Annex

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ANNEX

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The INTRA Project database as an application tool for business innovation

The database of innovations is intended as a catalyst to help SMEs become more competitive, and to ensure that stakeholders share a common language, allowing producers to focus on their own needs, and researchers to find the best solutions to meet demands.

The information is organised in different sections to facilitate research and analysis, even for each single piece of data. The information given for each innovation concerns:

Implementing body (research body and business); classification by innovation type; chain; traditional product, patent; public or private funding; keywords.

Technology transfer support services

The *Database of agrifood innovations in Puglia* contains information about the main items related to the needs of agrifood businesses, and is helpful in identifying the scientific institution that responds to a specific need. A panel of multi-sector experts has selected and collected this information from 313 studies made over the last 5 years that have led to innovation in the agricultural sector. The database allows searches by different criteria, and provides the innovative proposals in each category, subdivided into further categories .

The catalogue currently contains 182 innovative proposals obtained using the following criteria:

- research that has produced available innovations attuned to business needs:
- research involving a farm/agrifood business or a knowledge-generating body.

The innovations included in the Catalogue are organised according to *concept-based aggregations* (clusters), making it possible not only to catalogue 13 *different types* of innovation, but also to identify the main elements on which the primary sector is investing.

Each innovation is classified at three hierarchical levels according to the type of innovation.

The first level refers to the 4 clusters according Eurostat classification and definitions of the European Commission: *product, process, marketing and organizational innovations.*

1. **Product Innovation**: product or service completely new or upgraded in relation to its initial features;

2. **Process innovation**: new methods or methods significantly upgraded for the creation and supply of services;

3. Marketing Innovation: new marketing method involving significant changes in product design or packaging;

4. Organizational Innovation: implementation of an organisational method in business practices, workplace organisation or in external relations.

The second level of classification includes 13 different types of innovation, further sub-divided into 61 aspects of innovation (third level). (Table 3)

The graphs and tables below show the information collected in the database. This sample has no statistical value, but is aimed at developing an information model able to strengthen the application of the new innovation chain paradigm. The innovation clusters in the database mainly regard product and process innovations.

Table 2. Structure of the innovation databse.

id	313	314	362
title	VAL.TIP.OLI - Valorizzazione della tipicità degli oli extravergine di oliva salentini	Val. Negr. - Valorizzazione della qualità e della sicurezza delle produzioni vitivinicole a base Negroamaro	Studio dei Lieviti naturali per la valorizzazione di pani tipici del Mezzogiorno
objective	Valorizzare la tipicità degli **oli extravergine di oliva salentini** attraverso: 1. sviluppo di una metodologia scientifica e oggettiva di certificazione e di autenticazione delle produzioni olearie tipiche; 2. caratterizzazione e tipicizzazione a livello qualitativo e sensoriale dell'olio prodotto e miglioramento del processo produttivo in modo da incrementare le qualità organolettiche del prodotto;	Valorizzare la filiera viti-vinicola del **Negroamaro** attraverso: 1. Individuazione di cloni/biotipi di negroamaro dotati di caratteristiche di pregio destinati alla produzione di vini di alta gamma; 2. messa a punto di protocolli e di sistemi di coltivazione dei vigneti in grado di migliorare le caratteristiche tecnologiche e compositive delle uve Negroamaro; 3. messa a punto di protocolli innovativi in fase estrattiva piÃ¹ idonei a migliorare l'intensità e la stabilità del colore e la composizione aromatica di vini a base Negroamaro	produzione, caratterizzazione di lieviti naturali tipici per produzioni di **pane tipico pugliese** e miglioramento delle operazioni di manipolazione e conservazione dei lieviti naturali; 2)miglioramento delle caratteristiche reologiche, sensoriali e di conservabilità dei pani tipici pugliesi,
institution	Fanizzi e De Bellis (UNISALENTO) - Mita (ISPA CNR) - Frisullo (UNIFG)	La Notte e Giannini (CRSFA Basile Caramia)	DIPARTIMENTO DI PROTEZIONE DELLE PIANTE E MICROBIOLOGIA APPLICATA
enterprise			
Cluster (I level innovation)	PRODOTTO	PRODOTTO	PRODOTTO
II level innovation	caratteristiche prodotto	nuovo prodotto	caratteristiche prodotto
III level innovation	evidenze dell'origine	nuova varietà	shelf life del prodotto finito
food chain	olio	vino	cereali
traditional product T/N	T	T	T
status	privato	privato	pubblico
patent status	senza brevetto/licenze	senza brevetto/licenze	senza brevetto/ licenze
realized	Aumento delle qualità organolettiche degli oli extravergine di oliva salentini mediante miglioramento processo produttivo e certificazione	Vini di alta gamma mediante utilizzo di cloni/biotipi di negroamaro; Maggiore intensità e stabilità colore e composizione aromatica nel Negroamaro mediante realizzazione di protocolli innovativi	Pane tipico pugliese con maggiori caratteristiche di di manipolazione e conservabilità

