SOUTH EAST EUROPE
Transnational Cooperation Programme

INNO-FOOD SEE

Setting up the innovation support mechanisms and increasing awareness on the potential of Food Innovation and RTD in the South- East Europe area

Project Code: SEE/B/0028/1.3/X

WORK PACKAGE 3: ANALYSIS OF POLICIES AND STRATEGIES FOR FOOD INNOVATION

D3.2a- Profiling of regional food research entities

Version: 1.0
Date: 18/09/2012
Pages: 23

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Dissemination Level:

Partner	Official name (in English)	Abbreviation	Country
LP	Centre for Research and Technology Hellas- Institute of Applied Biosciences	EKETA- IAB	Greece
ERDF PP1	Federation of Industries of Northern Greece	SVVE	Greece
ERDF PP2	National Research Council- Institute of Sciences of Food Production	CNR/ISPA	Italy
ERDF PP3	Agricultural University of Plovdiv	AUP	Bulgaria
ERDF PP4	Pazardzhik Regional Administration	OAP	Bulgaria
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Abstract:
The report presents the results of the profiling of the regional research entities focusing to the food sector.

Project Document Information

Project acronym:	Inno- Food SEE
Project full title:	Setting up the innovation support mechanisms and increasing awareness on the potential of Food Innovation and RTD in the South- East Europe area
Project Code:	SEE/B/0028/1.3/X
Project start date:	1st April 2011
Project duration:	30 months
Deliverable number:	
Deliverable title:	D3.2a- Profiling of regional food research entities
Due period of deliverable:	
Actual submission period:	September 18,2012
Authors:	Pasquale Del Vecchio, Sebastiano Vanadia, Michelangelo Pascale, Paola Lavermicocca
Editors:	
Reviewers:	
Work Package no.:	3
Work Package title:	**ANALYSIS OF POLICIES AND STRATEGIES FOR FOOD INNOVATION**
Work Package leader:	SVVE
Work Package participants:	
Nature:	
Version:	
Draft/Final:	
No of pages (including cover):	
Keywords:	

List of Acronyms and Abbreviations

Acronym/abbreviation	Resolution

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(to be compiled by FING)

2. REGION OF APULIA

2.1 SHORT PROFILE OF THE REGION, THE AGRICULTURAL PRODUCTION AND THE FOOD INDUSTRY

The region of Apulia is the Italian south-eastern most region, with a territorial extension of 19.366 km^2, bordered by both the Adriatic and Ionian Seas, giving it one of the longest coastlines of any region in Italy, extending for about 800 km. The region is widely accessible by the sea and it seems a natural equipped wharf of the European community stretching over the Mediterranean that from centuries is in fruitful geographical economic cultural and religious relations with the Balkan area, the Middle-East, Northern Africa and East Europe.

The Apulia is a **Region of Convergence** with a population of **4,076,546** inhabitants, generating a **GDP** of about 68.9 million (in 2009).

The per capita GDP is about the 66% of the national average and represents about 72% of the EU27 average. Apulia manages for the period 2007-2013 about 2,7 M€ of the FESR programme and 640 K€ of the FSE programme plus other funds coming from interregional and national programmes.

In the recent period, while the **GDP** in the South over the previous year grew by 0.2% (in north-central than 1.7%), in Apulia it decreased in 2010 of 0,2% to **16,932** euros per capita. The situation is not good even if one looks at annual average 2000-2010: Apulia, which was to be the motor production of southern mainland, has recorded a minus 0.3%. For the second consecutive year, therefore, the Apulian economy has performed the best performance in the South. In 2009 the GDP of Apulia fell by 2.3% compared to 4.6% of South Italy (SVIMEZ Annual report 2010).

