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Co-generation, sharing and transfer of technologies in Small and Medium agrifood Enterprises (SMEs)

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Abstract. The chapter focuses on the results of the INTRA Project (Introducing innovations in traditional agrifood products to increase SME competitiveness). This initiative belongs to the Greece-Italy territorial cooperation programme and aims to strengthen the services for sharing and transfer of innovations in the agrifood sector. INTRA has focused on analysing the innovation needs of traditional Italian and Greek businesses, beginning with experiences collected in Apulia (Italy) and the Ionian Islands (Greece), in order to propose possible methodologies and tools for improving the efficiency of the innovation supply chain. Coordinated by CIHEAM-Bari, the project has involved the participation of the Ionian University, the regions, and the Brindisi and Corfu chambers of commerce. This work has created a database, intended as a system for collecting the innovation needs of businesses and as a concrete system for increasing their active involvement in the new collaborative bottom-up agrifood innovation paradigm. The conclusions propose strategies for reducing the cultural and geographical divide separating the innovators developing new projects from businesses and public authorities. Annex 1 contains a detailed examination of the INTRA Database.

Keywords. SM – Incubator – Start-up – Territory – Local – Global - European Union – Innovation need.

***Cogénération, partage et transfert technologique dans les PME du secteur agroalimentaire* (avec ANNEXE 1).**

Résumé. *Dans ce chapitre, nous allons passer en revue les résultats du projet INTRA (Introducing innovations in traditional agrifood products to increase SMEs competitiveness), une initiative dans le cadre du programme de coopération territoriale entre l'Italie et la Grèce visant à renforcer les services de partage et de transfert des innovations dans le secteur agroalimentaire. INTRA a mis au centre de ses activités l'analyse des besoins d'innovation des entreprises traditionnelles italiennes et grecques, à partir des expériences collectées dans la région des Pouilles et dans les îles Ioniennes grecques, afin de proposer des solutions méthodologiques possibles et des outils favorisant une filière de l'innovation plus efficace. Le projet, coordonné par le CIHEAM-Bari, a mobilisé les universités dans les îles ioniennes grecques, les régions et les chambres de commerce de Brindisi et Corfou. Le travail réalisé a permis la création d'une base de données qui pourrait servir de centre de collecte des besoins d'innovation des entreprises, un dispositif pour renforcer leur rôle dans le nouveau paradigme de l'innovation de l'agroalimentaire, suivant une approche collaborative et de bas en haut. Dans les conclusions, des stratégies sont proposées pour réduire l'écart culturel et géographique entre les innovateurs qui élaborent de nouveaux projets, les entreprises et les institutions publiques. La base de données INTRA est examinée en détail dans l'Annexe I.*

Mots-clés. *PME – Incubateur – Start-up – Territoire – Local – Global – Union européenne – Besoin d' innovation*

I – Introduction

The INTRA project (Introducing innovations in traditional agrifood products to increase SME competitiveness) belongs to the international cooperation programme between Italy and Greece and aims to strengthen the services for sharing and transfer of innovations in the agrifood sector. INTRA has focused on the innovation needs of traditional Italian and Greek businesses, building on experiences collected in Apulia (IT) and in the Ionian Islands (GR), in order to propose feasible

methodologies and tools for improving the efficiency of the innovation supply chain. Coordinated by CIHEAM Bari, the project has involved the participation of the Ionian University, the regions, and the Brindisi and Corfu chambers of commerce.

Joint work by MAIB and the Ionian University has created a system for collecting agrifood firms' innovation requirements, and this can provide a concrete tool for increasing their involvement in the new collaborative bottom-up innovation paradigm for the agrifood sector.

II – The context

Small and medium enterprises (SMEs), particularly in the agrifood sector, play a crucial role in the Italian, Greek and general Mediterranean economy for the growth of the system's competitiveness and for the creation of jobs. They represent the majority of businesses, and their competitiveness mainly consists of "*no price*" factors, i.e. factors related to product "quality", differentiation and diversification.

The economic recession and the decline in product demand have had negative effects on employment in our area, with a subsequent loss of work-related skills, and reduced investments in equipment and infrastructures, especially in Research and Development. Just as it is expensive to generate innovation because research requires time, capital and skills, and cannot ensure results, it is also true that SMEs may have difficulties in applying innovations proposed by others, due to a lack of resources and of qualified skills.

Therefore, it is important for the local economic system, including agrifood businesses, to improve the ability to perceive changes, in order to maintain competitive advantages not related only to prices. However, the ability to perceive changes firstly requires the introduction of new knowledge and new professional skills able to identify needs and provide possible solutions. This is extremely important for SMEs because their structure and internal organization is often inadequate to manage this process, which thus becomes exogenous. In some cases, despite the availability of public funds, businesses have evident difficulties in defining their innovation needs and in finding appropriate responses.