Table 3. Classification of 4 innovation clusters.

Cluster	Number of identified research works	% of research works identified in the Database
Product Innovation	95	52%
Process Innovation	78	43%
Marketing Innovation	3	2%
Organizational Innovation	6	3%

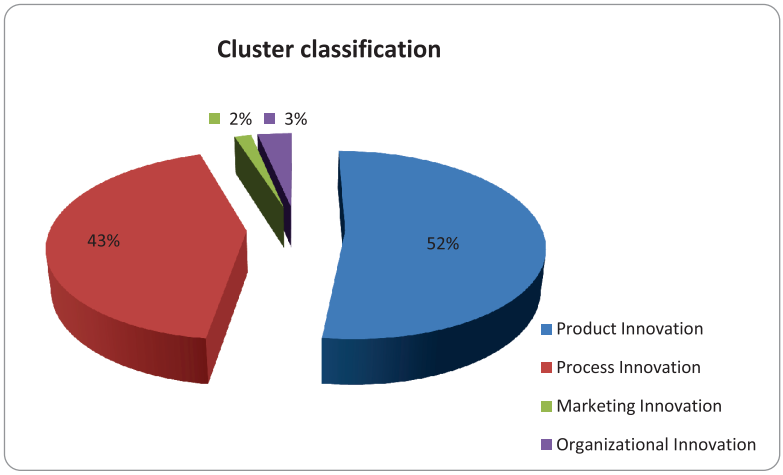

Figure 1. Innovation cluster classification.

Process innovation and organizational innovation are subdivided into three 2nd level innovation types, as in the graphs below:

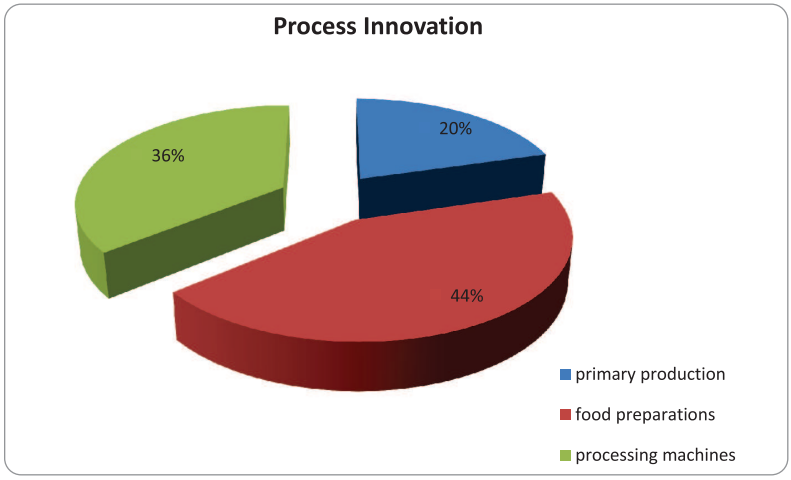

Figure 2. Process innovation classification.

