has and can use to increase its wealth”; “a place or thing that provides something useful” (Merriam-Webster dictionary); or, “a stock or supply of money, materials, staff, and other assets that can be drawn on by a person or organisation in order to function effectively”; “a country’s collective means of supporting itself or becoming wealthier, as represented by its reserves of minerals, land, and other natural assets” (Oxford University Press dictionary).

The change in the rural development paradigm and the new (rural) lifestyles resulted in new societal demands and consumption dynamics and those, in turn, conducted to the diversification of the rural economy, which brought also the reconfiguration and/or the broadening of the usually assumed rural resources (land, arable soil, fresh water, nature, eco-systems, animals, plants, crafts, traditions, rural and agricultural infrastructures, ...). Some of these resources, reshaped or recombined, gain new value or importance or originate new resources like landscapes, environmental quality, gourmet or quality local products, arts, design, networks, market partners, certifications, etc... .

The relation between rural resources and rural innovation and their importance for the dynamics of local systems and rural development is highlighted or suggested by several authors (*e.g.* Bosworth 2012; Cannarella and Piccioni, 2011; Esparcia, 2014).

Rural resources categories could be obtained from an extensive literature review, either retaining direct references or identifying the resources related to the rural activities and innovations described. In the following paragraphs we develop the literature-based set of categories of rural resources that was identified and adopted by this paper.

Physical and natural resources, including raw materials, namely extractive materials; renewable raw materials, like biomass; wild products, like berries and mushrooms; and water,

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sun, wind, temperature, which remain relevant for the traditional rural (mainly agricultural and forestry) activities (Bosworth, 2012; Cannarella and Piccioni, 2011; Copus *et al.*, 2013; DATAR, 2010; DEFRA, 2004; DGDSMR, 2011; Frangenberg, 2008; Ilbery *et al.*, 2005; Mitchell, 2013; Sánchez-Zamora *et al.*, 2014).

Natural and cultural amenities like, for example, nature and natural heritage; biodiversity, wildlife, including game and fish stocks; forests and water bodies; landscape and environmental quality; that sustain a diversification from traditional land-based productive activities into rural consumption activities, namely “green” tourism and recreation. The same happens with cultural heritage and historical sites, that are considered values and symbols of local identity and also contribute to this diversification, offering autonomous or complementary resources to tourism (Baptista, 2010; Bosworth, 2012; Breil, 2007; Cannarella and Piccioni, 2011; Copus *et al.*, 2011 & 2013; Copus and Hörnström, 2011; DATAR, 2010; DEFRA, 2004; DGDSMR, 2011; Frangenberg, 2008; Madureira, 2008; OECD, 2006; van der Ploeg *et al.*, 2000; Sánchez-Zamora *et al.*, 2014; Shields, 2005; Smallbone, 2009).

Also related to heritage are restored or re-invented traditions based on local cultural heritage and knowledge (Cannarella and Piccioni, 2011). Some examples are local/regional quality agro-food products, with a special reference to rural local products like AOC - *Appellation d’Origine Controlée*, PDO - Protected Designation of Origin and PGI - Protected Geographical Indication, which have an increasing importance for rural economic agents (farmers and local food producers) to capture new markets and the consumer demand shifts towards more “local” and “natural” products, thus bringing positive economic benefits for local rural economies. The same applies to other traditional resources like handicraft and the cultural specificity and design of products (Breil, 2007; Copus and Hörnström, 2011; DATAR, 2010; DEFRA, 2004; DGDSMR, 2011; Esparcia, 2003; Frangenberg, 2008; Ilbery *et al.*, 2005; Mitchell, 2013; Smallbone, 2009).

Local agriculture and forestry and other local economic activities can also be mentioned as resources for rural services and to agro-industry in the sense that they create business opportunities: productive agriculture not only provides outputs for local processing but can also be a major purchaser of local inputs, including business services (Smallbone, 2009), training, education and capacity building. These opportunities are magnified if there is interest

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in the re-appropriation of local cultural heritage and traditional knowledge (Breil, 2007; Cannarella and Piccioni, 2011; DATAR, 2010; Esparcia, 2003; Smallbone, 2009).

Rural populations, territories and settlements can also be considered rural resources as they provide opportunities for several types of activities. It is the case of young children, older people and newcomers, who benefit from social services and educational facilities; rural inhabitants or rural businesses who receive training and capacity-building; skilled local workforce, “story tellers” or “intangibles”-keepers that can be employed (or involved) in traditional craftworks, heritage and nature conservation, tourism and cultural activities; and small villages and rural towns and their inhabitants, which receive information and communication technologies, technological poles, and business incubators (Breil, 2007; Brunori *et al.*, 2007; Cannarella and Piccioni, 2011; Copus *et al.*, 2011 & 2013; DATAR, 2010; Esparcia, 2003; Garrod *et al.*, 2006; Lee *et al.*, 2005; Shucksmith, 2010; Soto, 2014).

Finally we must refer that, as expected, there are resources used for innovation purposes by the organisations located in rural areas that are not specifically rural. It is the case of non-rural technologies (*e.g.* hi-tech industries, design, energy) and the resources related to the functioning of the organisations (*e.g.* labour, human resources (HR) training, cost control, information systems, quality certifications) and to their marketing activities (*e.g.* webpages, online sales, customer management, packaging). It also happens that some innovating organisations could be in rural areas or anywhere else, as their functioning is not directly related to specifically rural resources (many are located there only due to owners choice or decision), although they often are the main local employers (services, retail, construction and manufacturing sectors) (*e.g.* Bosworth, 2012; Copus, *et al.*, 2013; DATAR, 2010; Kalantaridis and Bika, 2011; Mahroum *et al.*, 2007; Smallbone, 2009).

1.3 - Methodology

Data collection

To assess the rural resources that are relevant for innovation in rural areas, we built and analysed a database of 120 interviews to innovative organisations located in the Portuguese

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rural areas, obtained through a rural innovation survey (the RUR@L INOV survey), which gathered information on 647 innovations carried out by these organisations. The Portuguese rural areas were defined according to OECD (2010a) low density typology at NUTS 3 level. The sample was randomly selected according to the weight of innovative organisations by regions (NUTS 2) and legal nature (Madureira *et al.*, 2013), from an on-going database that identifies innovative organisations in rural areas. Given the absence of statistical data, this comprehensive database includes information received from a broad set of national, regional and local entities and actors, on innovative cases, organisations, initiatives or projects (based on an enlarged definition of innovation regarding the one from OECD and Eurostat (2005), namely comprising also innovations responsible for the creation of social value and not merely the economic value). The surveyed organisations include a great diversity of activities, innovations and innovators that can be considered representative of such diversity in the Portuguese rural areas. The questionnaires were applied through face to face interviews carried out in the end of 2012 and the beginning of 2013.

The questionnaire was divided in 4 main interest areas, as described in Table 1.1 (Madureira *et al.*, 2013).

Table 1.1 - The RUR@L INOV survey

| Identification of the organisation | Characterisation of the organisation | Innovation activities and processes | Innovation leader/manager profile |
|--|--|--|--|
| <ul style="list-style-type: none"> · Type: address, legal status, size, legal constitution year · Size dynamics: evolution of sales or services; evolution of the HR framework | <ul style="list-style-type: none"> · Economic activities; goods and services · Geographic markets and value chain · HR and qualifications · Financial resources · Other resources (land, technologies, information networks, trademarks, patents) | <ul style="list-style-type: none"> · Innovations introduced, objectives, year, return on investment, weight on sales · Activities for innovation, including R&D and non R&D · Innovation expenditures; financial support to innovation · Innovation inputs: sources of information and local knowledge types · Co-operation for innovation · Effects of innovation (internal and external) · Barriers to innovation (internal and external) | <ul style="list-style-type: none"> · Socio-demographic characteristics · Scholarship; professional and leadership experience · Attitudes and behaviour towards innovation · Location factors · Motivations for entrepreneurship |

Data structure

For the purpose of this research the rural (and non-rural) resources categories that were identified in the previous section through literature review, were, where possible, split in more than one category to obtain a more detailed characterisation of resources better fitting the surveyed innovations. As there wasn't a previous definition and categorisation of rural resources, the categories developed for and used in this survey can be the base of a comprehensive concept for future research in this subject.

Respondents' answers concerning the descriptions of the 647 innovations introduced by the 120 surveyed organisations (see table 1.1) and the motivations for their introduction were analysed in detail in order to allocate each innovation to only one of the different categories of resources identified, an allocation that was made based on the most important resource category used to develop that innovation. Through counting innovations by resource category for each organisation, we measured the importance of each resource category for this organisation.

As each organisation can develop different innovations using different resource categories, the analysis below was made by organisation, in order to confirm the diversity of rural organisations according to the categories of resources used to develop their innovations: a data matrix was obtained with the survey organisations in rows, resource categories in columns, and cells filled with the counts of innovations by resource category in each organisation.

Data analysis

The relationships between innovating organisations and the resources used to innovate were analysed through a cluster analysis, as we aimed at classifying the organisations according to the patterns of rural (or non-rural) resources they use to innovate, that is according to the used resource categories and their relative weights. In fact, the cluster analysis performed essentially groups those organisations with higher within-cluster similarity and higher across-cluster differences as regards the used resource patterns.

Because there are some possible and plausible correlations between resource categories used by an organisation, a factor (principal component) analysis was carried out previously to the

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cluster analysis, allowing the identification of major factors (gradients) of diversity in resources across organisations, that take into account and control those correlations (which were confirmed by the analysis). The cluster analysis was then run on the first 5 factors (selected according to the eigenvalue criterion; these factors retain 70% of the original variability in resource patterns) rather than on the original variables to avoid that resource dimensions for which our categories are more detailed and happen to be correlated are given excessive weight in the clustering procedure.

We opted for a hierarchical cluster analysis, using the squared Euclidean distance function and the Ward agglomerative method; the selected number of clusters was decided based on the observation of the dendrogram.

Clusters were named and described by comparing the within-cluster average counts for the different resource categories, taking into account their corresponding 95% Confidence Intervals.

All multivariate (cluster and factor) analyses were run in the SPSS software (IBM SPSS Statistics 22).

1.4 - Results

Rural and non-rural resources categories

Table 1.2 presents the list of rural and non-rural resource categories used in our analyses. This list is grounded on the literature review (rural resources typology) and was developed into more detail based on the answers to our innovation survey. It is also provided a small description of examples of resources chosen as representative of those that can, in general, be found in rural areas, taking into account the literature review and our purpose to provide a comprehensive base for future research in this area.

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Table 1.2 - Rural Resources typologies and detailed categories

| Rural resources typology (from the literature review) | Categories | Description (and examples) |
|--|-------------------------------|---|
| Physical and natural resources | Soil, water, climate | and other physical conditions necessary for crop production |
| | Local genetic resources | autochthones crop varieties and livestock breeds |
| | Agriculture & Forest products | fruits, vegetables, meat, milk, timber, cork, wool, leather |
| | Wild resources | wild growing non-wood products (<i>e.g.</i> wild berries, mushrooms), honey, salt, game, fish stocks |
| Natural and cultural amenities | Landscape amenities | cultural landscape, natural sceneries, cultural and historical heritage, water bodies, thermal waters |
| | Wildlife and nature | wild animals and plants, natural parks |
| Traditions | Traditions | sausages, cheese, jam, wine, olive oil, handicraft |
| Agriculture and forestry | Agriculture | plough, crop growing, irrigation, cattle breeding |
| | Forestry | forestry, timber and cork extraction, forest fruits collection |
| Rural populations, territories and settlements | Old or disadvantaged people | retired, sick people, unemployed, young children |
| | Local human capital | local and traditional knowledge, skilled work force |
| | Rural territories | small or peripheral villages and towns, rural regions |
| Not specifically rural | Non-rural technologies | Hi-tech industries, design, energy |
| | Organisation resources | HR training, cost control, information systems, quality certifications |
| | Sales resources | webpages, online sales, customer management, packaging |

Rural Resources for Innovation in Portuguese Rural Areas

According to the methodology explained in section 1.3, each innovation identified in the survey was allocated to only one of the resource categories presented in table 1.2. Innovations allocated to each resource category were then counted for each organisation to yield the resource pattern of this organisation.

The total numbers of innovations and/or organisations associated to some resource categories were very small. As a rule of thumb, the resource categories with no more than 10 observations or no more than 5 organisations were considered less-robust data as a basis for the analysis, and so we opted to reallocate the corresponding innovations to the second most fitted category. Thus, the innovations first allocated to the categories “Local genetic resources” (7 innovations in 5 organisations), “Wild resources” (7 innovations in 5

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organisations), and “Old or Disabled people” (21 innovations in 5 organisations) were reallocated to another category. Those allocated to “Forest” (7 innovations in 5 organisations) were reallocated to the “Agriculture” category, as they presented some similarity (land-based activities, as resources), and the category was renamed “Agriculture & Forestry”. The category “Non-rural technologies” was renamed “Non-rural resources”, as it incorporated some of the innovations formerly allocated to the “Old or disabled people” category (which is relevant for both rural and non-rural areas). Finally, the innovations firstly allocated to the “Organisation resources” and “Sales resources” categories were grouped under a merged category named “Organisational resources”.

Table 1.3 presents the resulting total numbers of innovations and organisations associated to each resource category after all these reallocations and regroupings. The second column includes the total number of organisations with at least one innovation in each resource category and in the third column is presented the total number of innovations summed across organisations, allocated to each specific resource category.

Table 1.3 - Organisations and Innovations per type of (revised) rural resources categories

| Resources | Organisations | | Innovations | |
|-------------------------------|----------------------|-------|--------------------|-------|
| Soil, Water, Climate | 38 | 31.7% | 95 | 14.7% |
| Agriculture & Forest products | 34 | 28.3% | 72 | 11.1% |
| Landscape amenities | 27 | 22.5% | 57 | 8.8% |
| Wildlife and nature | 12 | 10.0% | 28 | 4.3% |
| Traditions | 57 | 47.5% | 125 | 19.3% |
| Agriculture & Forestry | 20 | 16.7% | 57 | 8.8% |
| Local human capital | 11 | 9.2% | 17 | 2.6% |
| Rural territories | 13 | 10.8% | 22 | 3.4% |
| Non-rural resources | 14 | 11.7% | 54 | 8.3% |
| Organisational resources | 63 | 52.5% | 120 | 18.5% |
| Total Innovations | | | 647 | |

The table above suggests that many organisations resort for their innovations to more than one resource category (in fact 99 organisations, 82.5%, do that). It is also noticeable the number of organisations (57) and innovations (125) related to Traditions, confirming a growing interest for the (re)introduction of past traditions and techniques, as well, as the number of organisations and innovations that resort to Soil, Water, Climate (38 and 95, respectively) as well as to Agriculture & Forest products (34 and 72), that shows a renovation of agriculture

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and forestry related activities. The large number of organisations (63) and innovations (120) related to Organisational resources is expectable as these occur in all type of organisations.

Table 1.4 presents a synthesised description that is intended to illustrate the 647 innovations identified in the survey to Portuguese rural innovators, according to the categories of rural resources that were used to achieve those innovations.

Table 1.4 - Examples of innovation typologies related to the categories of rural resources involved

| | |
|--|---|
| Soil Water Climate | <ul style="list-style-type: none"> - improvement of production methods; - crops certification; - hydroponics and floating productions; - study of regional varieties. |
| Agriculture & Forest products | <ul style="list-style-type: none"> - new technologies for agro-food production; - ready-to-eat fresh vegetable and fruits; - new conservation and packaging processes; - resource to environmental friendly technologies. |
| Landscape amenities | <ul style="list-style-type: none"> - thematic and scenic routes; - rural and agro-tourism: accommodation and facilities connected to nature; - thermal pools, spas, biological swimming pools; - tourism products related to experiences and emotions. |
| Wildlife and Nature | <ul style="list-style-type: none"> - hiking and trekking activities, horse-riding holidays and donkey tours; - fauna and flora interpretative tours, birdwatching, activities in wolf's territory; - wildlife conservation or reintroduction (including game); - eco-educational activities. |
| Traditions | <ul style="list-style-type: none"> - new agro-food products using traditional recipes; - marketing of local products PDO and PGI; - fashion design and production using natural products; - design products using traditional technology. |
| Local human capital | <ul style="list-style-type: none"> - training of local communities and community involvement in decision-making; - involvement of communities in farm, agro-food and raw materials production; - collaborative networks with local population to provide local traditional activities; - cross-generations collaboration. |
| Agriculture & Forestry | <ul style="list-style-type: none"> - technical support to farming and forestry including certification; - experimental tests of crop varieties and agro-food products; clusters improvement; - entry into new markets, internationalisation and logistics support services; - support and/or development of R&D projects. |
| Rural territories | <ul style="list-style-type: none"> - support to regional innovation and entrepreneurship; training of local stakeholders; - rural-based business incubators; - promotion of regions products and territories; - cultural and sports activities and services. |

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Non-rural resources - artificial intelligence for public and industrial lighting; photovoltaic modules;
- production and diversification of building materials and techniques;
- new gerontology services; social sharing desks;
- Living Labs; smart houses concepts.

Organisational resources - platforms to register ideas to be developed;
- websites and online sales systems;
- leftovers reuse; payments with “waste materials”;
- packaging innovation for specific products.

Cluster identification

Innovating organisations were classified according to the pattern of resources they use to innovate using the cluster-analysis methodological options mentioned in section 1.3. We opted to not include in the analysis the category related with organisational resources, as these resources are used by all types of organisations regardless of location and whether (or not) they use rural resources.

The followed cluster methodological options led to the 6 clusters of innovating organisations represented in table 1.5 together with the average number of innovations per resource category (and corresponding confidence intervals - CI) for each cluster. The clusters 1 to 6 represent, respectively, 38.3%, 23.3%, 5.8%, 4.2%, 20.8% and 7.5% of the 120 surveyed organisations (table 1.6).