Agriculture in Apulia is largely modern and intensive, allowing the region to be at the first places in Italy for the production of many products, like “hard” grain and tomatoes in the Foggia province, besides table grapes and oil, with around 50 millions olive trees. Also important is the production of salad, artichokes, fennel, cabbage, celery and oats. In specific areas fruit cultivation is also relevant, like peaches and kiwi. The primary sector, equal to 5%, produces considerable quantities of valuable produce as wheat, olives, fruit and vegetable, beets, milk, flowers, tobacco and, in some areas of the Salento, medicinal herbs that give rise to an intense activity of food processing and agroindustry one. These industries are distributed in various territorial points and often represent local branches of large industries from the North of Italy.

The **food industry** represents one of the key economic sector of the region, the value added at Basic prices (VA) produced by Regional Food was 1.1 billion euros equal to about 5% of the total national and 21% of the South one (Istat 2007). The trade and industrial processing

of agricultural products, in the period 2003-2007 increased by more than 5%. In the same period the income from employment and gross wages, in the in the field of agri-food processing are both increased (23%) more than in the rest of Italy.

The main agro-food chains present in Apulia are:

- Dairy products;
- wheat and bakery;
- meat products;
- olive oil;
- grapes and wine;
- vegetable and fruits (olive, almonds, figs), and livestock (sheep, pigs, cattle and goats).

In addition to the traditional sectors of wine and oil, also the mill industry and pasta production have a big role in the sector, also being Italian leader in the heavy wheat production (21 % of national total, Istat 2011), while the Apulia is the third Italian region for the pasta production. Significant roles are covered also in the diary industry, coffee and meat transformation (Bank of Italy 2011).

2.2 SHORT DESCRIPTION OF THE REGIONAL RESEARCH AND INNOVATION FRAMEWORK

Apulia Regional key entities are supporting the development of the agro-food sector, composed by public and private entities, operating at different levels to create synergies concurring at the creation of an integrated system. In particular, the Apulia Region has been carrying on a **global strategy** to enforce the integration and to favour the communication and interaction among different players supporting them in a common and unique process of sustainable innovation. In this framework very important has been the Region authority role and the creation of a dedicated Agency, named **ARTI,** with the institutional function to gather all academic and research players in strict conjunction with territory and local industries. In this way this Agency is representing a natural bridge to facilitate exchange of experiences, becoming also pole favouring the links with SMEs and local or productive initiatives, supporting the economic growth of the agro-food sector.

This section focuses on the identification and brief description of the key players of the regional research and innovation system, focusing on food. Entities such as University Departments/ Faculties, Other Educational Institutes, Research Institutes/ Centres, Innovation and Technology Transfer Organizations, Business Support Entities, Public Authorities, clusters and networks are presented.

The academic and research entities play an active role in developing new process and products useful for innovative and competitive SMEs.

In Apulia there are **4 main public Universities**: University of Bari "Aldo Moro", Polytechnic of Bari, University of Salento (Lecce), University of Foggia and **one private university**, the Jean Monnet LUM, located in Bari. Considering the Academic institutions, the main Universities offering academic curricula in the field of agrofood and supporting the sector are **University of Bari**, with 2 specialized faculties: Agronomic Faculty (covering all the main food chains, such as diary products, meat, vegetables, cereals), Biotechnology, Animal safety and wellbeing, the **University of Foggia** has the Agronomic Faculty and the Food Technology Faculty. These are the big poles where research groups work in strict conjunction with enterprises and other international institutions to develop new processes and support innovation.

The **Polytechnic of Bari** and **University of Salento** participate at this process too developing collateral curricula such as process engineering, managing engineering, electronic engineering, developing knowledge on industrial processes or applications useful to the agrofood transformation and industry (i.e. develop of finger print, RFID applications, etc.). The economical faculties belonging to University of Bari and University of Foggia and University of Salento complete this system providing economic analysis or studies on the sector, developing economic topics also related to agro-food innovation, and providing academic curricula useful in this sector. The same role is being played by the private university, the LUM, which develops curricula in the economic and management area.