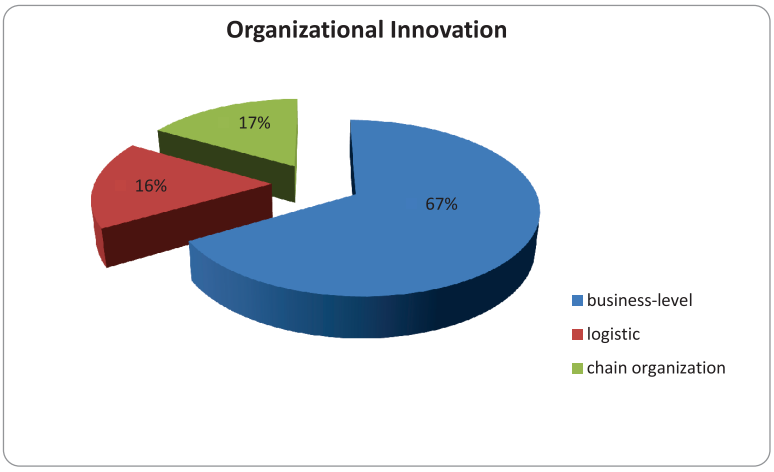

Figure 3. Organisational innovation classification.

Extracted data summarize the classification of innovations according to the type of innovation or the chain (research priority)

Table 4. Example of cluster subdivision for 2nd level innovations.

Innovation cluster	No.	Type of Innovation 2nd level	Research works Selected in the DATABASE
product	**1**	new product	34
	2	new composition of ingredients	14
	3	product features	13
	4	new service	34
process	**5**	primary production	16
	6	food preparations	34
	7	processing machines	28
marketing	**8**	communication	2
	9	new markets/prices	1
	10	new distribution in relation to retail outlets	0
organisational	**11**	business-level	4
	12	logistics	1
	13	chain organisation	1
TOTAL			**182**

Chain-based classification enables rapid identification of all the innovations produced in a given agrifood sector.

The third level of innovation provides a more detailed classification of existing research in the database.

Table 5. Innovation types.

Innovation Cluster	Type of Innovation 2nd level	Type of Innovation 3rd level	Research works selected
product	new product	new variety;	21
		fully new product	13
	new composition of ingredients	nutraceutical foods;	2
		functional foods;	11
		new ingredients	1
	product features	shelf life of the finished product;	6
		shape (size, colour, etc.);	/
		brand;	/
		packaging material;	3
		convenience;	/
		other certifications;	1
		evidence of origin	3
	new service	methodologies of the food product;	30
		product orders;	/
		product delivery;	/
		traceability	4

Table 6. Innovation types – Process innovation.

Innovation cluster	Type of Innovation 2nd level	Type of Innovation 3rd level	Research works selected
process	primary production	sowing;	/
		fertilisation;	2
		plant protection;	5
		irrigation;	1
		production systems;	1
		harvest;	/
		animal feeding;	2
		animal husbandry/growth/fattening	1
		milking/slaughtering;	/
		fisheries and aquaculture	3
	food preparations	post-harvest and preliminary processing;	6
		mechanical treatments;	3
		physical treatments;	5
		chemical treatments;	4
		biological treatments;	1
		biotechnological treatments	16
	processing machines	techniques for product storage;	9
		primary product processing;	11
		final product treatment process;	3
		reduction in energy absorption;	1
		reduction of environmental impact	4

Table 7 - Innovation types – Marketing innovation.

Innovation cluster	Type of Innovation 2nd level	Type of Innovation 3rd level	Research works selected
marketing	communication	promotion	1
		advertising;	/
		publicity;	/
		direct marketing;	/
		mix of communication strategies	1
	new markets/prices	search for new markets	1
		methodologies of market analyses;	/
		commercial positioning (prices)	/
	new distribution in relation to the points of sale	strategic alliances;	/
		e-commerce;	/
		personal selling;	/
		vertical integration of distribution channels;	/
		management of logistics and of supply chain;	/
		new distribution channels	/

Table 8 - Innovation types – Organizational innovation.