These 6 clusters correspond to resource patterns clearly dominated by one resource category or where more than one category occurs. Some relationships between co-occurring categories emerge from these resource patterns (table 1.5).

The typical resource patterns of different clusters confirm that most organisations resort to rural resources to innovate. The only exception is cluster 4 (only 5 organisations; table 1.6), which uses mostly non-rural resources in their innovations. In Table 1.6, we propose names for the different clusters, chosen based on their typical resource patterns.

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Table 1.5 - Average number of innovations per resource category (resource pattern) in each cluster

| Cluster | | Soil water climate | Agricult. & forest products | Agricult. & Forestry | Landsc. amenities | Wildlife & nature | Traditions | Local human capital | Rural territories | Non rural |
|----------|-------|--------------------|-----------------------------|----------------------|-------------------|-------------------|-------------|---------------------|-------------------|-------------|
| 1 | Mean | 0.17 | 0.85 | 0.13 | 0.04 | 0.02 | 2.26 | 0.07 | 0.04 | 0.15 |
| | 95% L | 0.04 | 0.42 | 0.01 | -0.02 | -0.02 | 1.79 | -0.01 | -0.02 | 0.00 |
| | CI U | 0.30 | 1.28 | 0.25 | 0.10 | 0.07 | 2.73 | 0.14 | 0.10 | 0.31 |
| 2 | Mean | 0.29 | 0.04 | 0.04 | 1.86 | 0.96 | 0.43 | 0.29 | 0.11 | 0.11 |
| | 95% L | -0.03 | -0.04 | -0.04 | 1.39 | 0.41 | 0.16 | 0.05 | -0.01 | -0.11 |
| | CI U | 0.60 | 0.11 | 0.11 | 2.33 | 1.52 | 0.70 | 0.52 | 0.23 | 0.33 |
| 3 | Mean | 0.43 | - | 0.43 | - | - | 0.57 | 1.00 | 2.14 | 1.57 |
| | 95% L | -0.30 | | -0.30 | | | -0.33 | -0.41 | 1.15 | -0.42 |
| | CI U | 1.16 | | 1.16 | | | 1.47 | 2.41 | 3.13 | 3.56 |
| 4 | Mean | - | 0.20 | - | 0.40 | - | - | - | - | 6.40 |
| | 95% L | | -0.36 | | -0.71 | | | | | 2.82 |
| | CI U | | 0.76 | | 1.51 | | | | | 9.98 |
| 5 | Mean | 2.84 | 1.08 | 0.16 | 0.04 | - | 0.16 | - | - | 0.04 |
| | 95% L | 1.95 | 0.41 | 0.01 | -0.04 | | -0.04 | | | -0.04 |
| | CI U | 3.73 | 1.75 | 0.31 | 0.12 | | 0.36 | | | 0.12 |
| 6 | Mean | 0.56 | 0.44 | 4.89 | - | - | 0.11 | - | - | - |
| | 95% L | -0.73 | -0.58 | 3.84 | | | -0.15 | | | |
| | CI U | 1.84 | 1.47 | 5.94 | | | 0.37 | | | |

Table 1.6 - Cluster names, synthetic description and representativeness

| Cluster name | Main resources | Nr of organis. |
|--|--|----------------|
| 1 - Reinventing Traditions | <u>Traditions</u> (and Agriculture & forest products) | 46 |
| 2 - Experiencing Landscape | <u>Landscape amenities</u> and Wildlife & nature | 28 |
| 3 - Building Capacities | Rural territories + Non rural + Local human capital (and Traditions) | 7 |
| 4 - (Rural)-locating by choice | Non rural | 5 |
| 5 - Differentiating Land-based productions | Soil Water Climate (and Agriculture & forest products) | 25 |
| 6 - Supporting Agriculture & Forestry | Agriculture & Forestry (and Soil Water Climate + Agriculture & forest products) | 9 |

Cluster description

In this sub-section, we provide a synthetic description for each cluster, including some information collected through the rural innovation survey.

Cluster 1 - Reinventing Traditions

The 46 organisations included in the **Reinventing Traditions** cluster (38.3% of the 120 organisations in our sample) have a mean of 2.3 innovations related to the rural resource

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category “Traditions” (table 1.5) (this is the maximum average value for all clusters and is above the upper limits of CIs for the remaining clusters). They also register a mean of 0.85 innovations related to “Agriculture & Forest products”, which, although relatively high, is below the upper limits of CIs for clusters 5 (Differentiating Land-based productions) and 6 (Supporting Agriculture & Forestry). It must be noted that some organisations in this cluster have innovations related to all other resource categories but with very low averages (means lower than 0.2 and in some cases very close to zero).

These organisations are responsible for 36.6% of the detected innovations. Considering the resources used to achieve innovation, they represent 73.7% of the organisations (83.2% of the innovations) that resorted to “Traditions” and also 58.8% of the organisations (54.2% of the innovations) related to “Agriculture & forest products”. They are also near half of the organisations that use “Organisational resources” to innovate.

The **Reinventing Traditions** cluster is mainly composed of private organisations, covering all sizes (from very small to large), doing business as agro-industries (41.3%), but covering all value chains related with traditional productions (agriculture, forestry and fisheries, other industries, trade and other services), producing agro-food and agro-industry products (58.7%) or other manufactured products (15.2%).

In what concerns innovation types, they practise mainly product innovation, but also marketing and process innovation, and mostly incremental innovation. Most of them (67.4%) used local knowledge for their innovations, mainly traditional knowledge. Some examples of the innovations introduced are: the creation of new gourmet products using traditional recipes and/or new technologies both in production and processing; and fashion design and production using natural products like “cork skin”, linen, wool, or using traditional technologies.

Cluster 2 - Experiencing Landscape

The 28 organisations included in the **Experiencing Landscape** cluster (23.3% of the 120 organisations in the sample) have a mean of 1.9 innovations allocated to the rural resource category “Landscape amenities” and 1.0 innovations allocated to “Wildlife & Nature” (almost all innovations allocated to this resource category are in this cluster) (table 1.5). For these two

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resource categories, the cluster mean is above the upper limits of CIs for all other clusters. They also register a small amount of innovations related to all the other resources, from which “Traditions” with a mean of 0.4 innovations and “Soil water climate” and “Local human capital, both with 0.3, deserve a reference.

These organisations introduced 21.0% of the innovations identified. They represent 85.2% of the organisations (91.2% of the innovations) related to the use of “Landscape amenities” and 91.7% of the organisations (96.4% of the innovations) related to “Wildlife & Nature” as resources for their innovations. They are also half of the organisations that integrated “Local human capital” in their innovations processes and 22.2% of those that made innovations related to “Organisational resources”.

The **Experiencing Landscape** cluster is mainly composed of private organisations (with also some non-profit organisations), with all sizes except large organisations. Their main activities are tourism and leisure-related (50.0%), including also other services (28.6%), most of them related to nature conservation. They provide mainly tourism (71.4%) and other services (14.3%).

In what concerns innovation they practise mainly product innovation, but also marketing innovation and almost all of them (92.9%) do only incremental innovation. Almost all (96.4%) used local knowledge for their innovations, mainly ecological knowledge.

Some examples of the innovations introduced are: tourist products related to experiences and emotions, with the involvement of local populations; hiking and trekking activities for nature and wildlife discovery; accommodation and facilities connected to enjoying landscape and nature; and the usage of natural products for cosmetics and of traditional building materials and methods yielding environmental benefits.

Cluster 3 - Building Capacities

The 7 organisations included in the **Building Capacities** cluster (5.8% of the 120 organisations in the sample) practice innovations related to several resource categories (table 1.5). They have a mean of 2.1 innovations related to “Rural territories” (well above CIs for all other clusters, indeed almost all innovations allocated to this resource category are in this cluster); a mean of 1.6 innovations related to “Non-rural” resources (which, although

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relatively high is well below the lower limit of the CI for cluster 4 “(Rural) locating by choice”), and an average of 1.0 innovations resorting to Local human capital (above upper limits of CIs for all other clusters). They also register 0.6 innovations related with “Traditions” and 0.4 innovations related with “Soil water climate” and “Agriculture & Forestry”. This cluster doesn’t include innovations related to “Agriculture & Forest products”, “Landscape amenities” and “Wildlife & Nature”.

These organisations represent 7.3% of the global number of innovations. They include 58.3% of the organisations (75.0% of the innovations) that use the resource category “Rural territories” and 25.0% of the organisations (38.9% of the innovations) using the “Local human capital” resource category. They almost don’t include innovations related to “Organisational resources”.

The **Building Capacities** cluster includes only non-profit (and no sales) organisations and most belong to the local and central administration sector. Their scope of activity is mainly other services (85.7%), which represent 100% of the services offered, including training and knowledge supply and local territories’ and local communities’ development.

Their innovations are mainly social and product innovations, but they also do other types of innovation (except marketing) and do only incremental innovation. All of them use local knowledge for their innovations, mainly ecological but also with a high participation of the other typologies (construction technics; tradition; history & culture).

Some examples of the innovations introduced are: support to entrepreneurship and training of local stakeholders; creation of rural-based business incubators and Living Labs; territories promotion, historical and culture heritage restoration; and, communities’ involvement, cross-generations interchanges and social services.

Cluster 4 - (Rural)-locating by choice

The 5 organisations included in the **(Rural)-locating by choice** cluster (4.2% of the 120 organisations in the sample) have a mean of 6.4 innovations related to Non-rural resources, which are the most part of the innovations produced by this cluster organisations (table 1.5). Rural resources like “Soil water climate”, “Agriculture & Forestry”, “Wildlife & Nature”,

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“Traditions”, “Local human capital” and “Rural Territories” are not used and only “Agriculture & Forest products” (0.2) and “Landscape amenities” (0.4) were resorted to.

These organisations are responsible for 6.2% of the innovations identified. As referred above they almost only use “Non-rural resources” on their innovation processes, representing 35.7% of the organisations (59.3% of the innovations) that used this type of resources. Three of them introduced innovations related to “Organisational resources”.

The **(Rural)-locating by choice** cluster is composed by private organisations from very small to large, but mainly SME. Their activities and the goods and services provided are divided into other industries/ other manufactured products (80%), like construction materials, electric equipment, design objects, and other services (20%), mainly social and local services.

In what concerns innovation they all practise product innovation, but also marketing and organisational innovations, including radical innovation (60.0%) and incremental innovation. Only 40.0% used local knowledge for their innovations, divided between construction techniques and tradition.

Some examples of the innovations introduced are: the production and diversification of construction materials and techniques; innovation in energy production and artificial intelligence lighting; and, new therapies and services related to gerontology services.

Cluster 5 - Differentiating land-based productions

The 25 organisations included in the **Differentiating land-based productions** cluster (20.8% of the 120 organisations in the sample) have a mean of 2.8 innovations related to the rural resources “Soil water climate” (table 1.5) and a mean of 1.1 innovations related to “Agriculture & Forest products” which are also shared by the clusters Reinventing Traditions and Supporting Agriculture & Forestry (the mean is lower than the upper bound registered in those two clusters). This cluster hasn’t innovations related to the rural resources “Wildlife & Nature”, “Local human capital” and “Rural territories” and the other rural resources only have a very small incidence (a mean lower than 0.2 or very close to zero).

These organisations include 20.4% of the innovations detected. Considering the resources used to achieve innovation, they represent 60.5% of the organisations (74.7% of the

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innovations) that resorted to “Soil Water and Climate” and also 32.4% of the organisations (37.5% of the innovations) related to “Agriculture & forest products”. They represent 20% of the organisations that made innovations related to “Organisational resources”.

The **Differentiating land-based productions** cluster is mainly composed by private organisations (84%), including also cooperatives (12%), covering all dimensions except non-profit/no sales organisations. More than half of their activities (52%) and products (68%) result from agriculture and forest productions but this cluster includes also organisations with wholesale and retail trade activities (32%) and products/services (12%) and also some agro-food and agro-industry products (16%).

They introduced a mix of product innovations (76%), process (72%) and organisational innovations (52%), most of it incremental innovations (60%) but also radical innovations. Only half (52%) resorted to local knowledge for their innovations, mainly ecological but including also the other typologies.

Some examples of the innovations introduced are: the improvement of production and harvesting methods and technologies in order to obtain better productivities and environmental benefits; value added to productions (biological and regional varieties certifications, research labs, new marketing and distribution typologies); and new processes of products processing, conservation and packing.

Cluster 6 - Supporting Agriculture & Forestry

The 9 organisations included in the **Supporting Agriculture & Forestry** cluster (7.5% of the 120 organisations in the sample) have a mean of 4.9 innovations related to the rural resources “Agriculture & Forest” (table 1.5). They also register a mean of 0.6 innovations related to “Soil water climate” but with a lower significance than in the cluster Differentiating Land-based productions (the mean is also lower than the upper bound registered in the cluster Building Capacities) and of 0.4 innovations related to “Agriculture & Forest products” but also with a lower significance than in the clusters Differentiating Land-based productions and Reinventing Traditions. This cluster doesn’t include innovations related to the rural resources “Landscape amenities”, “Wildlife & Nature”, “Local human capital”, “Rural Territories” and to “Non-rural” resources, and only have a very small incidence on “Traditions”.

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These organisations introduced 8.5% of the innovations identified. In what concerns the resources used to achieve innovation, this cluster includes 42.9% of the organisations (75.9% of the innovations) that resorted to “Agriculture & Forestry”. They are only 1.6% of the organisations that made innovations related to “Organisational resources”.

The **Supporting Agriculture & Forestry** cluster is mainly composed by non-profit organisations (77.8%), mainly no sales, but including also micro and SME organisations that provide other services (88.9%), including agriculture and forestry support and R&D, and promotion and internationalisation services.

These organisations introduced all types of innovation, and mainly (88.9%) incremental innovation. Near half (55.6%) used local knowledge for their innovations, mainly traditional and ecological knowledge.

Some examples of the innovations introduced are: technical support and services to improve production processes; experimental testing of agriculture varieties and agro-food products; clusters improvement; and, support to new markets entry and internationalisation activities.

1.5 - Discussion and concluding remarks

From this analysis we can confirm that rural resources, as a concept, have clearly broadened their scope beyond traditional agriculture- and forest-related resources to include also a wide range of “new” resources. In particular, we can retain that these resources are the basis and the inspiration for most of the innovations developed in rural areas, which confirms the close relationship between rural resources and rural innovations and their importance to trigger innovation and rural development. Only in a small cluster (cluster 4), the non-rural resources category is dominant among the resources used for innovation.

It is also clear that rural innovators usually don't limit their innovations to one resource category alone but search economies of scope, diversification and added value, in line with the new rural paradigm: 82.5% of the organisations use different types of resources to achieve innovation.

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Furthermore, it can be retained the importance of rural resources to rural activities and, in special, for rural innovations as it is explained in the following paragraphs, confirming the information collected from the literature review.

More than one third (38.3%) of the innovative organisations are related to the “reinvention” of traditions, bringing life to new uses of local recipes and gastronomy and to new usages of traditional materials (Reinventing Traditions cluster). These “reinvented” traditions may reinforce the attractiveness of rural areas for investment and new comers and possibly contribute to refresh the breath of traditional agriculture and rural regions.

Also an important share of innovators (23.3%) base their activities and innovations on the growing demand for landscape amenities, wildlife and nature by most of the rural and urban populations (Experiencing Landscape group). The use of these resources offers traditional and new types of rural tourism, and may contribute to reinforce the importance of nature conservation by bringing value added to natural areas.

Two emerging types of innovators (Building Capacities (5.8%) and Supporting Agriculture & Forestry (5.8%) clusters) concerned with innovations in capacity building and support to agriculture and forestry activities are focused on the development of rural people and territories and may have an increasing contribution to the development of rural areas, mainly through the creation of knowledge poles and networks.

It must be noted that the traditional land-based production resources maintain a significant importance in rural areas (by providing the main innovation resources to 20.8% of rural innovators: those included in the “Differentiating land-based productions” cluster); these innovators not only supply differentiated fresh food and raw materials to agro-food industries but also act as landscape modellers and biodiversity contributors.

Finally we must refer the innovators that resort in most part to non-rural resources ((Rural) locating by choice group). While only representing a small percentage of the innovators located in rural areas (4.2%), they, although in a reduced amount, can use rural resources, and, in the case of non-rural related industries, can be responsible for an important share of the rural GVA and employment.

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The empirical evidence obtained through the defined innovation patterns confirms the widening of the rural resources typology. The paper contributes to a comprehensive definition of rural resource, in an innovation context that crosses all activities that can be found in rural areas, and, furthermore, to highlight the importance of rural resources and thus that rurality matters within the framework of the current dynamics and consumer trends that value the identity and authenticity of the territories.

The clustering of innovative organisations according to their patterns of using rural resources confirms the diversification of rural economies and highlights the importance of organisations, innovations and specialised productions alternatives to conventional agriculture and forestry. In particular, for their representativeness, a reference must be made to the reinvention of recipes and handicraft activities and the mobilisation of local knowledge together with global knowledge, to respond to a growing search for niche, tasty, genuine consumptions, as well as for territory-related envelopes allied to local products and traditions (packages, new selling places, show-cooking, etc.) and to a landscape- and nature-based tourism. But in the case of agriculture and forestry, it also shows that innovation searches for, and reinforces, a competitive differentiation, both related to a growing competitiveness and national and international interest for quality products and to more environmental friendly productions. Evidence was also obtained on the importance of the capacity building and supporting activities that bring an increased strength to the productive clusters. Finally, the non-rural innovators have a very small representativeness (at least in the Portuguese rural areas) but considering, both that they are there by choice and the contributions they can bring to rural economies, it would be interesting to find out how other could be attracted to rural areas.