On the global scale, markets force firms to participate in relational networks that involve an investment in terms of time and resources, also providing an opportunity to keep up with local or global markets and with an increasingly "dynamic" demand. The principle is that the wider the network, the greater is the possibility of finding innovative solutions to improve business performances and market positions. The network, the quantitative and qualitative relationships become an asset of the firm's economic resources.

In this sense, the technological evolution and the web 2.0 are particularly useful, and more helpful than specific open innovation tools. Open innovation is "a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external routes to markets if they want to improve their technological skills" (Henry Chesbrough, 2006).

In this framework, research becomes more successful the more it meets business needs and the more it is applied at the territorial level; this makes it possible to measure its effectiveness, identify criticalities and outline future developments. Innovation is thus the result of a systematic approach based on the creation of a network, on interactive learning, and on negotiation between a heterogeneous group of stakeholders centred on the entrepreneur.

This dialogue requires intermediate participants linking different stakeholders involved in innovation "strategies". Rather than mediating individual relations ("*one-to-one*"), this involves mediating "*in-between*" and "*many-to-many*" relations (Howells, 2006), i.e. facilitating knowledge sharing and transfer between the different stakeholders in the production chain (research bodies, assistance services and businesses, as well as the authorities and ordinary citizens), with the

needs of business as the starting point. These intermediaries work to promote innovation, and aim to build relations suited to the systematic nature of the Agricultural Innovation System (AIS)[1] and to favour interaction between the different stakeholders involved in the innovation process. To date, the agricultural sector has mainly relied on the public sector intermediaries of the Agricultural Extension Services, often with a limited mandate and reduced effectiveness (Leeuwis, 2004; Rivera, Sulaiman, 2009).

If, on one hand, innovation requires the involvement of multiple stakeholders and effective interactions between them, the AIS approach also recognises an important role for the institutions, therefore also for laws, regulations, attitudes, customs, practices and incentives, in influencing stakeholder interaction (World Bank, 2006).

However, technological, societal, economic and cultural differences often hamper the establishment of effective links between heterogeneous groups of stakeholders, impeding the subsequent formation of "coalition" groups and partnerships between businesses and institutions and between public and private sectors (Pant, Hambly-Odame, 2006). Howells has coined the term "innovation broker" to define an organisation or entity that manages all aspects of the innovation process established between two or more parties. Although indicated as a possible solution to fragmentation and to the limited performance of knowledge infrastructures and of the innovation system (Clark, 2002; World Bank, 2008), this subject appears to have been less systematically investigated in the agricultural sector.

III – The situation in Europe

In order to deal with this situation, helped by the Directorate-General for Research and Innovation, the European Commission has launched the European Innovation Partnerships - EIPs (EU Regulation No. 1305/2013 art. 55) within the "Innovation Union" initiative of the Europe 2020 strategy. The EIPs aim to find innovative solutions to the great challenges facing society, such as climate change, energy, food security, health and population ageing. They gather together participants from different political entities, sectors and countries in order to integrate or launch initiatives, involving both supply and demand, along the entire cycle of research and innovation. Their objective is to overcome the weaknesses, bottlenecks, and obstacles in the European research and innovation system preventing or delaying the development of good ideas and their market opportunities. The main novelty is the method the Commission intends to use to transfer innovation. The proposed process involves greater integration between agricultural businesses and the knowledge-based system of universities, research centres and advisory services.

The European Innovation Partnership on food security, "Agricultural Productivity and Sustainability", has two main objectives by 2020:

– to promote agricultural productivity and efficiency, reversing the current downward trend of productivity increases;

– to ensure agricultural sustainability by maintaining soil functionality at a satisfactory level.

Therefore, the European Union's objective for the next programming period is to increase production through a more efficient and sustainable use of natural resources.

Within the 2014-2020 policies for rural development, the Commission intends to remove two of the most frequent obstacles to innovative processes: the divide between research outcomes and the resistance of farmers, businesses and advisory services to the adoption of new practices/ technologies. In order to remove these structural and cultural divides, the EU is applying the bottom-up approach, one of the main guiding principles of the rural policies of the last twenty years. The proposal involves setting up "EIP Operational Units" involving all stakeholders, in order to develop a Plan which describes the proposed innovative project, the expected results and the

concrete contribution of the initiative to increasing agricultural productivity and competitiveness via sustainable resource management. This is, therefore, a process based on the principle of *co-generation and co-participation*, and is no longer a "linear transfer" of innovation.

Within its 2014-20 Rural Development Programmes, the European Union envisages a general strategy to identify innovation (EU Regulation no. 1305/2013 art. 8), alongside measures on "knowledge transfer and information actions" (art. 14), and "advisory services, farm management and farm relief services" (art. 15), in addition to the obvious actions to support and encourage "cooperation" (art. 35).