RTD entities represent a solid point of reference in the Apulian scenario: they are active in researches useful for the entire productive system, supporting the food and feed chain according to EU strategies and national and regional policies, thus permitting the creation of a common growth of innovation with enterprises. Many Apulian research institutes belong to CNR – National Research Council of Italy – and gives support to the agrifood research system, developing advance research to those aspects related to food production or to plants.

CNR ISPA - Institute of Science of Food Production belongs to National Research Center of Italy (CNR) and is the major public research institute in Apulia specialized in food research, with its national headquarters in Bari and a branch in Lecce. It represents one of the most important research center in Italy and in Apulia, with its long time research and advanced knowledge in food and feed safety and food quality. The CNR ISPA employees more than 100 researchers, has high equipped laboratories (chemical, microbiologic, quality control labs) and international experience being partner or coordinator of several international projects.

Other CNR institutes are also included in the analysis (IGV – IVV) and presented in the table below.

The **Agricultural Research Council (CRA**) is a national research organization which operates under the supervision of the Italian Ministry of Agricultural, Food and Forestry Policies (MiPAF), with general scientific competence within the fields of agriculture, agro-industry, food, fishery and forestry. CRA gathers together the experience of 15 Centers and 32 Research Units organized in 5 Departments (i.e. Vegetal Biology and Production; Animal Biology and Production; Transformation and Valorization of Agro-Industrial Products; Agronomy, Forestry and Land Use; Quality, Certification and Reference). In Apulia the CRA is present with some branches specialized in wine and cereals.

CRSA (Sperimental Research Center for Agriculture) operates in the field of applied research to agriculture, in particular developing new methods or processes for improving grape cultivars and wine transformation processes. This center is participated by Apulia Region, Municipalities of Locorotondo and Cisternino, Province of Bari and Taranto, University of Bari – Faculty of Agronomy, SMEs, Consortium too and represent an example of public-private experience to support innovation in a specific area and in a specific sector (wine and enology). The Center is closed to a Professional Training Institute specialized in enology and wine processing.

The key regional entities in support of food RTD and innovation include:

- Academic and research entities;
- Business support entities;
- Innovation and technology transfer entities;
- Funding institutions.

2.3 KEY INFORMATION FROM THE PROFILING OF THE REGIONAL RESEARCH ENTITIES

The key information from the profiling of the regional RTD entities are presented in a tabular format as below:

Full official name of entity and	Typology	Food related key research areas	Knowledge based services offered	Number of current international and national projects (last 5 years)	Number of Personnel	Number of Patents and Spin off companies	Number of international and national publications (last 5 years)
Institute for chemical and physical processes (IPCF)	*Research Institute*		None	*-National*:1	Research staff permanent :8 Research staff – temporary: 8 Technical staff:3 Administrative staff: 2		-International :13 - National : 1
Institute of Plant Genetics (IGV)	*Research Institute*	- General research on agriculture production and technology	-Varietal seed bank for exchange with free public (universities, local authorities and EPR) and private (private research and seed industries) institutions. -Creation, management and integration of biological genetic and -Biomorphological databases -Artichoke: evaluation genetic of variability and isolation of polyphenol synthesis genes, characterization and expression of genes coding for enzymes of phenylpropanoid pathways, microRNA, genomics -Legumes: isolation, characterization and biological properties of protease inhibitors Bowman-Birk type, study and valorization of local ecotypes -Wheat: characterization, selection, pre-breeding and development of new varieties -Preparation of a DNA Bank, integrated with the seeds bank and the living collections available at the IGV -Developing a platform to provide tools and services to strategic IGV C.N.R. project (commessa) -Development of molecular markers to describe genetic variability, varietal identification, traceability and fraud protection -Technological tests on semen quality and flour for	- *International: 4* *-National: 4*	Research staff permanent :20 Research staff – temporary: 6 Technical staff:18 Administrative staff: 4		-International :35