From the above it can be retained the importance of the clusters not related to the conventional agricultural and forestry activities, which suggests that this importance should be supported and reinforced by the public policies, in special rural development policies and regional innovation agendas.

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**Chapter 2 - Capturing and Measuring Innovation:
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Capturing and Measuring Innovation: introducing the Rural Innovation Indicators System (RIIS)

Abstract

The innovation that happens in rural areas, practised by a wide range of organisations (from individual to large businesses and non-profit organisations) and related with all types of activities (from agriculture to services), has a growing importance for the promotion of these areas sustainability and competitiveness. However, many of these organisations, and consequently the innovations they implement, are not captured by the current framework to identify and measure innovation, based on the Oslo Manual.

To improve the existing capturing and measuring innovation framework, we developed a methodology to capture and measure rural innovation and to cover, besides inputs and outputs, the innovation process. The Rural Innovation Indicators System, designed to measure the innovation implemented by organisations settled in rural areas, regardless of their legal form, dimension, or activity sector, brings a significant support to understand innovation and to contribute for the definition of innovation and rural development policies.

Keywords: Hidden innovation; Indicators; Innovation in rural areas; Measurement of innovation

2.1 - Introduction

The current framework to identify and measure innovation, based on the Oslo Manual (OECD and Eurostat, 2005), only applies to business innovation and leaves aside very small firms (with less than 10 employees), non-firms organisations and low-technological innovation. However, the innovation not captured by the existing methodologies, therefore called “hidden innovation”, is also of extreme importance for the rural areas sustainability and competitiveness.

In this paper we present a methodology that was prepared to capture and measure rural innovation in order to support a framework to disseminate, near both existent and potential

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innovators and policy and decision makers, good innovation practices in rural areas and thus to contribute to include them in rural development and innovation policies and to enhance innovation in these areas. Through this methodology we prepared and applied a new Rural Innovation Indicators System (RIIS).

In the following sections we present: in section 2.2, the framework and the literature review that sustains the methodological choices adopted; in section 2.3, the methodology used and the selection of the variables that could be adapted to capture and measure innovation in rural areas; in section 2.4, the indicators system (RIIS) that was developed to capture and measure good practices of rural innovation and some results obtained; and finally, in section 2.5, some concluding remarks highlighting that all types of innovation (from Hi-tech and R&D intensive innovation to small scale imitation) are developed in rural areas.

This methodology was prepared on the scope of the project RUR@L INOV - Innovation in Rural Areas (Madureira *et al.*, 2013), which main objective was to capture the different types of innovation that are being developed and implemented by the organisations and other stakeholders located in the Portuguese rural areas. The research undertaken confirmed that a large percentage of the innovation developed in the Portuguese rural areas is small scale and low-technological innovation. These evidences can, with a large amount of confidence, be extended to other European and non-European rural regions and even to more populated areas.

2.2 - Framework and Literature Review

Measuring innovation

Innovation is being measured since the 50's, when Jacob Schmookler started to use patents as an indicator of innovation, although it was understood that patents measured invention, not innovation. In the 60's, the start of R&D surveys made possible the use of industrial R&D data to measure innovation and the development of concepts and tools to obtain data on innovation, namely at firms level, began in the 80's (Godin, 2002). In 1992, a draft manual for the OECD countries - the Oslo Manual - was adopted, with the purpose to harmonise national methodologies and collect standardised information on the innovation activities of

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firms: the type of innovations carried out, the sources of technological knowledge, the expenditures on related activities, the firm's objectives, the obstacles to innovation and the impacts of innovation activities (OECD, 1992; OECD and Eurostat, 1997, 2005). A firm was considered innovative if it produced one (or more) technologically new or significantly improved product or process in a three-year period. Since then, the OECD and Eurostat definition of innovation has changed: on the second edition of the Oslo manual, services activities were added to the manufacturing activities, together with a weaker distinction between technological and non-technological activities (Godin, 2002). Discussion of organisational innovation and non-technological innovation was included in an annex (OECD and Eurostat, 2005).

According to Rogers (1998), that compares the OECD's innovation definition and measurement systems with the ones from the Australian government and businesses, one method for measuring innovation is to make the distinction between the outputs of innovative activity and the inputs for this activity.

Several variables for measuring the success of the firm (output) are discussed, having into account that indicators as profits, revenue growth, share performance, market capitalisation or productivity can reflect other factors other than the degree of innovativeness. Suggested alternatives are (from OECD survey) the percentage of sales accounted for new or improved products or processes and the creation of variables for measuring the number of new or improved products and/or processes introduced.

Intellectual property data, such as patents, usually used to measure firm's innovation outputs and later considered as indicators of inputs to innovation, don't represent always a commercially exploited innovation and in many cases are not obtained as it involves the full disclosure of knowledge that could be of indirect use to competitors.

The degree of R&D expenditure is frequently used to measure innovation effort (input) and can be an indicator of innovation activity, although it doesn't match exactly with innovation. Data on the purchases of external technology or on the improvement of equipment or machinery can also be used as an indicator of innovative activity. The same applies to the expenditure on the marketing of new products and on training that is related to the

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introduction of new or improved products and processes, as innovation involves the entire resources of a firm in developing and extracting value from new ideas (Rogers, 1998).

Rogers (1998) also proposes the use of econometric techniques to quantify the firm's innovativeness, as it allows inferences on the value of the different innovation activities, an assessment of the overall value of these activities, and to compare it to other firms. The advantage of these methods is that they can link the innovation inputs, as R&D and patents, to measurable innovative outputs, like market value and productivity.

Since 1998, the Oslo Manual was adopted by Eurostat as the official methodology to design and put into practice the Community Innovation Survey, known as CIS. The CIS is carried out with two years' frequency by European Union member states, and is designed to provide information on the innovativeness of sectors by type of enterprises, on the different types of innovation and on various aspects of the development of an innovation, such as the objectives, the sources of information, the public funding, the innovation expenditures etc.. Formerly reporting data on product and process, the CIS 2010 included also organisational and marketing innovation as well as a new innovation activity to design, improve or change the shape or appearance of goods or services for product and process innovations. The target population for CIS concerns statistical units (innovators and non-innovators, R&D performers and non-R&D performers) in the business enterprise sector (goods-producing and services industries) and includes "all" statistical units with at least ten employees that are considered the "smaller" units.

More recently, OECD (2010) identified five key areas of action that could be the basis for a forward-looking, longer-term, international measurement agenda for innovation. These areas include: innovation metrics that can be linked to aggregate measures of economic performance; a high-quality and comprehensive statistical infrastructure to analyse innovation at the firm-level; metrics of innovation in the public sector and for public policy evaluation; new and interdisciplinary approaches to capture knowledge creation and flows; and, the measurement of innovation for social goals and of social impacts of innovation. The indicators proposed for the country level are, among others, related with sources of growth, intangible assets, innovation beyond R&D, protection of innovation, complementary innovation, collaboration, multidisciplinary and interdisciplinary research, clusters of knowledge and knowledge circulation, skills, entrepreneurial talent, mobilising private

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funding, policy environment, investments in R&D and in innovation, information and communication technologies.

The new European Union regulation concerning the production and development of Community statistics on science and technology (European Commission, 2012b) includes statistics on R&D, statistics on government budget appropriations or outlays on research and development, innovation statistics and statistics on human resources in science and technology. Although the R&D statistics must comprise all R&D performing units for all activities classified in the NACE Rev.2., the innovation statistics don't include, among others, activities as Agriculture, forestry and fishing; Accommodation and food service activities; Real estate activities; Administrative and support service activities; Public administration and defence; Compulsory social security; Education; Human health and social work activities; Arts, entertainment and recreation; and, Other services activities (NACE Rev. 2). Furthermore (as it is in the CIS) the Innovation Surveys are applied only to enterprises with 10 or more employees leaving aside the non-enterprises and an important share of the enterprises. Considering only the enterprises, in the EU27, those with less than 10 employees represented, in 2012, 92.1% of the total number of the enterprises, 28.7% of the employment and 21.1% of the gross value added (GVA) (Gagliardi *et al.*, 2013). In Portugal these figures grow, respectively, to 94.8%, 39.4% and 22.8%. To these must be added all the organisations related to the activities not included. For example, the primary sector in 2012 represented 5.2% of the employment (11.0% in Portugal) and 1.7% of the GVA (2.3% for Portugal) (EC DGARD, 2013).

It must be also noted that besides R&D there are other methods of innovating, including technology adoption, incremental changes, imitation, and combining existing knowledge in new ways (Arundel *et al.*, 2008). As innovation cannot simply be equated with science-based R&D, Asheim (2012) distinguishes between two modes of innovation: one that relies on informal processes of learning and experience-based know-how and is based mainly on competence building and organisational innovations and producing mostly incremental innovations - the DUI mode (Doing, Using and Interacting); and another based on the use of codified scientific knowledge, which is a science push/supply-driven high-technology strategy able to produce radical innovations - the STI mode (Science, Technology and Innovation). But this author also confirms that combining the two modes of innovation seems to be most

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efficient, that is, firms that have used the STI mode intensively may benefit from paying more attention to the DUI mode, and vice versa.

Furthermore it has been recognised that measuring innovation based only in inputs and outputs is not enough to an extensive characterisation of the innovation process.

Some proposals to solve this drawback are the use of innovation performance measurement (IPM) systems, but according to Cruz-Cázares *et al.* (2013) none of these seem to be effective in addressing the complete needs of an innovative enterprise and, in addition, enterprises are facing difficulties in establishing a clear relationship between innovation and enterprise performance. Dewangan and Godse (2014) proposed the use of IPM schemes that define and cluster key performance indicators (KPI), comprising a multi-dimensional view of performance and focused on measuring performance of various stages within the innovation life cycle (innovation process oriented).

Recently, Boly *et al.* (2014) made a research on the evaluation of innovation processes on medium sized enterprises (SME) in the manufacturing industry, considering that a process is a sequence of tasks that are coherent in regard to the final artefact: a new product, a new service or a new technology. To evaluate firm's innovation capacity (IC) the authors propose "15 fundamental innovation management best practices", concerning both inputs and process: Design; Project management; Integrated strategy; Project portfolio management; Suitable organisation definition; Innovation process improvement; Competence management; Moral support; Knowledge management; Competitive technology intelligence activities; Network management; Collective learning; Ideas research/Creativity; R&D activities; and, Customer relationship management (CRM).

A different approach is the use of Balanced Scorecards to measure the performance of innovation processes (Ivanov and Avasilcăi, 2014) that was already used as a tool to evaluate social enterprises and to monitor the progress of its social entrepreneurs (New Profit, Inc. referred by Kramer, 2005). According to this author, the Balanced Scorecard is able to bring together multiple kinds of performance measurement into a single framework that can be tracked quarterly and can be used, among others, to measure Social Impact (the quality of the organisation's impact on individuals, and social outcomes); the "Customer"/Key Stakeholders/Clients perspective (new customer acquisition, customer satisfaction,

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“customer” retention, market share or referrals); the Internal Business Processes (increase in employee retention, increase in volunteer retention, decrease in cycle times for training and service delivery); Learning, growth and innovation (staff retention, satisfaction, alignment of incentives, rates of improvement in critical customer and internal processes, increase in information technology tools and data, quality of training, increase in learning opportunities and Board satisfaction/retention/attendance); and, the Financial perspective for non-profit organisations (revenue growth and diversification, cost control (keeping within budgeted expenses) and productivity).

From what it is seen above, it can be drawn that most of the activities related with rural innovation and rural settled innovative organisations are not covered by CIS and other surveys and statistics and that although there are some attempts to measure the innovation process we are far from having an established measuring system.

Good practices of innovation in rural areas

In OECD countries, rural areas account for three-quarters of the land and are home to a quarter of the population. Rapid changes in the international economy clearly have a different effect on these regions, than on cities and towns (OECD, 2006).

The assets of rural regions, such as quality of life and environment, natural heritage and other amenities, combined with improved accesses, infrastructure, internet and increased leisure time are retaining and/or attracting people and businesses for rural areas. New opportunities are identified and encounter echo in a new innovation paradigm.

According to Brunori *et al.* (2007) novelties in rural areas emerge as the outcome of “different ways of thinking and different ways of doing things”. It is also the opinion of Esparcia (2008), that refers new knowledge and/or different types of innovation that are being developed in rural areas: innovation in products (agro-tourism and rural tourism activities related to environmental protection); technological innovations (irrigation, pollution control, waste treatment, treatment of agricultural products, etc.); innovations in processes (cooperation of stakeholders); organisational innovations (structures for cooperation between local actors); innovations in attitudes (the culture of cooperation).

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“Social innovation” is also a new aspect of innovation that is becoming important in rural areas, as it concerns improving service provision, organising goods and services provision in innovative ways, or responding to emerging social needs related with community development, health and welfare, as well as social processes of innovation, such as open source methods, microcredit, distance learning and social entrepreneurship (Brunori *et al.*, 2007).

The great amount of measuring systems and metrics analysed revealed that there are no specific definitions for good practices of innovation in rural areas and that there are several descriptions of what can be “good practices in innovation”. Bellow we present some of the views collected.

For several territorial and social development organisations, good practices in rural areas are defined as regional initiatives having produced positive and tangible outputs and results regarding specific objectives (ARE, 2006; CSE, 2003; Rur@ct, 2012; UAFSE and SAE, 2004); that can be replicated or adapted to other contexts horizontally (diffusion) and/or vertically integrated into systems and regulations (ARE, 2006; CSE, 2003; InterAction, 2012; Rur@ct, 2012; UAFSE and SAE, 2004); that seeks complementarity and is consistent with the priorities of a regional strategy and policy (CSE, 2003; EC DGARD, 2010; Rur@ct, 2012; UAFSE and SAE, 2004).

Approaches based on investment (internal and/or external) instead of subsidy based are also considered a good practice (COTEC, 2010; OECD, 2006). COTEC (2010) also considers a good practice for innovation when enterprises provide policies and resources to the pursuit of innovation projects and activities. The resource to venture capital is also considered a key driver of innovation (Florida and Kenney, 1988; Reffitt and Sorenson, 2007) because it enables investment in young firms or the formation of new high technology business, overcoming the financing barrier that many times hold back innovation.

An important message obtained is the need to include knowledge, openness and networking or internal and external collaborations. Knickel *et al.* (2009) recommends, for all innovation stages, a network that includes partnerships with stakeholders outside academics, involving local people, integrating local and academic knowledge, recognising and building on existing capacities of the various actors; as well as for all stages and all actors, the need to include

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actors with an “open attitude” or an “innovative mind-set” towards change, overcoming sectoral and territorial barriers, collaborating with communities, regions, countries and sectors. This openness is also one of the lessons obtained from Kenyon (2005), that refers, among others, the need to have collaboration, networking and strategic partnerships, including key players in the community; to involve leadership and skilled management principles and practices, including knowing when to seek outside expertise; and the importance of staff pride, enthusiasm and involvement. Several authors and entities also emphasise as a good practice the involvement of local knowledge and local actors, both producers and consumers (Boly *et al.*, 2014; de Jong and Marsili, 2006; Kenyon, 2005), the involvement of stakeholders institutions, entities and relevant personalities (Brunori *et al.*, 2007; CSE, 2003; de Jong and Marsili, 2006) and with a cross and participatory action (ARE, 2006). COTEC (2010) agrees in the need to include a diversity of actors and conceived a model of “sequential interaction” to help enterprises in the transition for knowledge economy.

DATAR, (2010) consider as good practitioners the rural organisations that contribute to a sustainable territorial development and, more specifically: with a positive impact on the employment and growth development of the area where the investment has taken place, and/or on the socioeconomic situation of the innovator (DATAR, 2010; EC DGARD, 2010); that build the capacity to deliver services in agriculture and rural livelihoods and newcomers in a sustainable way (DATAR, 2010; InterAction, 2012); that promote the natural, cultural and tourism resources and contribute to the recovery and management of bio-resources, landscape / heritage preservation, environmental / ecological protection (DATAR, 2010; de Jong *et al.*, 2006); and/ or that are adapted to local specifics (ARE, 2006).

Finally, it is also considered a good practice when there is a continuous process of innovation management and focused on both quality and differentiation of products/services offered and on an innovative marketing (Boly *et al.*, 2014; COTEC, 2010; Kenyon, 2005) as well as when organisations had shifted its orientation to regional and international markets (EU SCAR, 2012; OECD, 2012).

2.3 - Methodology for capturing and measuring rural innovation

As referred above, the current framework to identify and measure innovation, based on the Oslo Manual, leaves aside very small firms, non-firms organisations and low-technological innovation that are important to enhance innovation in rural areas contributing for these areas sustainability and competitiveness. To have an inclusive picture of the importance of rural innovation we had to capture information on these DUI mode innovators but without excluding the science-based R&D (STI mode) innovators.

The analysis of the literature also revealed that the measurement of innovation practiced either at national level or at organisation level is limited to the measurement of input factors and/or of the results achieved. Thus, the purpose of this research created several challenges at the methodological level.

Also as referred in section 2.2, the great amount of measuring systems and metrics analysed revealed that there are no specific definitions for good practices of innovation in rural areas and that there are several descriptions of what can be “good practices in innovation”. The range of descriptions gets broader, or more imprecise, when the focus is reduced in order to identify what could be good practices of innovation in rural areas and, much more, when the organisation is specifically addressed.

The same applies when trying to identify the indicators that would be more suitable for measuring good practices in rural areas. The same drawbacks were found as existing indicators and measuring systems were also broad, or focused either into measuring innovations in large firms and excluding the primary sector - like the above referred CIS -, or to acquire information country related, like, for example, the NESTA Innovation Index, focused on UK, or the Innovation Union Scoreboard that compares the European Union member states levels. Most of the indicators are also mainly designed to measure inputs and/or outputs.