Innovation cluster	Type of Innovation 2nd level	Type of Innovation 3rd level	Research works selected
organizational	business-level	staff training	/
		business process management	2
		knowledge management	2
	logistics	relationship with suppliers;	/
		production planning and warehouse management;	1
		distribution and transportation strategies;	/
		information systems	/
	chain organization	horizontal integration;	/
		vertical integration;	/
		inter-clustering	1

Some comments on collected data

A further selection has been made among the 182 innovative proposals to enable a more thorough analysis of innovation in the agrifood sector. Consequently, empirical analysis has been performed on 30 research works that concern typical products from Puglia as the subject of innovation and/or the development of a prototype/patent. The results of this analysis show that the innovations produced and applied have not influenced the quality and the intended use of the main agricultural products, whereas priority has been given to the innovations linked to specific needs of the production process, including the recovery of waste and residues for different uses; choice of native varieties and local breeds to preserve genetic resources; plant breeding via sustainable biotechnologies; sustainable use of nutrients, plant protection products and products for animal health; use of microorganisms, beneficial insects and bioactive molecules for plant protection, including the selection of appropriate genetic resources; the microbial biodiversity, conservation, quality and fertility of soils.

Another emerging need is the relationship between **food** and **health,** which means focusing on the nutraceutical value of agrifood products, including reformulating traditional products, characterising them with their own intrinsic features and emphasising their healthy and functional properties.

Current research shows rising trends in food intolerance. These trends are well known, and are typical of a society which has an increased life expectancy. Other aspects of research concern all elements of packaging and its new functions related to the product; the production of high-quality foods for all (food security); product upgrading and food traceability; product characterisation and compliance with the relevant certification and food safety standards.

Analysis of the above elements shows that innovation concerning products is of primary importance for farms. Moreover, a growing number of the farmers at the production base are becoming aware that innovation cannot be provided only by others, but should derive from a process shared with research and experimentation centres, so as to facilitate the acquisition of intangible assets, such as skills, network relations, R&D, branding and communication.

This analysis shows that innovative farmers have focused on searching for new varieties and also on recovering and enhancing local traditions and environmental features. In this case, farmers can contribute their knowledge and skills to develop innovations that consumers will appreciate and reward. There are some agricultural production areas in which this has been successful, such as wine, oil, special flours, organic products, etc.

The primary sector is still far from considering clustering as a tool for creating value. Yet this kind of approach increases the potential value of possible innovations, and is a remedy for the isolation and small scale of agricultural businesses.

The stakeholders who are able to live and work in an environment with a wealth of knowledge and experimental studies can envisage innovative ideas and practices and can easily find the expertise and specialised services in their local area which are used to develop a new innovative vision, also by imitating the best firms.

The boxes below are examples of the descriptive data sheets for a sample of innovations in the database. The description begins with the problems of the main reference chains and their innovation requirements, followed by a description of the innovation produced by the collaboration between business and research body. Emphasis has been given not only to the results in terms of solutions, but also in terms of effects on market competitiveness and on profitability, without excluding the constraints and limitations involved in applying innovation.

BAKERY PRODUCTS SUPPLY CHAIN

Selection of natural yeasts for bread-making

Need

One central problem for bakeries making yeast-based products is that they are unable to sell the product on interestingly profitable markets because it cannot comply with the commercial requirements of fragrance, storage quality and ease of use.

Innovation

The innovation consists above all of selecting groups of microorganisms, i.e. lactic acid bacteria, to obtain a natural yeast suitable for bread-making, hence a yeast kit which bread-makers can buy.

Application and impact of innovation on business competitiveness

The innovation was applied to the production of "puccia", a typical bread product from Puglia. *Puccia* was initially sold in sealed packages with controlled atmosphere at traditional retail outlets; after the innovation was introduced, *puccia* has encountered consumer appreciation and a large-scale retail chain has begun to market the product.

Considering the promising results achieved for a product like *puccia,* it would be useful to see if this innovation can be applied to other typical bakery products with a locally-based quality label and which comply with production specifications. Bakers could thus obtain a product that they can sell at a higher price, due to its improved organoleptic characteristics, and to the income and volumes guaranteed by access to large-scale retail chains. In addition, they will also benefit from reduced running costs due to the use of home-produced yeast, and will not need to use controlled atmosphere to ensure product freshness .

OIL SUPPLY CHAIN

Metabolic profile maps of Apulian oils

Need

The olive sector encounters the difficulty of guaranteeing the origin of olives and olive oil: serious problems are involved in distinguishing between extra virgin oils produced in Puglia from local olives, and oils made from imported olives, or oils which are only bottled in Puglia. This problem has implications for the introduction of Apulian oils in some foreign markets and for certification of product typicality.