Full official name of entity and	Typology	Food related key research areas	Knowledge based services offered	Number of current international and national projects (last 5 years)	Number of Personnel	Number of Patents and Spin off companies	Number of international and national publications (last 5 years)
			industrial use -Methods for assessment of biological diversity in agricultural environments and confined field -Educational visits to schools of every order and degree				
Institute of Biomembrane and Bioenergetics (IBBE)	*Research Institute*	- Protection of soil and groundwater - General research on protection and improvement of human health - Nutrition and food hygiene -Manufacture of food beverage - Biological SCIENCE	- Data Bank -Software tool		Research staff permanent :24 Research staff – temporary: 0 Technical staff:7 Administrative staff: 3	Patents: 1	International: 37
Water Research Institute (IRSA)	*Research Institute*	- Protection of ambient water - Protection of soil and groundwater -Earth and related science	- Visit to experimental plants; - Characterization of polluted sites - Chemical analysis of solid and liquid samples - Consultancy on water resources management plans	*International: 6* *National: 1*	Research staff permanent :60 Research staff – temporary: 38 Technical staff:36 Administrative staff:		International: 18
Institute for Plant Protection (IPP)	*Research Institute*	- General research on agriculture production and technology - Crops	-Analysis of nematodes, nematicides essays and products for biological control -Identification of Longidoridae nematodes and soil analysis in pre or post-implantation for the diagnosis of nematodes virus vectors of the screw, sequencing microorganisms -Assessment of the degree of resistance of cultivated varieties and essays on tolerance / resistance to nematodes -biochemical analysis -Identification of microorganisms in the soil, root-knot nematode on Solanaceae, and cyst nematodes	- *International: 1* *-National: 4*	Research staff permanent :19 Research staff – temporary: 2 Technical staff:8 Administrative staff: 1	Patents: 1	- International:122

Full official name of entity and	Typology	Food related key research areas	Knowledge based services offered	Number of current international and national projects (last 5 years)	Number of Personnel	Number of Patents and Spin off companies	Number of international and national publications (last 5 years)
			and foliar -Analysis of genes of interest for the protection of plants and plant disease diagnostics				
Institute of Marine Sciences (ISMAR)	*Research Institute*	- Protection of ambient water - Fishing and fish-farming	-Control on fish production -Control on experimental fishing vessel -Algal strains supply -Cooperation with Public Administrations for coastal areas management	- *International: 1* *-National: 4*	Research staff permanent :7 Research staff – temporary: 2 Technical staff:4 Administrative staff: 5	Patents: 2	International: 13
Institute of Sciences of Food Production (ISPA- LE)	*Research Institute*	- Food technology - Manufacture of food products and beverages - General research on agriculture production and technology	-Selection/ Characterization of microrganism for wine industry-Selection/ Characterization of microrganism for dairy industry -Molecular characterization of plant germplasm	*-National: 4*	Research staff permanent :13 Research staff – temporary: 5 Technical staff:3 Administrative staff: 2		International: 31
Institute of Sciences of Food Production (ISPA- BA)	*Research Institute*	- General research on protection and improvement of human health - Nutrition and food hygiene - General research on agriculture production and technology - Food technology - Manufacturing and processing techniques	- Training course on detection techniques for mycotoxins and toxigenic fungi in the food chain - Analysis of mycotoxins in various agri-food products - Supplying typical cultures of fungi of phytopathological, mycotoxicological and agri-food interest - Visits to experimental farms and to demonstration catalogue plots with horticultural plants and fruit trees	- *International: 11* *-National: 8*	Research staff permanent :37 Research staff – temporary: 26 Technical staff:15 Administrative staff: 4	Patents: 10	International: 258 National: 106
Institute of Sciences of Food Production (ISPA- TO)	*Research Institute*	- General research on protection and improvement of human health - Animal products - Fishing and fish-farming	-Protein sequencing and protein identification -Animal production trials -Chemical and biochemical characterization of food and feed	- *International: 1* *-National: 1*	Research staff permanent :11 Research staff – temporary: 3 Technical staff:3 Administrative staff: 1		International: 25
Institute of Sciences of Food	*Research Institute*	- Nutrition and food hygiene - General research on	- Bacterial collection for exchange with free public (universities, local authorities and EPR) and private	*National: 8*	Research staff permanent :3		International: 17