One of our challenges was to identify a set of key variables and indicators that could be associated with the development and implementation of rural innovation. The methodology developed to define a set of indicators to capture and measure good practice of innovation in

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rural areas was based on the analysis of several and diversified systems designed to measure innovation as a whole or good practices on rural development.

As a result it was possible to identify, from the examples analysed, a group of variables that could be adapted to capture and measure rural innovation and the good innovation practices that are being developed in rural areas. From these were selected a first set of key variables and indicators that could be adapted to characterise the development and implementation of good practices of innovation in the Portuguese Rural Areas and to measure the results that could be obtained through these good practices.

In our analysis we also have considered an added value to understand and measure the processes followed by the rural based organisations to develop and achieve innovation. So, besides the usual input and output indicators, we tried to gather indicators that could evaluate those processes. Accordingly, the selection of indicators was allocated into the levels of functioning of the organisation for the production of innovation: Input, Process and Outputs.

As examples of Input indicators we can refer those related with: internal (many times informal) knowledge and skills like human resources university graduated, employed in science and technology or R&D activities and internal multidisciplinary and interdisciplinary research, resorting to interdisciplinary teams or co-operative atmospheres (Asheim, 2012; COTEC, 2010; Hervás-Oliver *et al.*, 2011; Leskovar-Scapan and Bastic, 2007; Morris, 2008; OECD, 2005 & 2010; Spielman and Birner, 2008). Also important Input indicators are: financing through internally generated funds, private funding, direct and indirect government funding, borrowing, venture capital investment funds; the mechanisms used to support private investment in R&D like competitive grants, tax provisions, credit guarantees, government R&D financing; and, the existing/potential barriers to entrepreneurship and innovation (Florida and Kenney, 1988; Leskovar-Scapan and Bastic, 2007; OECD, 2005, 2010 & 2012; Reffitt and Sorenson, 2007; Spielman and Birner, 2008).

For Process indicators we could find those related with innovations like the number of innovations (by type - product, process, design, organisational, marketing) incremental or radical, experimented or adopted during the last 5 years, the existence of mixed modes of innovation (complementary innovation strategies in manufacturing or in services) and their contribution to the value chains; and those related to the total factor productivity (TFP)

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growth or number of changes introduced in firms and to their internationalisation processes (Asheim, 2012; Boly *et al.*, 2014; EU SCAR, 2012; Leskovar-Scapan and Bastic, 2007; NESTA, 2012; Nybakk *et al.*, 2009; OECD, 2005, 2010 & 2012; Spielman and Birner, 2008). Also included as Process indicators were the external knowledge acquisition using contract R&D, purchasing, licensing, or through partnerships (alliances, joint ventures, joint development, etc.), with external parties (customers, suppliers and consultants), and contacts with Universities, international networks, competitors and social networks; non R&D activities and R&D expenditures and their percentage of sales (Asheim, 2012; CEC, 2006; COTEC, 2010; van Hemert *et al.*, 2012; Hervas-Oliver *et al.*, 2011; Leskovar-Scapan and Bastic, 2007; Morris, 2008; NESTA, 2009; Nybakk *et al.*, 2009; OECD, 2005, 2010 & 2012; Spielman and Birner, 2008).

As Output indicators, we detected the total number of innovations created or introduced, the contribution of innovative products to sales, the growth rate of the firm, the number of patents and trademarks and the number of publications in academic journals, number of mentions in media, number of actions for knowledge dissemination (CEC, 2006; COTEC, 2010; Hagedoorn and Cloudt, 2003; van Hemert *et al.*, 2012; Hervas-Oliver *et al.*, 2011; Morris, 2008; Nybakk *et al.*, 2009; NESTA, 2009; OECD, 2005, 2010 & 2012; Spielman and Birner, 2008).

The methodology adopted for the definition of the variables and for the construction of indicators to measure good practices for rural innovation, as well as the fine tuning of the selected set of variables and indicators, was discussed and refined through the input obtained from researchers, consultants, entrepreneurs and decision-makers, with expertise in innovation, rural development and statistical development, who participated in a Focus Group or were asked to provide written contributions.

Another group of indicators, derived and expanded from CIS surveys, was included to describe the main characteristics of the organisations.

2.4 - The Rural Innovation Indicators System

General description

The presentation of the state of the art concerning the measurement of innovation in rural areas, based on the literature review prepared above, shows the lack of a system of indicators or a specific metric to measure rural innovation. It was confirmed the importance of defining, testing and fine tuning a set of tools that would fill the detected gap.

In this section we present the set of indicators designed to measure the innovation implemented by organisations settled in rural areas: the Rural Innovation Indicators System (RIIS). This novel and essential tool is prepared to compare the performance of a diversity of organisations, with regard to several dimensions and indicators of innovation, allowing also the monitoring of the innovative behaviour of any rural organisation.

The RIIS was tested resorting to the data basis obtained through a survey that gathered information about 120 organisations which are representative of the great diversity of activities, innovations and innovators that can be found in rural areas. The survey for data collection was inspired on the framework established by the Oslo Manual, and expanded in order to include: a more comprehensive concept of innovation, including social value creation and not only commercial value; an analysis unit extended to non-enterprise organisations, in particular non-profit associations and local authorities; firms, and other organisations, regardless of size, starting from the individual entrepreneurs until large companies; the observation of the innovation processes, gathering information about the description of innovations: what they were (or are), when did the process started and its duration, the objectives and the weight of each innovation in the sales (or services) volume (Madureira *et al.*, 2013). The survey covered the period comprised between 2009 and 2011/12.

The structure of the survey was used as a reference to the definition of variables and indicators, as the answers received were the likely information to identify and classify the cases of good practice. Furthermore, some of the answers obtained allowed a fine tuning of the variables definition and of the construction of the indicators that could be associated with good practices for rural innovation. We also sought to identify other indicators that could be used in future analyses, although they could not be quantified within the scope of the project.

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The literature review, the several analyses carried out and the type of answers that could be obtained from the survey made us decide for a conceptual model that was used to focus on “innovative organisations in rural areas”, regardless of their size, activity and legal form, instead of focusing on the innovations themselves.

Indicators for measuring good practices of rural innovation

The set of indicators included in the RIIS is presented on Table 2.1. For each of these indicators, various classes were defined in order to allow a better understanding of the available information.

The set of indicators includes the three fundamental dimensions that are associated with the levels of functioning of the organisations for the production of innovation: the Inputs used for innovation; the Processes followed to achieve innovation; the results (or Outputs) of innovation. It was considered a fourth dimension that describes the main Characteristics of the organisations.

Table 2.1 - The RIIS Indicators*

| Characterisation of the Organisation | |
|---|---|
| 1. Type and size | 1.1 Legal form of the organisation |
| | 1.2 Size of the organisation |
| 2. Activities and products/services | 2.1 Economic activities |
| | 2.2 Products and services |
| Input | |
| 3. Location | 3.1 Typology of urban areas |
| | 3.2 Economic and social development of the organisations environment |
| | 3.3 Location competitive advantages |
| | 3.4 Location competitive disadvantages |
| 4. Skills | 4.1 Leader/manager innovation skills |
| | 4.2 Human resources qualifications |
| | 4.3 Internal cooperation |
| | 4.4 Organisation skills in R&D |
| | 4.5 Organisation skills in Design |
| | 4.6 Organisation skills in Marketing |
| 5. Resources | 5.1 Financial resources |
| | 5.2 Resources through “merit” (prizes, venture capital, incentives systems) |
| | 5.3 Material resources |

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| | |
|-------------------------------------|---|
| 6. Sources of knowledge | 6.1 Internal sources of information |
| 7. Networking | 7.1 Partnerships for innovation |
| 8. Barriers to innovation | 8.1 Internal barriers |
| | 8.2 External barriers |
| Process | |
| 9. Innovations | 9.1 Type of innovations created / adapted |
| | 9.2 Innovation patterns |
| | 9.2a Products/processes new or improved |
| | 9.2b Market enlargement |
| | 9.2c Organisational improvements |
| | 9.2d Networking |
| | 9.3 Intensity of the innovation process |
| | 9.4 Activities for innovation |
| | 9.4a R&D activities for innovation |
| | 9.4b R&D continual internal activities |
| | 9.5 Investment in innovation |
| | 9.5a Investment in R&D for innovation |
| | 9.6 Value chain |
| 10. Internationalisation | 10.1 Exports profile |
| | 10.2 Geographical scope |
| | 10.3 Dynamics for internationalisation |
| 11. Knowledge mobilisation | 11.1 External sources of information |
| | 11.2 Mobilisation of local knowledge |
| 12. Networking (Synergies) | 12.1 Synergies for innovation |
| | 12.1a Local networks |
| | 12.2 Motivations for cooperation |
| | 12.2a Local partnerships |
| | 12.2b Empowerment partnerships |
| | 12.2c Business partnerships |
| 13. Specialisation/ diversification | 13.1 Specialisation |
| | 13.2 Diversification |
| 14. Behaviour to local specifics | 14.1 Adapting to local specifics |
| | 14.2 Local development |
| Outputs | |
| 15. Innovations | 15.1 Number of innovations created/adapted |
| | 15.2 Number of innovations created/adapted on the last 3 years |
| | 15.3 Weight of the innovation in the organisation sales (or services) |
| 16. Socio-Economics | 16.1 Job creation |
| | 16.1 Job creation for innovation |
| | 16.3 Internal results (sales variation) |

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| | |
|--------------------------------|---------------------------------|
| 17. Dissemination of knowledge | 17.1 Dissemination of knowledge |
| 18. Impacts | 18.1 Certificates |
| | 18.2 Internal effects |
| | 18.3 External effects |

*The indicators description can be found in appendix

The survey didn't include the collection of data related to some indicators (Internal cooperation, Organisation skills in Marketing, Synergies for innovation and Certificates) and for others the data could not be obtained directly. To gather all the intended information and produce a complete evaluation of the organisations further questions need to be included in future surveys.

The indicators construction

As referred, the structure and the results of the survey were used as a reference to the definition of variables and indicators.

Thus, 6 types of indicators can be considered: By class (the variables are divided in classes: mainly characterisation indicators); Descriptive (the variables are qualitative, descriptive or informative); Weighted (the variables are weighted before being combined); Combined (the variables are summed or combined into other variables); Relative (the variables are combined in order to reach a %); Open-ended (the higher value depends on the universe). Some examples are presented below.

An indicator By class is the classification of the organisations in what concerns the "Products and services" provided. These were organised according to the Statistical classification of economic activities - NACE, complemented with information related with the common organisation of agriculture markets (European Union, 2007) and the combined nomenclature for the customs (European Commission, 2012a) and then aggregated into six classes: (1) products "from the farm"; (2) agri-food and agro-industry products; (3) other manufactured products; (4) trade; (5) tourism; (6) other services.

"External (and internal) barriers" are Descriptive indicators used to illustrate that even the "success cases" mention barriers-related obstacles.

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The “Value chain” is a Weighted indicator, based on the information that was collected concerning the (up to) three major products/services of the organisation. A score was given considering the direct participation (in %) of the organisation in the several levels of the value chain: production; processing; distribution; marketing and sales; and, post sales. The result obtained was weighted with a factor related to the level of participation of the organisation in the product or service design.

The “Size of the organisation” is a Combined indicator: classes were defined according to the definition of the European Commission (2005) for SME that combines jobs and sales to rank the organisations. Considering that the resulting “micro organisations” were near 50% of the universe analysed, a subdivision was created: “nano-organisations” including those which have less than five jobs and sales up to 100 thousand euros. Another class was created for non-profit (and no sales) organisations.

The “Organisation skills in R&D” (or Design) that measure the percentage of the technical staff that has R&D (or Design) functions and the “Investment in innovation” that indicates what % of the sales (from the previous year) was invested in innovation activities are examples of Relative indicators.

“Job creation” is an Open-ended indicator as the employment variation and employment variation rate have no fixed maximum score: the highest value, both in number and percentage, will depend on the organisations that are being evaluated.

The RIIS barometer

A RIIS barometer was prepared to synthesise, through a radar graphic by type of indicator - input, process, output -, the average results associated with the indicators identified as the more illustrative of the rural innovation in Portugal.

The RIIS barometer presents a comparison between the maximum score attainable for each indicator, the highest score obtained within the set of organisations evaluated - “Best practices” - and the average values obtained by this set. The average values distinguish between business organisations (enterprises and cooperatives) - “Average (business)” -, and a non-profit group (national and municipal institutions and non-profit associations) - “Average (non-profit)”. Separately are also presented the Averages by size (in number of jobs) of the

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organisations: “Average (nano)”, “Average (micro)”, “Average (small & medium (S&M))” and “Average (large)”.

The application of the RIIS on the project data base revealed some convincing results. The radar graphs illustrate a significant gap between the average and the best practices for most of the indicators, and it is also visible that for some indicators the maximum value was not attained. These results mean that there is room to improve the innovation practices in the Portuguese rural areas.

It is also observable that, for some of the indicators, there are significant differences between the averages corresponding to the business sector organisations and the averages of the non-profit organisations, as well as between the averages by size of the organisations (business and non-profit). This is an expectable result as the RIIS reflects the diversity of organisations that can be found in rural areas.

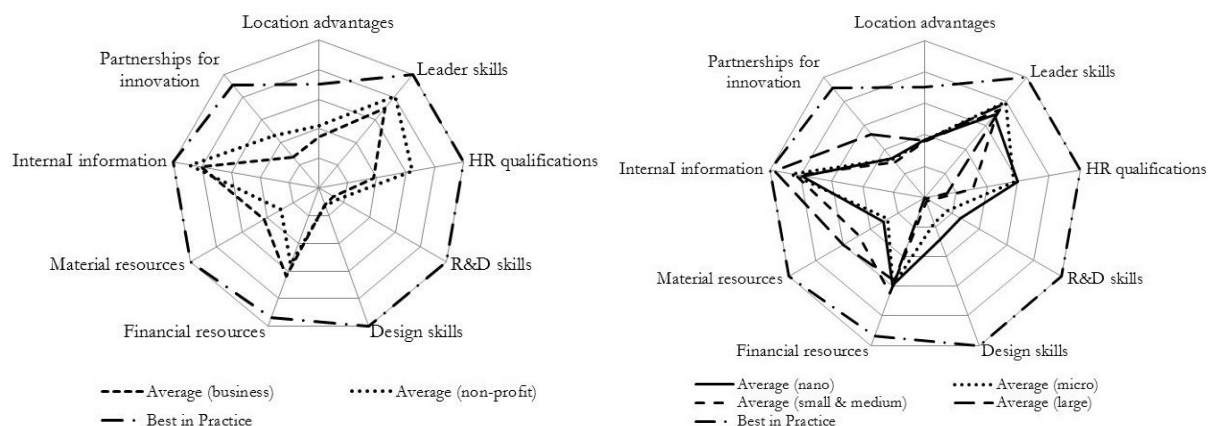
In what concerns Input indicators (Graph 1.1), are noticeable the large differences between the “Averages” and the “Best practices” on the indicators “Organisation skills in R&D/Design”, both for business and non-profit organisations. This results from the smaller proportion of specialised human resources on the largest and medium sized organisations. For the indicator “Location competitive advantages”, as the set of location advantages used by each organisation changes from one organisation to another, the maximum level is far from being attained.

“Leader/management innovation skills” and the use of “Internal sources of information” have a good approximation to “Best practices” for all the types and sizes of organisations which is an expected result given the fairly good “Human resources qualifications”. These results validate the importance of skills and internal knowledge for innovative organisations and the presence of a large amount of DUI mode practices for innovation. The use of “Financial resources” is also relatively good.

The main differences, on average, between business and non-profit groups, are on the use of “Material and financial resources”, where the “business” show a better performance, and on “HR qualifications” (in general and at the level of leader/manager skills) and on the resort to diversified “Partnerships for innovation” where the non-profit organisations present best

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performances. Large organisations present best performances on the option for different “Partnerships for innovation”, as well as on the use of “Internal sources of information” (where the average approaches the best in practice). Large and S&M also detach from the others on the use of “Material resources”. As mentioned above, the smaller organisations perform better in what concerns “HR qualifications” in special related to “Organisation skills in R&D/Design” where nano organisations show the best averages, followed by micro.



Graph 1.1 - Radar analysis. RIIS Input indicators

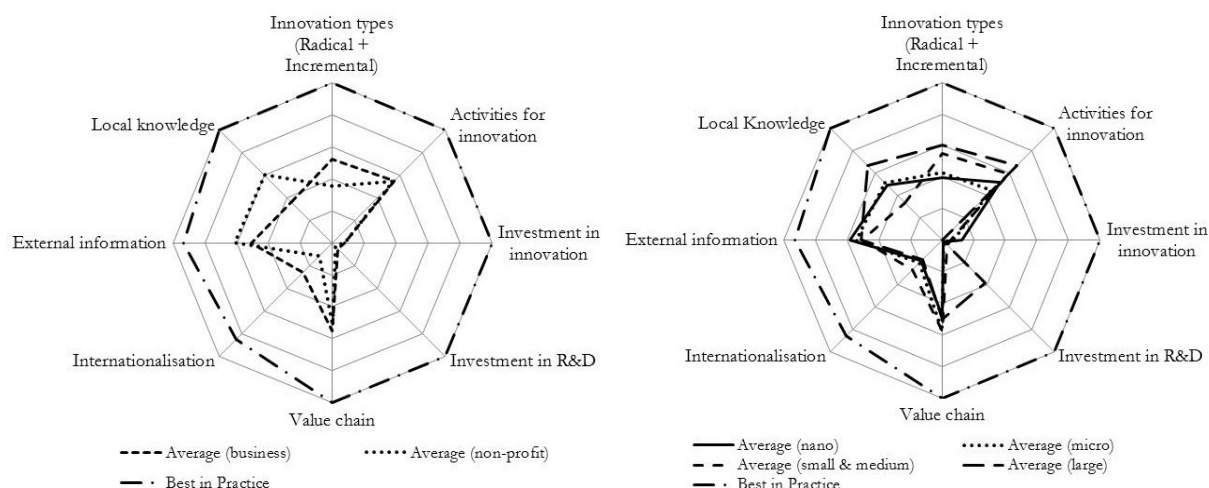
For Process indicators (Graph 1.2), the largest differences between “Average” and “Best practices” are related to the “Investment in innovation” and, above all, to the “Investment in R&D” (where only the large organisations show a relatively good result). These performances can, on one hand, reflect the economic climate of the reporting year (2011), under the influence of national and external crises, and, on the other hand, it confirms that a great number of the innovations implemented by the organisations located in rural areas are DUI mode innovators don’t resorting to R&D. There is also an important gap related to the “Internationalisation” may be due to a lower importance of exports for the non-profit sector. It is also noticeable that for this indicator the maximum value is not attained.