IV – Instruments for a new paradigm

Over the years, the INTRA research group has established a dialogue with the business community in the areas concerned. It has attempted to provide concrete tools and a practical application methodology of the paradigm described so far, with the aim of creating an innovation system attuned to the needs of businesses and territories via a genuine "bottom-up" approach.

The first important criticality concerns the creation of a method and relevant scenario for the identification and systematisation of innovation needs; this needs to be easy to update, exhaustive and cheap. In brief, there are two options:

a. construction of a framework of innovations available on the market that correspond to the needs of businesses and of communities

b. identification of innovation needs using listening and surveying techniques directly on farms to provide concrete solutions.

From an operational point of view, the above proposal aims to go beyond the catalogue of innovations available to the "production chain" (EIP - Operational Group), as provided for in 2014-20 programming.

Creation of an innovation catalogue entails many difficulties:

- the exhaustiveness of innovations recorded at the international level, since it would be too restrictive to refer only to the territorial level;
- the methodology for building, feeding and updating the catalogue;
- the methodology for transferring knowledge at the farm level.

Moreover, there is always the risk that the creation of a catalogue of innovations will maintain the current linear top-down approach, i.e. an innovation system largely dependent on research activity and not always attuned to producers' needs.

At the same time, there are no effective methods to support the process of identifying and systematising innovation needs. Other criticalities include the following:

- lack of personnel sufficiently sensitive and qualified to deal with a development process related to innovation;
- limited ability to create networks and stable collaborative relations in the innovation chain;
- limited awareness of innovation's key-role in business strategies;
- weakness in the current system of sharing and transferring knowledge due to linear approaches of scientific institutions and their research activity, which is far removed from the real needs of final operators.

This last aspect highlights the importance of reshaping the innovation chain in agriculture, and the issue has been positively addressed by the European Commission in (EU) Regulation no. 1305/2013, by making use also of interactive innovation and cross-fertilisation methods, i.e. by enlarging the chain to other economic and social sectors.

V – The methodological approach

In order to activate forms of dialogue, sharing and co-design of innovation among the stakeholders in the chain, a "bottom-up approach" has been applied which takes into account the obvious criticalities related to the excessive fragmentation of the national agricultural system, the predominance of small agrifood businesses, and the difficulty of interacting with businesses on innovation processes. These criticalities have been overcome by applying a *blended* analysis method, based on a rational collection of the most recent innovations in the agrifood sector (database) and on direct contact with a panel of 40 Apulian firms, surveyed about their innovation needs, problems related to the transfer and application of innovation, and the priorities on which research should focus. This has led to the creation of an "open innovation environment", favouring "u*ser-driven innovation*" in creating processes to co-generate new services, products and social infrastructures.

INTRA methodology has built on the successful experience of the Living Labs, meant as virtual open places where businesses and research bodies can interact to create, test and validate new products/services and supply their feedback on the application of innovation under real conditions and in a specific territorial context. The Living Labs are innovation catalysts and support the process by filtering demand and supply, stimulating the cooperation of all stakeholders; in addition, they supply decision-makers with clear indications about innovation strategies based on the needs of the local business community.

A living lab is developed in two stages: 1) mapping the needs of businesses (collection and cataloguing issues, needs and problems expressed by users; 2) catalogue of living lab partners, i.e. the research bodies able to offer innovative solutions or available to develop them with businesses; 3) living lab activation, i.e. collaboration and implementation and/or development of the innovation. At times, these processes are activated by public administrations, as in the case of Regione Puglia, with operational support programmes for business development.

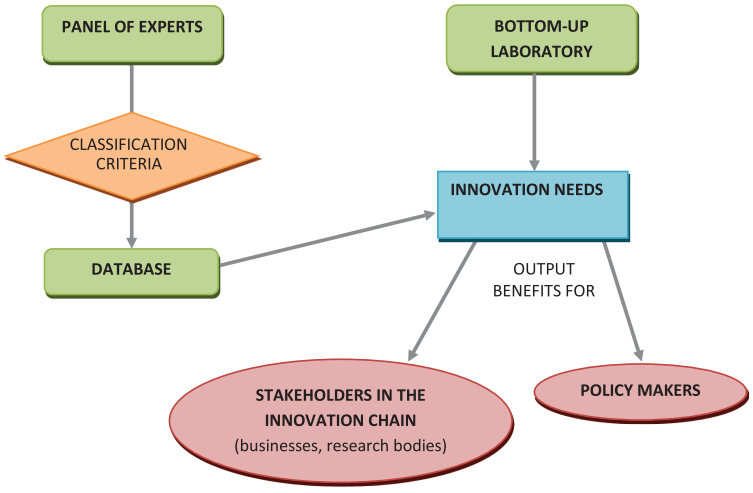

Table 1. INTRA methodology

The INTRA database makes it possible to identify innovations and facilitate analysis and statistics via the aggregation of data and information, and to provide indications about the main research directions or specific innovations, in addition to facilitating knowledge and interaction between the stakeholders in the innovation chain.