Innovation

The innovation consists of creating a database for the varietal recognition of oils via their metabolic profile. Operation of the database is strictly correlated to the rate at which it is updated whenever new analyses are carried out.

Application and impact of innovation on business competitiveness

The main beneficiaries of this innovation are the firms which bottle oil, especially those oriented towards export markets. The cost of innovation consists of a fee to access the database. The benefits are associated with greater sales opportunities on foreign markets, and the reduction in the cost of dealing with disputes concerning product origin, as well as with the possibility of having a territory-based quality mark on the label, stating that the product's territorial origin is analytically proven.

FRUIT AND VEGETABLE SUPPLY CHAIN

Varietal selection of Catalogna chicory for freezing

Need

Consumer demand for fruit and vegetable products is directed towards genuine, natural, easy and ready-to-use foods, both fresh and cooked. The shelf-life of fruit and vegetables becomes the strategic variable that can offer higher margins by facilitating access to distant markets, which increasingly demand typical products linked to the territory and to the quality of local varieties, expressing the production area, its climate and landscapes.

Innovation

The innovation consists of identifying local varieties, of Catalogna chicory in this specific case, which enhance the organoleptic features of the product and are also suitable for preparation and packaging as frozen products.

Application and impact of innovation on business competitiveness

The cost of innovation is connected with genetic selection of the plants and with the implementation of new production lines including product packaging. Benefits are largely linked to the possibility of adding value to native varieties, both in quantitative terms via genetic selection, and in economic terms by marketing the product through more profitable channels.

FRUIT AND VEGETABLE SUPPLY CHAIN

Functional tomatoes with low nickel content

Need

Food safety is a component of the demand for technological innovation that businesses express due to growing consumer attention paid to food healthiness. An area of special interest is the relationship between soil and plant, i.e. the transport of soil nutrients in the plant's edible parts, consequently ingested when the food is eaten.

Innovation

The innovation concerns the control of nickel contamination levels in tomatoes processed to produce tomato paste. Tomatoes were grown in soils containing a low nickel level and as protected crops on nickel-free substrates, using good agricultural practices to prevent nickel concentration in the soil and to reduce the existing levels.

Application and impact of innovation on business competitiveness

Testing confirmed that the tomatoes contained low nickel concentrations. Harvested tomatoes were used to make tomato paste for experimental use in a hospital; the products were given to a sample of patients with nickel-related health problems, whose response was excellent.

WINE SUPPLY CHAIN

Measuring vegetative vigour for precision viticulture

Need

The inefficient use of chemical inputs in agriculture has negative effects on the economic management of the business and on consumer health.

Innovation

Precision agriculture is an innovation enabling rational interventions based on the crop's actual requirements and improved agronomic and economic performances. The introduction of systems to survey the plants' physiological status using sensors and remote sensing equipment is the innovation chosen for the wine sector. It consists of collecting field data on vegetative vigour; the data are then processed by a special system to produce a vegetative vigour map, which provides a useful tool for planning fertilisation, irrigation and plant protection interventions.

Application and impact of innovation on business competitiveness

Positive effects include the improvement of wine quality levels, with statistically significant results, together with a lower environmental impact. In addition, there are improvements in the final economic budget, because product differentiation gives a competitive advantage. The use of precision farming techniques also enhances the social responsibility of the business.

The limitations to the introduction of this innovation are related to the costs of field data collection, and of training staff to interpret the data processed by the expert system and apply them in the field.

DAIRY PRODUCTS SUPPLY CHAIN

Formulating a liquid medium to extend the shelf-life of Apulian mozzarella

Need

There are difficulties in transporting dairy products, especially *mozzarella*, to markets located far from production sites,, because the travelling time involved damages product qualities and healthiness.

Innovation

The innovation consists of formulating a liquid medium which extends product shelf-life to 6-8 days, thus making it possible to sell the product on European markets.

Application and impact of innovation on business competitiveness

Excluding experimentation, innovation costs are very low and involve the tank containing the new liquid and the system for distribution of the liquid in the packages. On the other hand, the benefits are extremely positive, because of increased sales volumes deriving from the expansion of markets and a big reduction in returned goods.