The best approximations to the “Best practices”, although with some gap, are found in two indicators: the “Activities for Innovation” (better for large organisations and S&M) and the “Value chain”. There is also a good performance as regards the indicators “External sources of information” and “Mobilisation of local knowledge”.

Synthesising the differences, it is concluded that the “business” group and the large organisations and S&M implement more radical and incremental innovation. The business

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organisations and S&M also have a better performance as regards “Internationalisation”, while the non-profit organisations exhibit better results on the mobilisation of “External sources of information” (including “Local knowledge”). Large organisations, besides showing the higher “Investment in R&D” are also the best performers in what concerns the “Mobilisation of local knowledge”, followed by the micro and nano organisations.

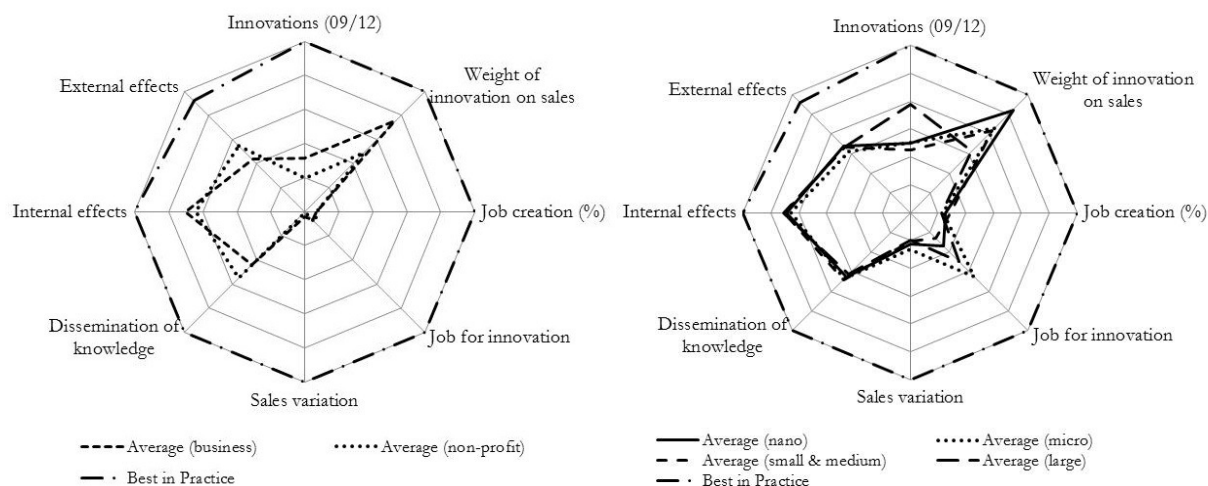


Graph 1.2 - Radar analysis. RIIS Process indicators

As regards Result indicators (Graph 1.3), the major differences between “Average” and “Best practices” arise in “Job creation” and “Job creation for innovation” and for “Internal results (sales variation)”. These differences can be explained by very good performances from some organisations, both in terms of job creation and sales growth. The “Weight of the innovation in the organisation sales (or services)” and “Internal effects” show a good approximation to “Best practices” while “External effects” and “Dissemination of knowledge” reveal fairly good performances.

Making an analysis by groups, the “business” group exhibits a better position on the “Weight of the innovation in sales (or services)” and on “Internal effects”, while non-profit organisations are better in terms of “Dissemination of knowledge” and on “External effects”. Large organisations implemented a large “Number of innovations” between 2009 and 2012 while the smaller organisations (nano followed by micro and S&M) register a better “Weight of the innovation in sales (or services)”. It is also noticeable the good average of micro and large organisations in what concerns the “Job creation for innovation”.

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Graph 1.3 - Radar analysis. RIIS Output indicators

2.5 - Concluding remarks

The results obtained provide a vivid picture of the importance of the innovation that has been introduced and/or adapted in the Portuguese rural areas. It also confirms that innovation is developed regardless of the organisations legal nature or dimension and that all the types and sizes of rural organisations are important for the rural areas sustainability and competitiveness.

The analysis undertaken confirms that it is feasible to obtain data from different types of organisations using a sole conceptual and methodological reference and a sole data collection tool, and that, for the definition of innovation and rural development policies, it is important to include on the capturing and measuring of innovation all the types of organisations and not only enterprises with more than 10 employees, as it is current practice, particularly when using the framework of the Oslo Manual.

Evidence is also obtained that the broadening of the traditional indicators systems and other metrics of measuring innovation, usually limited to the measurement of input factors and results achieved, in order to contemplate the evaluation of the processes followed by the organisations to introduce innovation, is of great value to the understanding of innovation. The inclusion of a set of indicators to measure the innovation process, as it was done in the RIIS, is essential, to completely understand the specificity of the contexts where the rural

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innovation takes place. It is at the level of the processes that it is possible to understand the innovation patterns adopted, and the importance for these patterns of different dynamics such as the mobilisation of R&D and local knowledge, the networking for the development of innovation, the internationalisation strategies and/or the option for specialisation or diversification of the organisations.

Furthermore, as the barometer illustrated, there is room to improve on innovation practices in rural areas (it is also visible that for some indicators the maximum value was not attained). The RIIS brings a significant support to distinguish the innovative from the not (or little) innovative organisations, positioning them in a gradient of innovation, revealing itself as a tool of great potential to understand innovation and to boost it effectively. It is useful to innovators, as it provides them an instrument to monitor and/or evaluate their performance in terms of innovation, and it is particularly relevant to the stakeholders involved in the design, implementation, monitoring and/or evaluation of rural development policies.

As the survey to innovative organisations located in rural areas was prepared and applied at an earlier stage in relation to the design of the RIIS, it was not possible to evaluate the organisations resorting to some of the defined indicators. Therefore, it will be possible, and interesting, for use in future evaluations, to adapt the survey in order to obtain the whole information required to take a complete advantage of the RIIS capabilities to characterise (and to evaluate) further “innovative practices” than those that were appreciated.

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Appendix

Table A.2.1 Short description of the RIIS indicators

| Characterisation of the Organisation | |
|---|---|
| 1.1 Legal form of the organisation ^a | Ranks the organisations according to their legal form |
| 1.2 Size of the organisation ^a | Ranks the organisations size according to the EC definition for SME that combines jobs and sales. With a breakdown of "micro organisations" into micro and nano |
| 2.1 Economic activities ^a | Divides the organisations by their Economic Activities using the Statistical Classification of Economic Activities in the EC (NACE) |
| 2.2 Products and services ^a | Main products or services marketed by the organisations, using NACE, Single CMO Regulation and combined nomenclature codes |
| Input | |
| 3.1 Typology of urban areas ^a | Ranks the organisations location, according to the OECD criteria for urban and rural areas |
| 3.2 Economic and social development of the organisations environment ^a | Gauges the degree of economic development and social well-being, by municipality |
| 3.3 Location competitive advantages | Competitive advantages of the organisations location according to the respondent's perception |
| 3.4 Location competitive disadvantages | Competitive disadvantages of the organisations location according to the respondent's perception |
| 4.1 Leader/manager innovation skills | Ranks the leader or innovation manager skills, based on their academic qualifications, professional experience and leadership experience |
| 4.2 Human resources qualifications | Percentage of graduates (including promoters, employees and promoters relatives) within the organisation |
| 4.3 Internal cooperation | Existence of internal networks and or internal cooperation for innovation |
| 4.4 Organisation skills in R&D | Percentage of the technical staff that has R&D functions |
| 4.5 Organisation skills in Design | Percentage of the technical staff that has design functions |
| 4.6 Organisation skills in Marketing | Percentage of the technical staff that has marketing functions |
| 5.1 Financial resources | Evaluates the financial capability of the organisations and/or their ability to finance themselves through equity and/or family loans, bank loans and/or microcredit, European funding, national public funding or regional or local funds. As a sub indicator the organisations that only use equity and/or family loans were also highlighted |
| 5.2 Resources through "merit" (prizes, venture capital, incentives systems) | Financial resources obtained through "merit" including awards, grants, venture capital or funds related to Incentive Systems |
| 5.3 Material resources | Material resources (patents, trademarks, technology, equipment) that may contribute to the innovation ability in the organisations |
| 6.1 Internal sources of information | Importance of internal (promoter and/or employees) knowledge sources for innovation, according to the valuation given by the respondents |

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| | |
|---|--|
| 7.1 Partnerships for innovation | Number of different types of collaborations/ partnerships to which the organisation resorted, on the last 3 years, for gathering innovation, distinguishing between organisations in the same sector or other sectors, in the same area or other areas, universities/research labs, suppliers, associations, media, local authorities, public bodies |
| 8.1 Internal barriers | Organisation internal barriers for gathering innovation (time, human resources, information/knowledge, costs, risks, financial resources, strategy), according to the respondents perception |
| 8.2 External barriers | Barriers imposed by the external environment that hinder the innovation acquisition process (lack of knowledge, labour, funding, access to markets, culture, accessibility, or bureaucracy, legal and institutional framework, etc.), according to the respondents perception |
| Process | |
| 9.1 Type of innovations created / adapted | Innovation patterns of the organisations, through the nature of the innovations achieved: “radical” (innovations new to the market or new to the sector); “incremental” (that improve existing products, processes, strategies or business models) or both. |
| 9.2 Innovation patterns | Innovation patterns according to the purpose for which they are intended: |
| 9.2a Products/processes new or improved | Organisations that develop new or improved products or processes |
| 9.2b Market enlargement | Organisations whose innovations are intended to attain new markets or to enlarge their existing markets |
| 9.2c Organisational improvements | Organisations whose innovations are intended to achieve efficiency gains and value and/or to better use internal resources |
| 9.2d Networking | Organisations whose innovations are intended for the establishment of sales and/or supply networks |
| 9.3 Intensity of the innovation process | Ranks the organisations according to the innovative intensity: launch phase, specific, concentrated, continued, discontinued, sequential, intensive |
| 9.4 Activities for innovation | Organisation activities for gathering innovation (internal or external R&D, purchase of machinery, equipment, technologies, acquisition of other external knowledge, specific training, introduction of innovations into the market, experimental production) |
| 9.4a R&D activities for innovation | Organisations that develop internal R&D activities and/or acquired them externally |
| 9.4b R&D continual internal activities ^a | Organisations that develop R&D activities continuously |
| 9.5 Investment in innovation | Relationship between the total investment in innovation activities and the sales in the previous year |
| 9.5a Investment in R&D for innovation | Investment in internal and external R&D activities for gathering innovation |
| 9.6 Value chain | Organisation's contribution to the different levels of the value chain and internal creation of added value, highlighting their contribution to the design of the product or service |
| 10.1 Exports profile | Organisations exports dimension (% exported of the main products/services) |
| 10.2 Geographical scope ^a | Geographical scope of the organisations exports (main products/services) |

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|---|--|
| 10.3 Dynamics for internationalisation | Evaluates at what degree the organisations research/use external organisations support (partnerships, distributors, intermediaries) to their internationalisation process |
| 11.1 External sources of information | Importance of external knowledge sources (from the market, consultancies, institutional, events, publications, internet, associations, local and popular knowledge) to the innovation process, according to the valuation given by the respondents |
| 11.2 Mobilisation of local knowledge | Diversity of local knowledge sources (technical-constructive, traditional-handicrafts, historical-cultural, ecological) used for innovation |
| 12.1 Synergies for innovation | Classifies the type of existing networks including the organisations and the main stakeholders of the network. Partially answered by the indicator below |
| 12.1a Local networks | Organisations whose innovations are related to the establishment of networks with the local community |
| 12.2 Motivations for cooperation | Organisations motivations for the cooperation/ partnerships, either formal or informal, to gather innovation, on the last 3 years, classified according to the type of partnership: |
| 12.2a Local partnerships | Cooperation between the organisations and the main local stakeholders (organisations from the same area and local authorities) |
| 12.2b Empowerment partnerships | Cooperation between the organisations and the knowledge or institutional stakeholders (universities/research labs, associations, public authorities) |
| 12.2c Business partnerships | Cooperation between the organisations and other organisations with related activities (of the same or other sectors, from other regions, suppliers) |
| 13.1 Specialisation ^a | Degree of specialisation of the organisations that have only an activity and a typology of products/services |
| 13.2 Diversification ^a | Degree of diversification of the organisations that have more than one activity and offer several types of products/services |
| 14.1 Adapting to local specifics | How organisations adapt their activity to the local environment |
| 14.2 Local development | Organisations that contribute to local development, taking advantage of the characteristics of their environment - historical, demographic, geographical, economic, social and cultural - to gather innovation |
| Outputs | |
| 15.1 Number of innovations created/adapted | Total number of innovations introduced by the organisations |
| 15.2 Number of innovations created/adapted on the last 3 years | Total number of innovations introduced by the organisations on the last 3 years |
| 15.3 Weight of the innovation in the organisation sales (or services) | Contribution of the introduction of innovations to the volume of sales or services of the organisations |
| 16.1 Job creation | Impact of innovations in the creation and/or maintenance of jobs in the last 3 years (in number and as a percentage) |
| 16.1 Job creation for innovation | Impact of innovations in the direct creation of jobs in the last 3 years |
| 16.3 Internal results (sales variation) | Impact of the innovations on the organisations sales variation in the last 3 years |
| 17.1 Dissemination of knowledge | Impact of the dissemination of innovations (notes in the media, participation in scientific, educational or commercial events, visits to the organisation, requests for technical support) |

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| | |
|-----------------------|---|
| 18.1 Certificates | Relationship of the creation of innovations with the assignment of environmental certifications |
| 18.2 Internal effects | Impacts of innovation at the organisation (competence and sustainability), according to the valuation given by the respondents |
| 18.3 External effects | Impacts of innovation in the organisation's external environment (effects on the socio-economic development, on the valorisation of heritage and on the creation of knowledge networks) according to the valuation given by the respondents |

a - Characterisation indicators

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**Chapter 3 - Neglected innovation in peripheral areas:
the added value of frameworks and tools enabling to
capture territorial specificities in innovation**

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**Neglected innovation in peripheral areas: the added value of frameworks and tools
enabling to capture territorial specificities in innovation**

Abstract

The main goal of this paper is to shed light, built on empirical data, on the need for an alternative framework and innovation survey that will enable the collection of statistical data on the innovation patterns shaped by territorial dimension.

A survey and a Rural Innovation Indicators System (RIIS) applied to the Portuguese rural innovators, confirmed that it is feasible, using a single conceptual and methodological framework, to capture an inclusive picture of the innovation patterns, including the neglected innovation and local specificities, that are of particular relevance in rural and other peripheral areas.

Keywords: CIS, Innovation in rural areas, Local specificities, Measuring innovation, Smart growth

3.1 - Introduction

In spite of a growing awareness that innovation is a broad scope concept, which includes social value, non-technological outputs and non R&D inputs, there isn't so far an inclusive referential, both in theoretical and methodological terms, to identify and evaluate all the innovations that happen in rural areas and to give a substantial contribution for the smart growth of most peripheral regions, in particular the rural areas in many European regions.

The current framework to identify and measure innovation in the European Union based on the Oslo Manual - the Community Innovation Survey (CIS) -, doubly marginalises the innovation carried out on rural areas, as it doesn't include very small firms (and non-firms organisations) and several of the relevant economic activities that happen in these areas such as: agriculture, forestry and fishing; tourism and recreation; public administration; human health and social work activities (OECD and Eurostat, 2005).

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In addition, this methodological referential is based on a sectorial matrix that leaves no room for the territorial dimensions of innovation, such as local specificities and local knowledge, which support rural innovation and therefore are of particular relevance for the sustainability and competitiveness of rural areas and other peripheral locations. The sectorial matrix of this referential is reflected on the regional measurements of the innovation, an example being the EU Regional Innovation Scoreboard (RIS).

Therefore, considering the EU concern in the development of regional smart specialisation strategies and in the engagement of local actors in local strategies, wider frameworks and metrics for innovation are clearly needed. This was also a concern from the Portuguese project RUR@L INOV - Innovation in Rural Areas (Madureira et al., 2013) where a rural innovation survey was conceived and applied to a national-level sample of innovative organisations located in the Portuguese rural areas. The questionnaire designed to this survey was prepared to provide data to feed a Rural Innovation Indicators System (RIIS), specially prepared within the project to measure and compare the innovation implemented by organisations settled in rural areas, regardless of their type, size and activities performed.

The goal of this paper is to render evident that we actually need wide-range surveys to capture and measure the innovation patterns that happen in rural and other peripheral regions to support the design and implementation of those areas' development and innovation policies. By comparing the innovation data on rural innovation gathered by the Portuguese rural survey, with the results that would be attained using the data collected by the CIS in its more recent version (CIS 2012), using as a reference the innovation measurement system RIIS, we want to make clear that the current framework used by OECD and the EU to identify and measure innovation doesn't allow an inclusive characterisation of innovation, leaving aside aspects that are important to capture and enhance innovation in rural and other peripheral areas.