The Database provides data according to three hierarchical levels of innovation/research classification:

The first level of classification refers to the four clusters identified by Eurostat and the European Commission: *product, process, organizational and marketing* innovation. The innovative research studies included in the catalogue have thus been associated with the four categories.

The second level includes 13 different types of innovation, further subdivided into 61 aspects of innovation (third level).

Moreover, the database makes it possible to aggregate innovations according to the supply chain or patent.

The lists classified according to research priorities provide the basis for discussion with businesses (**bottom-up laboratories**). It is also worth mentioning that the innovative proposals included in the Database are already the result of a process shared by the different stakeholders in the innovation chain (scientific institution and firm), since this is a criterion used in creating the database. The bottom-up laboratory output is a **system for gathering** business innovation needs. In other words, a tool for discussion in the bottom-up laboratory, enabling a self-assessment aimed at awareness and identification of their innovation requirements. Therefore, the identification of needs makes it possible to recognise the potential for the development of innovation in the firm. In addition, the "database" allows the identification of possible collaborators (researchers and businesses) in the development of innovation at the territorial level (e.g., creating an operational unit for the EIP) or at the level of the individual business.

The database is also an important tool of analysis for public decision-makers, as it enables innovation clustering and identification of the priorities for territorial planning/programming.

Bearing in mind that traditional diagnostic methods (questionnaires, interviews, focus groups) provided no significant results, a new approach to interpreting business needs was attempted. This involved a mixed system including both the quantitative approach (database) and qualitative analysis related to the brainstorming/bottom-up laboratory among the stakeholders in the chain.

The content of the database is a crucial issue. The proposed system capitalises on the experience of previous information infrastructures of the same type, which failed because they were too expensive to update and maintain. In order to avoid this problem, the database is open and participatory, meaning that each innovation system stakeholder interested in participating will have an incentive to update it.

VI – Conclusions

In advanced economies, it is evident that the linear innovation models, in which "innovation" is a result derived from pre-determined inputs (investments, human capital, infrastructures), are replaced by collaborative models. These aim to build integrated innovation ecosystems, in which innovation is the result of the interaction between key participants (academic, institutional and business), and in which the existence of networks and optimisation of their effectiveness are critical factors of success. Another element of this ecosystem is the capacity to gather the needs of the stakeholders, who are no longer "subjected to" the research system, in addition to a level of openness to the external innovation market much greater than that of the individual business.

These aspects emerge clearly from the analysis, confirming that innovation is an extremely complicated process involving multiple dimensions, and not strictly limited to the economic field. At present, the quality of human capital is vitally important for the innovation process in any production system.

We conclude that it is essential to reduce the cultural and geographical divide separating innovators developing new projects from businesses and public institutions; this may be achieved via the following strategies:

- developing an innovation system based on business needs;
- creating an open integrated information system to link all stakeholders and spread information and contacts;
- creating new networks to facilitate the exchange of experiences and fusions;
- creating new professional profiles, in particular a kind of innovation manager to encourage and facilitate production chain and network innovation processes;
- researching advanced methodologies and platforms to encourage real bottom-up processes for identifying needs and co-designing solutions, defining the priority technological and research fields, so that these produce tools directed towards the market and competitiveness;
- defining collaborative fields (clusters), involving not only participants in the same sector (e.g. agrifood), but also in different areas (e.g. mechatronics applied to agriculture), so as to launch cross-fertilization between participants and clusters of different production areas.

The points listed above can and must be a stimulus to encourage a process of product/process innovation and enhancement, which must be viewed from different perspectives: those of businesses and the production chain, paying attention to the kind functions carried out in the production process, those of the local community where the product is made, those of consumers, and those of the institutions. Innovation is actually an open process stemming from the product's links with local culture and traditions. It is the stakeholders in the agrifood system who can combine the usage value of the product with other more complex values, such as economic, social and environmental sustainability. These values require careful consideration when formulating an industrial development strategy.

Notes

1 The Agricultural Innovation System is defined by the World Bank (World Bank, 2006) as a network of organizations, businesses, and individuals that focuses on bringing new products, new processes, and new forms of organization into economic use, in collaboration with the institutions and policies affecting the way different stakeholders interact to share, access, and foster knowledge and learning. An AIS system therefore consists of researchers, consultants and farmers and also includes private and public stakeholders, such as processing companies, input suppliers, retailers, policy makers, consumers and NGOs.