Full official name of entity and	Typology	Food related key research areas	Knowledge based services offered	Number of current international and national projects (last 5 years)	Number of Personnel	Number of Patents and Spin off companies	Number of international and national publications (last 5 years)
Production (ISPA- MI)		agriculture production and technology - Food technology	(private research and starter industries) institutions Controls on milk, cheese, salami and beer productions Selection of starter cultures for quality cheese		Research staff – temporary: Technical staff: Administrative staff: 1		
Institute of Sciences of Food Production (ISPA- SS)	*Research Institute*	- General research on protection and improvement of human health - Agricultural sciences	-Control of fresh produce quality during the postharvest stage; -Guidance on horticultural produce management during the postharvest stage; -Microbiological identification of fresh produce disease agents; -Quantification of pesticide residue in fresh produce.	- *International: 1* *-National: 6*	Research staff permanent :9 Research staff – temporary: 3 Technical staff:9 Administrative staff: 2		International: 29
Institute of intelligent systems for automation (ISSIA)	*Research Institute*	General research on industrial production and technology	No	National: 1	Research staff permanent :19 Research staff – temporary: 21 Technical staff:3 Administrative staff: 2	Patents: 6	International: 30
Institute of biomedical technologies (ITB)	*Research Institute*	- Biological sciences - Software development	- Design and development of databases of interest Agribusiness - Service sequencing and fragment analysis	National: 4	Research staff permanent :9 Research staff – temporary: 8 Technical staff:1 Administrative staff: 2		National: 100 International: 4
Institute of nanoscience (NNL LE)	*Research Institute*	- General research on protection and improvement of human health	No	- *International: 2* *-National: 2*	Research staff permanent :20 Research staff – temporary: 13 Technical staff:16 Administrative staff: 3	Patents: 24 Spin off: 1	International: 41
Institute of plant virology (IVV BA)	*Research Institute*	- Agriculture Science	- Sanitary selection of germplasm of Mediterranean crops - Diagnosis: indexing, electron microscopy, serology, molecular biology; development of diagnostic reagents and methods -Sanitation of germplasm of mediterranean crops, its conservation under protected conditions and	- *International: 3* *-National: 6*	Research staff permanent :13 Research staff – temporary: 4 Technical staff:2 Administrative staff: 1		International: 31

Full official name of entity and	Typology	Food related key research areas	Knowledge based services offered	Number of current international and national projects (last 5 years)	Number of Personnel	Number of Patents and Spin off companies	Number of international and national publications (last 5 years)
			registration for Certified (virus-free) multiplication				
Agricultural Research Council (CRA-SCA)	*Research Institute*	- Water Supply - Agricultural sciences - Protection of soil and groundwater - Nutrition and food hygiene - General research on industrial production and technology - Crops	- Training on geostatistics - Field days -Agro-meteorological analysis -Crops and cropping systems simulations	- *International: 4* *-National: 2*	Research staff permanent :28 Research staff – temporary: 20 Technical staff:13 Administrative staff: 7		National: 25 International: 30
Agricultural Research Council (CRA-UTV)	*Research Institute*	- General research on agriculture production and technology - Food technology - Agricultural Science	- Service Control and certification of propagating material of the Vite - Materials category Initial and Base	- *National: 16*	Research staff permanent :9 Research staff – temporary: 12 Technical staff:7 Administrative staff:	Patents: 1	- International: 30
Agricultural Research Council (CRA-ZOE)	*Research Institute*	- Nutrition and food hygiene - General research on agriculture production and technology - Animal products - Veterinary medicine - Food technology	-Technical assistance to the sustainable cultivation -Forage production and nutritive value -Quality Forage -Potential production in marginal environments -Characterization flora fodder Gargano area and southern Italy in general -Bacterial uses in agriculture -Enhancement areas marginal for livestock -Intensive forage production	- *National: 1* - *International: 9*	Research staff permanent :4 Research staff – temporary: 2 Technical staff:17 Administrative staff: 3		- International: 20 - National: 9
Department of Bioscience, biotechnology and pharmaceutical sciences (UNIBA)	- *Academic Department*	- General research on agriculture production and technology	- Consultancy for the identification of DNA markers for different species and varieties. - Consultancy for the implementation of breed traceability/trackability systems based on genomic markers in the meat chain - Consultancy for genetic management and conservation of endangered livestock breeds	- *National: 1* - *International: 3*	Research staff permanent :70 Research staff – temporary: 10 Technical staff:31 Administrative staff: 7		International: 20