In the following chapters we present: in section 3.2 the literature review that sustains the importance of developing and implementing new frameworks and metrics to capture and measure innovation in rural and other peripheral regions; in section 3.3 the methodology applied to evidence the gaps that result from the use of CIS (or similar surveys) when compared to more extensive measuring systems; in section 3.4 we describe the results obtained and finally, in section 3.5 some concluding remarks highlight the need to dispose

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from a characterisation of innovation patterns that takes into account the territorial dimension specificities, based on the evidence gathered from the Portuguese rural areas.

3.2 - Framework and Literature Review

Innovation and regional development

Innovation, according to the OECD definition (OECD and Eurostat, 2005) is the “implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations”. To be considered an innovation the product, process, marketing method or organisational method must contain a degree of novelty and must have been implemented. Therefore innovations can include products, processes and methods that have been adopted from other firms or organisations (new to the firm) and can also be new to the market, or new to the world, when the firm is the first to introduce the innovation on its market, or on all the markets and industries. Many innovations may have characteristics that include more than one type of innovation.

Although it has been recognised by OECD (2010) that innovation can happen in low R&D intensity and low-technology industries, and that non-technological forms of innovation can contribute to productivity performance, including in rural economies, innovation is still perceived (and measured) as related to industry, R&D and technologies.

In what concerns the European Union (EU), innovation has been placed at the heart of the Europe 2020 strategy for growth and jobs (European Commission, 2010a): with an ageing population and strong competitive pressures from globalisation, Europe's future economic growth and jobs will increasingly have to come from innovation in products, services and business models. The flagship initiative “Innovation Union”, with over thirty action points, aims to improve conditions and access to finance for research and innovation in Europe, to ensure that innovative ideas can be turned into products and services that create growth and jobs (European Commission, 2010b), considering innovation a much broader concept than science, research and development and extension. It also highlights the concept of smart

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specialisation as a way to enhance the three priorities of Europe 2020: smart, sustainable and inclusive growth (European Commission, 2012a).

National/regional research and innovation strategies for smart specialisation (RIS3) are integrated and place-based economic transformation agendas that, among others, build on each country'/ region' strengths, competitive advantages and potential for excellence. The RIS3 approach embraces a broader concept of innovation that includes building competitiveness through design and creative industries, social and service innovation, new business models and practice-based innovation. All regions have a role to play provided that they can identify own competitive advantages, namely engaging entrepreneurial local actors to demonstrate the most promising areas for future regional development. Therefore, a Smart Specialisation strategy needs to take into account several geographically specific characteristics to help generating growth in regions (European Commission, 2012a).

European Innovation Partnerships (EIPs) are a new approach to EU research and innovation that build upon relevant existing tools and actions and are launched in areas in which government intervention is clearly justified and where combining EU national and regional efforts in R&D and demand-side measures will achieve the target quicker and more efficiently: Active & Healthy Ageing; Water; Agricultural Productivity & Sustainability (EIP-AGRI); Raw Materials; and Smart Cities and Communities (European Commission, 2014). The regulation on support for rural development (European Union, 2013b) determined the creation of a EIP network to support the EIP-AGRI: partnerships and bottom-up approaches to link farmers, advisors, researchers and businesses in operational groups to generate new insights and ideas, and to mobilise existing tacit knowledge into focused solutions (EU SCAR, 2013). But although other EIP-AGRI actions can emerge from the bottom up approach, the actual focus is related to the productivity of the primary production, resource management, bio-economy, supply-chains solutions and quality and consumers, disregarding many other aspects from what is now rural development.

It must be noted that the last decades brought an evident change in the rural development paradigm, where agricultural productivity gave place to an increasing consideration of environmental concerns and, in special, to an increasing diversity of new rural activities (*e.g.* EU SCAR, 2012; Knickel *et al.*, 2009b; OECD, 2006; van der Ploeg *et al.* 2000).

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The new rural development paradigm (OECD, 2006; van der Ploeg *et al.* 2000), that promotes the sustainable use of local resources and the community engagement in projects development, implied a broadening from the traditional economic and technological concept of innovation to include social innovation, new fields like the organisation of food chains, environmental management, services, etc. and to give more importance to innovations that depend on individuals' own creativity. This new approach requires facilitation, capacity-building and the mobilisation of local resources (EU SCAR, 2012).

Following the acceptance of this broader concept of innovation and the interest to engage entrepreneurial local actors (European Commission, 2012a), the European Union (2013a) also proposed a support from the European Structural and Investment Funds for community-led local development (CLLD), that replaces the LEADER program and the Fisheries Areas Network (FARNET), in order to allow local territories better taking multi-sectorial needs into account through a multi-funded approach (European Commission, 2015; Soto and Ransden, 2014). The former LEADER program, which is an example of the capacity to act collectively, drawing on knowledge resources (as well as FARNET), had already illustrated the importance of multi-sectorial and place-based approaches to build economic, social, cultural and institutional capacities as a basis for longer-term sustainable rural development (Dargan and Shucksmith, 2008). Taking into account these lessons, CLLD strategies are designed and projects are selected by local entities and solutions can be tailored to local needs and include the mobilisation of all the relevant policies and actors. CLLD is also about innovation but, and not excluding high level research and development or new technology, has to concentrate on those actions that have a multiplier or snowball effect on local development (Soto and Ransden, 2014).

Innovation (and new technologies) became crucial to rural development strategies (Cannarella and Piccioni, 2011) but the capacity to gather contributions from innovation to rural development, is different among regions (Camagni and Capello, 2013), confirming a territorial nature of innovation, often at a local or sub-regional level, and also the importance of regions as key drivers of innovation (Asheim, 2011a).

It is therefore essential that the identification of specific regional "innovation patterns" goes further than what is proposed by the smart specialisation model, as they may depend on the

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nature of each region traditional knowledge base and productive specificities (Camagni and Capello, 2013).

Traditional/local knowledge and other local elements, such as local skills, traditions, social values, environment and local culture conservation, are the basis of a high level of creative capacity and competitiveness in rural regions and stimulate both local innovation and the discovery of new local potentials through the engagement of insufficiently utilised local resources (*e.g.* Camagni and Capello, 2013; Capello and Lenzi, 2013; Gülümser *et al.*, 2011; Roper *et al.*, 2014). Roper *et al.* (2014) also expands the importance of traditional knowledge to drive or to contribute to global innovation through “learn local, act global” business strategies.

Another important concept for rural and regional innovation is the one of “learning”. Learning, based on activities which recombine or adapt existing forms of knowledge, has seen its importance recognised in the innovation process, as this is increasingly the outcome of collaborative networks where information is exchanged and learning processes happen (Camagni and Capello, 2013; Dargan and Shucksmith, 2008; Knickel *et al.*, 2009a). To replicate innovations in different environments implies learning processes and adaptation to the specific socio-technical contexts as many of the innovations result from tacit knowledge (learning by doing) which cannot be easily translated through codification, in special due to the specificities of the context in which knowledge is mobilised (Knickel *et al.*, 2009a).

The complex nature of rural innovation provides a stimulus for adopting a systemic, network-oriented vision: complex socio-technical systems and hybrid (and flexible) networks are required to stimulate rural innovation and multi-actor participation and collaboration are preconditions for success (EU SCAR, 2012). Partnership-building leads to the implementation of innovation, to a consolidation of the organisational structure and to the mobilisation of various resources. Some examples of successful innovation partnerships forms are: clusters of businesses and network companies; multi-actor partnerships; learning partnerships; public-private partnerships; territorial partnerships; communities of practice and territorial alliances (EU SCAR, 2012; Knickel *et al.*, 2009b).

It can be retained from the above that the monitoring and evaluation of existing policies should be strengthened and the actors’ cognitive schemes and motivations taken into account

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(Knickel *et al.*, 2009a) and that there is a need to combine the current knowledge on innovation and on rural regions to conduct more effective researches and policies to achieve a sustainable rural development (Gülümser *et al.*, 2011). For example, the parallel dynamics of specific cultural environments (mentalities, approaches, adjustment attitudes, etc.) must be taken into consideration (Cannarella and Piccioni, 2011), as well as the related variety and differentiated knowledge bases of a region (Asheim, 2011a) in order to establish effective and tailor-made regional policy strategies (Asheim, 2011b). Innovation, to be effective, must draw on the capabilities of regions, and policy-makers intervention in a regional economy must be based on the institutional history of a region and on the intervention types that better fit the region's context (Asheim, 2011b). Gülümser *et al.* (2011) remind that the generalisation of regional creative capacity for both urban and rural regions can misrepresent the intervening opportunities of rural regions and related policies. Therefore evidences arise that new thematically and/or regionally focused innovation policies require the identification of context specificities in the knowledge-to-innovation process, in a similar way as a "place-based" approach is postulated for a renewed EU regional development policy (Camagni and Capello, 2013).

Measuring innovation

The importance of the innovation effects on economic growth and on its promotion through incentives policies triggered the need to measure the first and to evaluate the seconds. This context has mobilised significant efforts of researchers and international institutions, including the OECD, towards the construction of operational concepts of innovation that would allow their identification and measurement.

The first indicators to measure innovation were the use of patents by Jacob Schmookler, in the 50's, followed by the start of R&D surveys, in the 60's, and by the development of concepts and tools to obtain data on innovation, namely at firms level, in the 80's (Godin, 2002). In 1992, a draft manual for the OECD countries - the Oslo Manual - was adopted, with the purpose to harmonise national methodologies and collect standardised information (OECD and Eurostat, 2005). Some improvements to the Oslo Manual followed and, since 1998, it was adopted by Eurostat as the official European methodology to measure innovation and therefore to design and put into practice the Community Innovation Survey, known as CIS. The new European Union regulation concerning the production and development of

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Community statistics on science and technology (European Commission, 2012b) includes now the innovation statistics together with statistics on R&D, on government budget appropriations or outlays on research and development and on human resources in science and technology.

Other European tools to evaluate innovation at the country and regional level are the Innovation Union Scorecard (IUS) and the Regional Innovation Scorecard (RIS). While the IUS provides a comparative assessment of the research and innovation performance of the EU Member States and the relative strengths and weaknesses of their research and innovation systems, based on 25 indicators, the RIS provides a comparative assessment of innovation performance across 190 regions of the European Union, Norway and Switzerland, using data from 11 of the IUS indicators (European Union, 2014a & 2014b). It must be noted that the indicators cover mainly the science-based and technological aspects of innovation and that the methodologies employed merge together indicators as diverse as innovation performance, knowledge inputs like R&D, sectorial structure, presence of spatial innovation enablers, with no clear conceptual expectations on the linkages among the different variables (Camagni and Capello, 2013).

As referred above, it is recognised that innovation can happen in low R&D intensity and low-technology industries, and that non-technological forms of innovation can contribute to productivity performance, especially in resource-based economies. It can also occur in any sector of the economy, including in rural economies where innovation often takes place in small firms but can be leveraged by the agriculture sector: enhanced productivity, entrepreneurship and value added as well as the development of clusters and value chains across sectors (from agriculture to exports passing by food processing and packaging and distribution logistics), are of a great importance to promote rural areas competitiveness and sustainability, generating growth and moving towards prosperity (OECD, 2010).

But even with these considerations, and the ones to extend measuring to public sector and social innovation, the current framework to identify and measure innovation, based on the Oslo Manual (CIS), only applies to business innovation, leaving aside very small firms, non-firms organisations and low-technological innovation, as well as the territorial dimension; all this neglected aspects are important to capture and enhance innovation in rural areas contributing for these areas sustainability and competitiveness.

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The CIS is carried out every two years by EU member states, some EFTA countries and EU candidate countries, to provide information on the innovativeness of sectors by type of enterprises, on the different types of innovation and on various aspects of the development of an innovation, such as the objectives, the sources of information, the public funding or the expenditures. Formerly reporting only data on product and process, since the CIS 2010 it includes also organisation and marketing innovation. The target statistical units for CIS concerns innovators and non-innovators, R&D performers and non-R&D performers in the business enterprise sector (goods-producing and services industries) with at least ten employees (Eurostat, 2014).

The CIS doesn't include, among others, activities like: Agriculture, forestry and fishing; Accommodation and food service activities; Real estate activities; Administrative and support service activities; Public administration and defence; Compulsory social security; Education; Human health and social work activities; Arts, entertainment and recreation; and, Other services activities (NACE Rev. 2). Furthermore it can be retained that the CIS is applied only to enterprises with 10 or more employees (European Commission, 2012b) thus leaving aside the non-enterprises and an important share of the enterprises.

To confirm the relevance of this gap it must be retained that in the EU27, the enterprises with less than 10 employees (and excluding, among others, those from the primary sector, public administration, education and other services) represented, in 2012, 92.1% of the total number of enterprises, 28.7% of the employment and 21.1% of the gross value added (GVA) (Gagliardi *et al.*, 2013). In Portugal these figures grow, respectively, to 94.8%, 39.4% and 22.8%. To these must be added all the enterprises related to the activities that are not considered by the CIS. For example, the primary sector, in 2012, represented in the EU27 5.2% of the employment (11.0% in Portugal) and 1.7% of the GVA (2.3% for Portugal) (EC DGARD, 2013) while the Tourism (accommodation and food service activities) accounts for 8.5% of the enterprises, 7.7% of the employment and 3.4% of the GVA in the EU27 and respectively 9.8%, 9.0% and 4.7% for Portugal (Gagliardi *et al.*, 2013).

Other CIS drawbacks have been highlighted from several authors or researches. Some examples are: the fact that some of the information obtained is only in dichotomous form (Mairesse and Mohnen, 2007); the non-existence of indicators to account for the more informal type of innovative activities typical of services and small firms (de Jong and Marsili,

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2006, Trigo, 2013); and, in what concerns rural regions, the non-differentiation between urban and rural regions, the non-consideration of their creative capacity, of the external effects of innovations, namely on local communities, neither of the usage of local features (particularly local knowledge and local culture) (Gülümser *et al.*, 2011).

Some of the referred drawbacks can be solved by each country initiative (Eurostat, 2014). For example, the Germany CIS (Mannheim Innovation Panel - MIP) includes questions on the success of process innovations; on the link between the macroeconomic environment and innovation; on the internationalisation of innovation and firm's exports; on the firm capabilities relevant for innovation; on the firm's market environment; and it also includes firms with 5 to 9 employees, and a broader set of sectors, although these have been adjusted according to the answers received but, for example, the service sector is covered in a quite extensive form (Aschhoff *et al.*, 2013; Schmidt and Rammer, 2007).

But it can be concluded that further efforts must be done to capture and measure innovation in rural regions and to contribute to include rural innovation in rural development and innovation policies.

3.3 - Methodology

The main goal of this paper is to shed light, built on empirical data, on the need for an alternative framework and innovation survey that will enable the collection of statistical data on the innovation patterns shaped by territorial dimension. For this we resorted to data collected for the Portuguese rural areas. The approach followed compares the assessment of rural-based innovative organisations obtained through the Rural Indicators Innovation System (RIIS), fed by the data collected through the Portuguese rural innovation survey, to the outcome that would be obtained when using only data from the CIS (the CIS 2012). In the end of this section we present a small explanation on the RIIS, the rural survey and the CIS.

An analysis of the CIS 2012 questionnaire allowed identifying which RIIS indicators would not receive information, or would only gather part of the required information to characterise the innovators and innovation patterns. The results were grouped by type of information in order to identify the relevance of the information gaps detected. Furthermore, crossing the

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results obtained through the application of the RIIS on the Portuguese rural innovators database, with the “information gaps” that result from the CIS, we provide evidence on the number of innovators that are undervalued by the CIS, and moreover on aspects that were neglected but are confirmed as relevant for rural and peripheral areas.

A characterisation of the legal form, size (in number of employees) and NACE Code of the surveyed organisations, allowed calculating the percentage and the relevance of the organisations that would be excluded when applied the European Commission criteria.

Finally, a small description of the organisations included in the “top 20” score that resulted from the evaluation of the surveyed organisations using the RIIS, and the identification of those that would be excluded, illustrates the amount of the diversity included in rural (or local) innovation that is not actually evaluated.

The Rural Innovation Survey

The rural innovation survey was prepared under the RUR@L INOV project. Its structure was inspired on the framework established by the Oslo Manual, and expanded in order to include (table 3.1): a more comprehensive concept of innovation, including social value creation and not only commercial value; an analysis unit extended to non-enterprise organisations, in particular non-profit associations and local authorities; firms, and other organisations, regardless of their size, starting from individual entrepreneurs until large companies; the observation of the innovation processes, gathering information about the description of innovations (*e.g.* what they were (or are); when did each innovative process started and its duration; the objectives and the weight of each innovation in the sales (or services) volume); and information on the knowledge mobilisation patterns, distinguishing different types of knowledge, namely local-based, the networking activities, the diversification strategies and the local-specific features (Madureira *et al.*, 2013). Through the RUR@L INOV survey was gathered information about 120 organisations which are representative of the great diversity of activities, innovations and innovators that can be found in rural areas. The survey covered the period comprised between 2009 and 2011/12.

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Table 3.1 - The Rural Innovation Survey

| Identification of the organisation | Characterisation of the organisation | Innovation activities and processes | Innovation leader/manager profile |
|---|---|--|--|
| <ul style="list-style-type: none"> · Type: address, legal status, size, legal constitution year · Size dynamics: evolution of sales or services; evolution of the human resources framework | <ul style="list-style-type: none"> · Economic activities; goods and services · Geographic markets and value chain · Human resources and qualifications · Financial resources · Other resources (land, technologies, information networks, trademarks, patents) | <ul style="list-style-type: none"> · Innovations introduced, objectives, year, return on investment, weight on sales · Activities for innovation, including R&D and non R&D · Innovation expenditures; financial support to innovation · Innovation inputs: sources of information and local knowledge types · Co-operation for innovation · Effects of innovation (internal and external) · Barriers to innovation (internal and external) | <ul style="list-style-type: none"> · Socio-demographic characteristics · Scholarship; professional and leadership experience · Attitudes and behaviour towards innovation · Location factors · Motivations for entrepreneurship |

The Community Innovation Survey (CIS)

The CIS targets statistical units (innovators and non-innovators, R&D performers and non-R&D performers) in the business enterprise sector (goods-producing and services industries) and includes statistical units with at least ten employees that are considered the “smaller” units (Eurostat, 2014). In what concerns the sectors included, the CIS data covers the following NACE Rev.2 sections:

- Core Industry (excluding construction): B Mining and Quarrying; C Manufacturing; D Electricity, Gas, Steam and Air Conditioning Supply; E Water Supply; Sewerage, Waste Management and Remediation Activities.
- Core Services: 46 Wholesale trade, except of motor vehicles and motorcycles; H Transportation and Storage; J Information and Communication (58, 61, 62, 63); K Financial and Insurance Activities; and M Professional, Scientific and Technical Activities (71, 72, 73).

CIS 2012 collected information on product, process, organisational and marketing innovation following the most recent changes recommended by the latest Oslo Manual guidelines. CIS results offer a broad set of indicators on innovation activities, innovation development,

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innovation expenditures, public funding, sources of information for innovation, innovation cooperation and organisational and marketing innovation (table 3.2).

Table 3.2 - The Community Innovation Survey

| Information on the enterprise | Product and process innovations | Other innovations | Strategies and obstacles |
|---|---|---|---|
| <ul style="list-style-type: none"> · Address · Main activity · Independent or part of a group · Geographic markets · Size: evolution of functions; evolution of turnover and number of employees; information on employees qualification | <ul style="list-style-type: none"> · Innovations introduced, innovation profile (new to the firm, to the market or to the world) · Partnerships for innovation · Weight on sales (of product innovations) · Activities for innovation, including R&D and non R&D · Innovation expenditures; public financial support to innovation · Competitiveness of the innovations (patents, trademarks, etc.) | <ul style="list-style-type: none"> · Organisational and Marketing innovations introduced (new or significant changes) · Innovation activities included in public sector procurement | <ul style="list-style-type: none"> · Competitive enterprise's goals · Strategies to reach goals · External obstacles to enterprise's goals |

The Rural Innovation Indicators System (RIIS)

The RIIS was designed to measure the innovation implemented by organisations settled in rural areas. This tool was prepared to compare the performance of a diversity of organisations, with regard to several dimensions and indicators of innovation, allowing the monitoring of the innovative behaviour of any organisation. The RIIS includes a set of key variables and indicators, prepared to capture and measure good practices of innovation in rural areas, and was built based on the structure of the rural innovation survey (and on the results from the interviews) completed by information gathered on several and diversified measuring systems, designed to measure innovation as a whole or to capture good practices on rural development. We also have considered an added value to understand and measure the processes followed by the rural-based organisations to develop and achieve innovation. So, the RIIS includes three fundamental dimensions: the Inputs used for innovation; the Processes followed to achieve innovation; the results (or Outputs) of innovation. A fourth dimension was included to describe the main Characteristics of the organisations. For each of the prepared indicators, various classes were defined in order to allow a better understanding of the available information (Madureira *et al.*, 2013). The RIIS was tested resorting to the above referred Portuguese rural innovation survey.

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The indicators included in the RIIS gather information, among others, on: the activities and products/services provided by the organisations; inputs for the innovation like the location choices, leader and human resources skills, financial and material resources and the existing barriers to innovation; the process followed, including the innovative profile and the mix of innovation types (comprising networking and social innovation), internationalisation procedures, knowledge (and local/traditional knowledge) mobilisation, the several types of networking (and synergies) and the behaviour to local specifics; and the outputs obtained such as the number of innovations produced, employment and sales dynamics, knowledge dissemination and impacts from the innovation both on the organisation and on the local/regional environment. The global set of the indicators that configure the RIIS is presented on Appendix.

3.4 - Results

The comparison of the results that can be obtained through the rural innovation survey with the results that would be attained using the data collected by the CIS 2012 was performed using as a reference the RIIS indicators (see Appendix). It can be concluded that the CIS doesn't give any information to several indicators and for others only gives partial information. In table 3.3 we grouped the "missing" information by type.

Table 3.3 - Information not obtained through CIS*

| Type of information | Not included | Partially included |
|-------------------------|--|---|
| Type of organisation | 2.2 Goods and services provided 13.1 Specialisation | 1.1 Legal form of the organisation (only firms) 10.1 Exports profile (doesn't include the exports dimension) 13.2 Diversification (only in part) |
| Impact from innovations | 9.6 Value chain 15.1 (total) Number of innovations created/adapted 16.1 Job creation for innovation 17.1 Dissemination of knowledge 18.1 Certificates 18.3 External effects | 15.3 Weight of the innovation in the organisation sales or services (only for product innovation) 18.2 Internal effects of the innovation (indirectly; doesn't include workers qualification and motivation) |

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| | | |
|---|--|--|
| Organisation skills and incentives for innovation | 4.1 Leader/manager innovation skills 4.3 Internal cooperation (included in CIS 2010) 4.4/4.5/4.6 Organisation skills in R&D, Design and Marketing (included in CIS 2010) | 8.1 Internal barriers (only indirectly) <i>18.2 Internal effects of the innovation (indirectly; doesn't include workers qualification and motivation)</i> |
| Organisation resources | 5.2 Resources through "merit" | 5.1 Financial resources (only public funding) 5.3 Material resources (only patents and trademarks) |
| Local knowledge | 11.2 Mobilisation of local knowledge | 11.1 External sources of information (excludes information on local development associations and local and popular knowledge) |
| Local partnerships | 12.1 Synergies for innovation 12.1a Local networks 12.2a Local partnerships | 7.1 Partnerships for innovation (excludes information on local partnerships) |
| Local environment | 3.2 Economic and social development of the organisations environment 3.3/3.4 Location competitive advantages/disadvantages 8.2 External barriers 14.1 Adapting to local specifics 14.2 Local development <i>18.3 External effects</i> | |

*in *italic* the indicators that can be allocated to more than one type of information

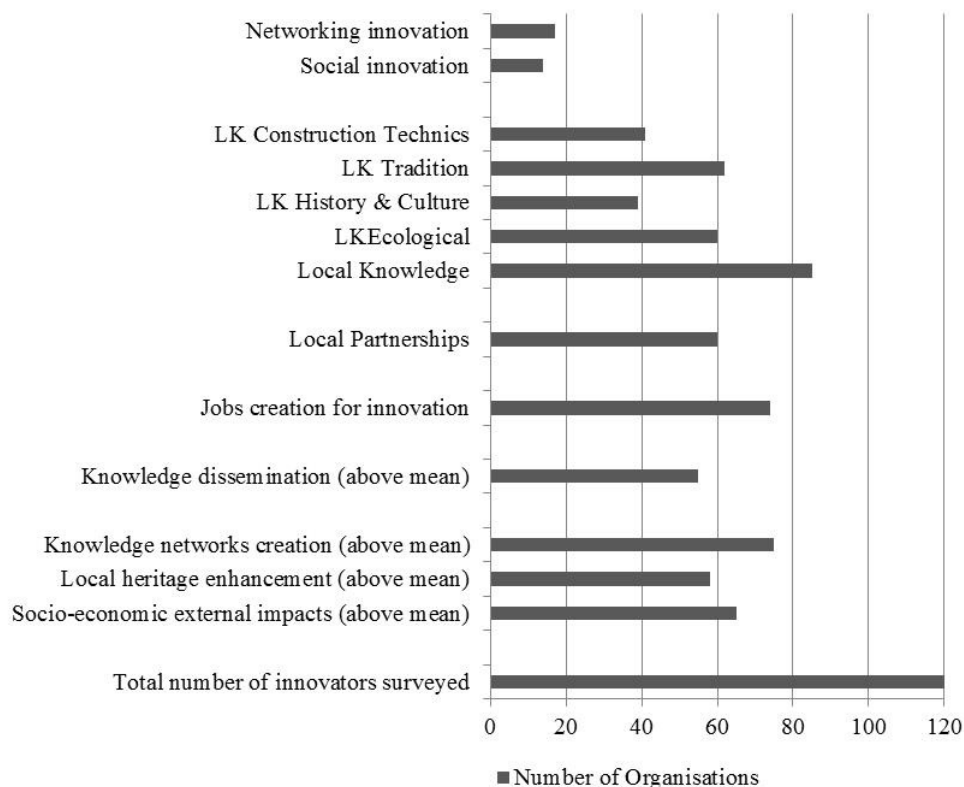
From the table it is visible that a large amount of further information about innovators and innovation patterns (relevant when measuring rural and local innovation) is neglected by the CIS but could be obtained if a broader innovation survey was used.

This is confirmed by graph 3.1 where we present, for the sample of the Portuguese innovators surveyed, the relevance of some of the information that is not gathered using the CIS or other similar surveys.

Some examples, related to the process followed to introduce innovation, are: the percentage of the organisations that introduced networking innovations (14%) and social innovation (12%); more than 2/3 (71%) of the organisations resorted to local knowledge and, from those, more than half (52%) used traditions-related knowledge and half of them (50%), ecological knowledge; also half of the organisations established local-based partnerships for their

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innovation process. In what concerns the impacts of innovation, it can be retained that: 62% of the organisations created jobs specifically related to the introduction of innovation; and almost all of them revealed contributions for knowledge dissemination (46% above the mean) and external positive impacts (54% were above the mean in their contribution to socio-economic external impacts; 48% on what concerns local natural and cultural heritage enhancement; and 62% backed, above the mean, the creation of knowledge networks).



Graph 3.1 - Empirical evidence on the relevance of the gaps on information when resorting to less detailed measuring systems

The above referred gaps increase when considering the CIS application criteria. The universe of 120 Portuguese organisations that were surveyed includes a diversified type of organisations. Considering the legal form, 82 (68.3%) are private business, 10 (8.3%) are cooperatives, 4 belong to the local and central administration (3.3%) and 24 (20.0%) are non-profit organisations. In what concerns the number of employees, 57 (47.5%) have less than 10 employees, 58 (48.3%) have between 10 and 250 employees and 5 (4.2%) have 250 employees or more. It means that, considering size, near half of the organisations are not surveyed by the CIS. Using as a reference the NACE code, and having in mind that the interviewed are located in rural areas, only 42.5% of the organisations could be surveyed by the CIS: for example 29.2% of the organisations have NACE codes corresponding to the

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primary sector (21), to accommodation and food service activities (8) and to arts, entertainment and recreation (6), while 18 (15.0%) are other service activities.

In total, including legal form, size and NACE code, only 32 organisations (26.7% of the sample surveyed in the Portuguese rural areas) are included in the CIS which confirms that the CIS doesn't present a full picture of innovation.

This is highlighted through the results obtained from the application of the RIIS to the surveyed innovators, which allowed identifying which organisations could be mentioned and described as references of successful innovation practices in the rural Portugal.

The RIIS “top 20 cases”, presented in table 3.4, include all legal forms, all sizes, all sales dimensions, all types of activities and goods or services, a great diversity of NACE codes and also a great diversity in what concerns the types of innovation introduced.

Table 3.4 - The “top 20” innovators

| RIIS score | Legal form | NACE code | Size (nr. employ.) | Sales | Innovations type* | Main activities | Id |
|-------------------|-------------------|------------------|---------------------------|--------------|--------------------------|--|-----------|
| 12 | Non-profit | S | < 5 | ≤ 2 M € | M, O, N | networking services related to regional tourism; local knowledge and partnerships | 94 |
| 11 | Non-profit | S | < 10 | No sales | S | technologies transfer to fruits & vegetables firms; knowledge and partnership-based | 111 |
| 11 | Private | C27 | < 250 | ≤ 50 M € | Pd, M, O | industry, technology and R&D based; high level creation of jobs and value | 122 |
| 10 | Private | A | < 250 | ≤ 2 M € | Pd, Pc, O | hi-tech production of fresh herbs; high level investments in innovation and jobs creation | 10 |
| 10 | Private | C10 | ≥ 250 | > 50 M € | Pd, M | agro-food industry; high level investments in R&D; large number of innovations | 35 |
| 10 | Private | C10 | ≥ 250 | > 50 M € | Pd, | agro-food industry; high level investments in R&D; jobs creation | 54 |
| 10 | Private | I55 | < 10 | No infor. | Pd, Pc, S | rural tourism; high specialised skills in R&D and design; local knowledge-based | 88 |
| 10 | Non-profit | S | < 250 | ≤ 2 M € | Pd, M, O | hampers of agricultural products sold in short-circuits; national network supported by LAGs; | 164 |
| 9 | Private | G46 | < 250 | ≤ 50 M € | Pc, O | hi-tech production of vegetables; high level investments on innovation and jobs | 32 |
| 8 | Private | I55 | < 5 | No infor. | Pd, N | rural tourism and cooking; networking innovation; local networks; skilled HR | 15 |
| 8 | Cooper. | G46 | < 10 | ≤ 0.1 M € | Pd, Pc, M, O | gourmet local products cooperative; local and internal knowledge based | 57 |

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| | | | | | | | |
|---|--------------|---------|-------|-----------|-----------|---|-----|
| 8 | Private | R93 | < 250 | ≤ 0.1 M € | Pd, M | nature-based tourism activities; internal information/skills, local partnerships | 64 |
| 8 | Non-profit | S | < 10 | ≤ 0.1 M € | Pd, S | environmental-based recreational activities; local knowledge, networking and partnerships | 89 |
| 8 | Private | A & I55 | < 250 | ≤ 50 M € | Pd, Pc, O | traditional production of gourmet vegetables; investments on R&D and exports | 96 |
| 8 | Non-profit | S | < 5 | ≤ 2 M € | Pd, Pc, N | forestry support services; local knowledge, local development partnerships; R&D skills | 101 |
| 8 | Non-profit | S | < 5 | No sales | Pd, N | crop varieties testing, clusters improvement; R&D development and acquisition | 115 |
| 8 | Non-profit | S | < 10 | No sales | Pd, Pc | support to agro-food firms; experimenting innovation activities; local partnerships | 117 |
| 8 | Private | A | < 250 | ≤ 2 M € | Pd, | wine interactive museum; R&D and local knowledge and partnerships based | 126 |
| 8 | Non-profit | S | < 5 | No sales | M, O, N | international marketing support; marketing innovations and knowledge dissemination | 173 |
| 8 | Public Admin | M74 | < 5 | No sales | Pd, M, O | local and geological tourism network; local development innovations and partnerships | 209 |

* Pd: Product innovations; Pc: Process innovations; M: Marketing innovations; O: Organisational innovations; N: Network innovations; S: Social innovations

But, if the CIS criteria were applied, only 4 of this 20 organisations would be surveyed (table 3.5) as 8 would not pass the three criteria (legal form, size, NACE code); 2 would not pass two criteria (size; NACE code); 5 wouldn't have the right NACE code; and one would not reach the size criteria. This would reduce immensely the capacity to describe rural innovation.

Table 3.5 - The “top 20” innovators that would overcome CIS criteria

| RIIS score | Legal form | NACE code | Size (nr. employ.) | Sales | Innovations type* | Main activities | Id |
|------------|------------|-----------|--------------------|----------|-------------------|---|-----|
| 11 | Private | C27 | < 250 | ≤ 50 M € | Pd, M, O | industry, technology and R&D based; high level creation of jobs and value | 122 |
| 10 | Private | C10 | ≥ 250 | > 50 M € | Pd, M | agro-food industry; high level investments in R&D; large number of innovations | 35 |
| 10 | Private | C10 | ≥ 250 | > 50 M € | Pd, | agro-food industry; high level investments in R&D; jobs creation | 54 |
| 9 | Private | G46 | < 250 | ≤ 50 M € | Pc, O | hi-tech production of vegetables; high level investments on innovation and jobs | 32 |

It is visible from the table above that a large amount of the innovation diversity that happens in rural areas would not be considered: one of the remaining firms is not even rural related and another only remains due to a “wrong” NACE Code as their main activity is agriculture-based; we would lose several relevant tourism-based firms and networks, that

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resort to local knowledge, several firms and associations that support (sometimes R&D- and science-based) agriculture, forestry and agro-food activities, some agricultural technology-based firms and also gourmet productions and marketing and sales innovators.

3.5 - Concluding remarks

The analysis undertaken confirms that using the European Commission criteria for the implementation of the CIS, based on selected NACE codes and only including firms with ten or more employees (Eurostat, 2014), leaves aside a great percentage of innovators (more than 2/3), that contribute for the development of rural areas and for the global picture of the regional (and national) innovation patterns.

Furthermore, the CIS doesn't collect information related to several types of non-technological innovation, namely network and social innovation, neither on several local specificities such as traditional/local knowledge and local/regional networking activities that are important to capture and enhance innovation in rural areas contributing for these areas sustainability and competitiveness.

It is noticeable that there are several types of information that cannot be obtained through the CIS, namely some details that help to characterise the innovators, the innovation patterns and dynamics, the internal impacts of other innovations than product innovation, the level of resort to internal skills and cooperation and, in particular, most of the information related to local specificities.

In the last case, information on local knowledge, local partnerships and local environment (and also on internal knowledge) is crucial when having in mind: the importance of regional characteristics to the smart specialisation strategies (European Commission, 2012a); the interest to engage entrepreneurial local actors through CLLD in the design of strategies and projects selection adapted to local needs (European Commission, 2012a; European Union, 2013a; Soto and Ransden, 2014); the contribution of innovation to rural development strategies (Cannarella and Piccioni, 2011); the need to understand the diversity of each region (Asheim, 2011a; Camagni and Capello, 2013), namely in what concerns the regional "innovation patterns", the traditional/local knowledge base and the regional/local specificities

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(Camagni and Capello, 2013; Capello and Lenzi, 2013; Gülümser *et al.*, 2011; Roper *et al.*, 2014); and, finally, the importance of learning and collaborative networks and partnerships (and in special territorial partnerships and alliances and communities of practice) to exchange information, recombine or adapt existing forms of knowledge and to replicate innovations in different environments (Camagni and Capello, 2013; Dargan and Shucksmith, 2008; EU SCAR, 2012; Knickel *et al.*, 2009a & 2009b).

The Portuguese case brings evidence that most of the innovation carried out by the Portuguese rural innovators is left aside. This comprises namely non-agricultural innovation related to the growing diversification pattern of rural economies, where novel activities, products and services highlight important innovation patterns and dynamics related with the mobilisation of place-based resources, and in particular with local knowledge boosted by a new generation of qualified rural entrepreneurs that create and reinvent the “traditional backward rural” by exploring its identity and genuine features, often with small-scale and low-technological innovation patterns. The same would happen when applying the existing innovation measuring framework to other peripheral areas like the coastal areas (not included in the RUR@L INOV project) incorporated in CLLD FLAGs (fisheries local action groups) due to their small density and the decaying of the fishing activities that are performing interesting small scale innovative activities (European Commission, 2015).

Therefore we retain the importance to include in future CIS or other national (or regional) level surveys more detailed questions on the organisations, in order to obtain detailed information on the rural/regional innovation patterns and dynamics that can contribute to local/regional specialisations and, in special, to include questions on local specificities such as local knowledge, local partnerships and local environment as this information is crucial to evaluate the effects of traditional knowledge on innovation and, in turn, of innovations in rural regions and thus to give orientations to tailor-made researches and policies based on the accurate identification of the local strengths, regional competitive advantages and potential for excellence.

The increasing diversification patterns of the economy of many rural areas in Europe, underpinned by spatial trends towards multifunctionality enhanced by the rural development policies and by the consumers and society demands, created multi-sectorial and territorial grounded specialisation trends that are actually the smart specialisations which are (or should

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be) sought by the regional smart specialisation strategies. This highlights the importance of adopting inclusive frameworks and tools able to detect and measure small-scale, non-R&D based and low-technological innovation and to include all types of organisations and activities.

Furthermore the application of a rural/regional specific innovation survey, in this case the one applied to the Portuguese rural innovators, and the analysis undertaken using the RIIS confirmed that it is feasible to obtain data to different types of organisations, using a single conceptual and methodological framework. This tool can be applied to a large-scale sample of organisations based on specific territories or regions, through a random selection of categories of organisations usually placed into different statistical universes: *e.g.* profit and non-profit organisations. In conclusion we believe that the innovation survey and measurement framework developed and applied to the Portuguese rural areas constitutes a relevant contribution to the progress needed in respect to the development of territorial-based referential and tools essential to support the design, implementation, monitoring and evaluation of the smart specialisation regional strategies and other local development approaches. Otherwise, the innovation potential of peripheral areas, namely of rural areas with diversified economies, will continue to be neglected along with its contribution to their competitiveness, sustainability and inclusiveness, due to the use of wrong lens that hidden the strengths and capacities of the territories from policy-makers and other stakeholders, including the social scientists and the innovation experts.

Acknowledgements

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Appendix

Table A.3.1 - The RIIS Indicators

| Characterisation of the Organisation | |
|---|------------------------------------|
| 1. Type and size | 1.1 Legal form of the organisation |
| | 1.2 Size of the organisation |
| 2. Activities and products/services | 2.1 Economic activities |
| | 2.2 Products and services |

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Input

| | |
|---------------------------|---|
| 3. Location | 3.1 Typology of urban areas |
| | 3.2 Economic and social development of the organisations environment |
| | 3.3 Location competitive advantages |
| | 3.4 Location competitive disadvantages |
| 4. Skills | 4.1 Leader/manager innovation skills |
| | 4.2 Human resources qualifications |
| | 4.3 Internal cooperation |
| | 4.4 Organisation skills in R&D |
| | 4.5 Organisation skills in Design |
| | 4.6 Organisation skills in Marketing |
| 5. Resources | 5.1 Financial resources |
| | 5.2 Resources through “merit” (prizes, venture capital, incentives systems) |
| | 5.3 Material resources |
| 6. Sources of knowledge | 6.1 Internal sources of information |
| 7. Networking | 7.1 Partnerships for innovation |
| 8. Barriers to innovation | 8.1 Internal barriers |
| | 8.2 External barriers |

Process

| | |
|----------------------------|---|
| 9. Innovations | 9.1 Type of innovations created / adapted |
| | 9.2 Innovation patterns |
| | 9.2a Products/processes new or improved |
| | 9.2b Market enlargement |
| | 9.2c Organisational improvements |
| | 9.2d Networking |
| | 9.3 Intensity of the innovation process |
| | 9.4 Activities for innovation |
| | 9.4a R&D activities for innovation |
| | 9.4b R&D continual internal activities |
| | 9.5 Investment in innovation |
| | 9.5a Investment in R&D for innovation |
| | 9.6 Value chain |
| 10. Internationalisation | 10.1 Exports profile |
| | 10.2 Geographical scope |
| | 10.3 Dynamics for internationalisation |
| 11. Knowledge mobilisation | 11.1 External sources of information |
| | 11.2 Mobilisation of local knowledge |
| 12. Networking (Synergies) | 12.1 Synergies for innovation |
| | 12.1a Local networks |

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| | |
|-------------------------------------|---|
| | 12.2 Motivations for cooperation |
| | 12.2a Local partnerships |
| | 12.2b Empowerment partnerships |
| | 12.2c Business partnerships |
| 13. Specialisation/ diversification | 13.1 Specialisation |
| | 13.2 Diversification |
| 14. Behaviour to local specifics | 14.1 Adapting to local specifics |
| | 14.2 Local development |
| Outputs | |
| 15. Innovations | 15.1 Number of innovations created/adapted |
| | 15.2 Number of innovations created/adapted on the last 3 years |
| | 15.3 Weight of the innovation in the organisation sales (or services) |
| 16. Socio-Economics | 16.1 Job creation |
| | 16.1 Job creation for innovation |
| | 16.3 Internal results (sales variation) |
| 17. Dissemination of knowledge | 17.1 Dissemination of knowledge |
| 18. Impacts | 18.1 Certificates |
| | 18.2 Internal effects |
| | 18.3 External effects |

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III. CONCLUSIONS

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III.1 Main Findings By Chapter

The research carried out in this thesis, and deeply described above, turns into evidence the relevance of the innovation that is implemented in rural areas, and also that the recent but growing multifunctionality of these areas has uncovered an unsuspected multiplicity of rural resources, which in turn are the basis and the inspiration for most of the innovations developed in rural areas. The research also confirms that although the rural innovation is not encompassed by the existing frameworks to measure and value innovation, it is feasible to obtain data related to all the different types of organisations located in rural areas using a single conceptual and methodological framework and that the designed Rural Innovation Indicators System (RIIS) being capable to measure all types of innovations is also able to capture both the territorial specificities and the diversity that exist in rural and peripheral areas.

Considering the relevance of the innovation that happens in rural areas for these areas sustainability and competitiveness and thus the importance to bring into evidence this relevance, this thesis includes a three folded research that is described in three papers:

“Innovation dynamics in rural areas uncover a multiplicity of resources, confirming that rurality matters”

“Capturing and Measuring Innovation: introducing the Rural Innovation Indicators System (RIIS)”

“Neglected innovation in peripheral areas: the added value of frameworks and tools enabling to capture territorial specificities in innovation”

The first part of the research - **Innovation dynamics in rural areas uncover a multiplicity of resources, confirming that rurality matters** - concluded that the changes brought by the new rural development paradigm that conducted to the diversification of the rural economy also brought the reconfiguration of the usually assumed rural resources. These gained new value or importance, and originated or uncovered “new” resources, being the all set of

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conventional and novel rural resources of extremely importance for the development of innovation and the dynamics of local systems and rural development. However it was also retained that their potential as resources for rural development is not yet fully seized and many of them are not even perceived as resources. The multiplicity of rural resources identified and described by this research, when related with the innovative organisations, evidenced six groups of innovators according to the rural resources pattern mobilised for their innovation processes. These were named to evidence the different innovation patterns driven by different rural (and no-rural) resources: Reinventing Traditions; Experiencing Landscape; Building Capacities; (Rural)-locating by choice; Differentiating Land-based productions; Supporting Agriculture & Forestry. The innovators clustering confirmed that rural resources, as a concept, have clearly broadened their scope and that these resources are the basis and the inspiration for most of the innovations developed in rural areas. It also confirmed that rural innovators usually don't limit their innovations to one resource category alone, but search economies of scope, diversification and added value, in line with the new rural paradigm. Thus, more than the contribution to a comprehensive definition of rural resource in an innovation context, the research allowed to highlight that rurality matters within the framework of the current dynamics and consumer and society trends that value the identity and authenticity of the territories.

The second part of the research - **Capturing and Measuring Innovation: introducing the Rural Innovation Indicators System (RIIS)** - highlighted that although the leading institutions on innovation are aware of the need to encompass broader and diverse innovation strategies, they maintain their sectoral and technology related definitions and measurement systems that don't account for the innovation practised by very small firms, non-firms organisations or related to several sectoral activities that are the substance of rural areas. To bypass this limitation a Rural Innovation Indicators System was built, based on the RUR@L INOV framework, to collect and measure information on: the main characteristics of the organisations; the inputs used for innovation; the processes followed to achieve innovation; and, the outputs of innovation. Each of these indicators includes various classes to allow a better understanding of the available information. A RIIS barometer, that synthesised, through a radar graphic by type of indicator, the average results associated with the main indicators, provided a vivid picture of the Portuguese rural innovation and revealed some convincing results, namely a significant gap between the average and the best practices for most of the indicators, and also that for some indicators the maximum value was not attained, meaning

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that there is room to improve the innovation practices in the Portuguese rural areas. The analysis undertaken confirmed that the RIIS is able to encompass data from different types of innovative organisations, to position them in a gradient of innovation, and, furthermore, that the inclusion of Process indicators is of great value to understand the specificity of the contexts where the rural innovation takes place. The results also confirm that the RIIS is useful to innovators, allowing them to monitor and/or evaluate their innovative performance, and to the stakeholders involved in the design, implementation, monitoring and/or evaluation of rural development policies.

Finally, on the third part of the research - **Neglected innovation in peripheral areas: the added value of frameworks and tools enabling to capture territorial specificities in innovation** - it was concluded that the CIS, the European framework to measure innovation, besides leaving aside several types of innovations and innovators, such as most of those that are relevant to characterise rural innovation, doesn't account for the territorial dimension of innovation, namely the influence of each region traditional knowledge base and productive specificities and thus conflicting with the interest of the EU smart specialisation and community-led local development approaches to identify regional or local competitive advantages and to engage local actors in this process. A detailed analysis of the CIS 2012 questionnaire allowed to confirm that this survey doesn't gather information on new innovation types like networking (including local-based networking) and social innovations, on local knowledge and local-based partnerships, as well as on some important innovation impacts like the jobs specifically related to the introduction of innovation, the knowledge dissemination, and the impacts on the innovators close environment. Other empirical evidence, based on the "top 20 score" produced through the RIIS, that includes all legal forms, all sizes, all sales dimensions, all types of activities and goods or services, a great diversity of NACE codes and also a great diversity in what concerns the types of innovation introduced, illustrates the great amount of information that is not evaluated when applying the CIS criteria. It is therefore confirmed that the CIS or other national (or regional) level surveys should obtain more detailed information on the rural/regional innovation patterns and dynamics but also that the RIIS is capable to measure the existing rural innovation dynamics and to capture the value that exists in rural and peripheral areas.

III.2 - General Conclusions

In this thesis, the research is focused on the importance to gather information on the innovation dynamics that exists in peripheral areas, in particular in rural areas with diversified economies, having into account their contribution to the competitiveness and sustainability of these areas.

The proposed comprehensive definition of rural resource in an innovation context crosses all the activities that can be found in rural areas and this wider range of rural resources is also the basis and the inspiration for most of the innovations developed in those areas. This confirms that rurality matters within the framework of the current dynamics and consumer and society trends that value the identity and authenticity of the territories. The clustering of innovative organisations according to their patterns of using rural resources confirms the diversification of rural economies and highlights the importance of organisations, innovations and specialised productions alternatives to conventional agriculture and forestry, in particular, those related to the reinvention of recipes and handicraft activities and the mobilisation of local knowledge, to a landscape- and nature-based tourism, to the growing competitiveness of quality and environmental friendly products, and to the importance of the capacity building and supporting activities that bring an increased strength to the productive clusters. It also confirms the interest to attract to rural areas the non-rural innovators considering the contributions they can bring to rural economies.

The research undertaken related to the design and the application of the RIIS on the Portuguese rural innovation database confirms that innovation is developed regardless of the organisations legal nature or dimension and that it is feasible, and desirable, for the definition of innovation and rural development policies, to obtain data from all this different types of organisations using a sole conceptual and methodological framework. Moreover it also retained that this novel and powerful tool brings a significant support to distinguish the innovative from the not (or little) innovative organisations, positioning them in a gradient of innovation. It is also confirmed that the inclusion of a set of indicators to measure the innovation process, as it was done in the RIIS, is essential, to completely understand the specificity of the contexts where the rural innovation takes place, namely the innovation patterns adopted, and the importance for these patterns of different dynamics such as the mobilisation of R&D and local knowledge, the networking for the development of innovation,

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the internationalisation strategies and/or the option for specialisation or diversification of the organisations.

Finally, the comparison of the RIIS framework to the criteria used on the implementation of the CIS, confirmed the importance to have at disposal an inclusive measuring framework (such as the RIIS) to ensure a global picture of the regional (and national) innovation patterns and to capture the value that exists in rural and peripheral areas, namely local specificities that are important for the diversity of rural innovation. From the analysis of the Portuguese case, the research retains empirical evidence that non-agricultural innovation related to the growing diversification pattern of rural economies, as well as information on local knowledge, local partnerships and local environment (and also on internal knowledge) are not taken into account when using the CIS. This gap on rural and local information must be filled when having in mind the sought implementation of regional smart specialisation strategies and the required contribution from local actors in the design of local development strategies. This highlights the importance of adopting inclusive frameworks and tools able to detect and measure small-scale, and non R&D based and low-technological innovation, to include all types of relevant organisations and activities and, in particular, to take into account each territory specificities.

Results suggest that the relevance of the clusters not related to the conventional agricultural and forestry activities, and the pertinence of the proposed comprehensive definition of rural resource, should be supported and reinforced by the public policies, in special rural development policies and regional innovation agendas. They also retain the need of a broader innovation indicators system (like the RIIS) and the importance to include in future CIS, or other national (or regional) level surveys, more detailed questions on the organisations, in order to obtain detailed information on the rural/regional innovation patterns and dynamics and thus to give orientations to tailor-made researches and policies based on the accurate identification of the local strengths, regional competitive advantages and potential for excellence.

III.3 - Future Research

This thesis also highlighted some limitations of this research, namely the ones related to the main data source of information used on the several analyses. As it was referred the research resorted to the information collected on 120 Portuguese rural innovators and their innovations on the scope of the project RUR@L INOV and therefore was limited by this project geographical (and institutional) range: the Portuguese continental Rural Areas.

Furthermore, as the RUR@L INOV survey to innovative organisations was prepared and applied at an earlier stage in relation to the design of the RIIS, it was not possible to collect the information related to some of the RIIS indicators and thus to evaluate their influence on each organisation innovative performance.

However the above referred limitations open a range of opportunities for future research in order to get a more inclusive knowledge on innovation dynamics and on the importance of innovation and of territorial specificities to the sustainability, competitiveness and inclusiveness of rural and other peripheral areas.

It will be possible, and interesting, for use in future evaluations, to adapt the RUR@L INOV survey in order to obtain the whole information required to take a complete advantage of the RIIS capabilities to characterise (and to evaluate) further “innovative practices” than those that were appreciated. The more complete will be the information gathered through the use of the RIIS the more it will contribute to the design, implementation, monitoring and/or evaluation of innovation and rural development policies. A periodic application of the revised survey to feed the RIIS in regular time intervals and the enlargement of its geographic scope to other countries or regions would also bring valuable information on the evolution of the innovation patterns and on the efficacy of policies, namely in rural areas.

Also the comprehensive definition of rural resource proposed by this research could be enriched if enlarged the territorial scope of the information collected and the size of the sample. Although the research already brings a relevant progress to widen the concept of rural resource and to include until now unsuspected rurality-related resources that confirm its importance in an innovation context, it must be noted that some limitations arisen related to the size of the existing innovators and innovations sample. As we had the opportunity to refer

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when describing the analysis undertaken we had to reallocate the innovations that were included in some very small resource categories to have more robust results. Enlarging the collection of information to more innovators, either settled in rural areas or in other peripheral areas, or even to other countries or regions, could allow to refine the results obtained and even to further expand the range of rural resources, including others that were not detected through the database.

Finally, the geographical (and institutional) limitations of the project, left aside the innovations and innovative organisations that are located in other types of peripheral areas, namely a great percentage of the Portuguese coastal zone and the Azores and Madeira islands, recognised as ultra-peripheral regions, and another type of unsuspected resources. Considering the detected relevance of the regional smart specialisation and local development strategies and the priorities of the actual European Structural and Investment Funds for both (rural and coastal) areas it could be an interesting upgrade to this research to adapt and extend the methodology developed under the RUR@L INOV project to capture and measure the relevance of coastal and marine resources related innovations and innovators, uncovering other innovation patterns and resources.

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