Full official name of entity and	Typology	Food related key research areas	Knowledge based services offered	Number of current international and national projects (last 5 years)	Number of Personnel	Number of Patents and Spin off companies	Number of international and national publications (last 5 years)
Department of Territorial, Agro-Environmental Sciences (DISAAT UNIBA)	- *Academic Department*	- Food technology - Other research on agricultural production and technology - General research on industrial production and technology - Protection of ambient water - Protection of soil and groundwater - Other research on the environment		- *National: 10* - *International: 7*	Research staff permanent :58 Research staff – temporary: 14 Technical staff:48 Administrative staff: 12	- Patents: 1 - Spin off: 2	- International: 25 - National: 11
Department of Production, Engineering, Mechanical and Applied Economical Science for Agro-Zootechnical Systems (PRIME UNIFG)	- *Academic Department*	- Nutrition and food hygiene - Veterinary medicine - Increasing economic efficiency and competitiveness - Manufacturing and processing techniques - Manufacture of motor vehicles and parts (including agricultural tractors) - Manufacture of food products and beverages		- *National: 12* - *International: 3*	Research staff permanent :18 Research staff – temporary: 22 Technical staff:5 Administrative staff: 4	Patents: 1	- International: 24 - National: 6
Department of Agricultural and Environmental Science, Chemistry and Plant Defence (DiSACD UNIFG)	- *Academic Department*	- Biological sciences - Earth and related sciences	- Committed research and analysis - Varietal discrimination required by the client - Measurement of total antioxidant in foods - Measurement of total antioxidant wheat		Research staff permanent :30 Research staff – temporary: 2 Technical staff:10 Administrative staff: 2		- International: 31 - National: 6

Full official name of entity and	Typology	Food related key research areas	Knowledge based services offered	Number of current international and national projects (last 5 years)	Number of Personnel	Number of Patents and Spin off companies	Number of international and national publications (last 5 years)
Department of Mechanics, Mathematics and Management (DIMEG-POLIBA)	- *Academic Department*	- General research on industrial production and technology - Increasing economic efficiency and competitiveness - Manufacturing and processing techniques		*National: 2*	Research staff permanent :78 Research staff – temporary: Technical staff: Administrative staff: 26	Spin off: 4	
Center for Research and Experimentation in Agriculture "Basile Caramia" (CRSA)	*Research Institute*	-Manufacturing of food products and beverage - Agriculture science	- Test facility for conducting official tests with the field of plant protection products and residues to evaluate the effectiveness of DL No. 194, 17/03/199. - Analysis on wines for export. - implementation and management of the National Citrus Incremental Section - implementation of training activities - Support activities to the Regional Plant Protection Service	*International: 3* *National: 40*	Research staff permanent :5 Research staff – temporary: 11 Technical staff:3 Administrative staff: 5		International: 23 National :73
Mediterranean Agronomic Institute of Bari (IAMB)	*-Other public entity*	- Agriculture Science	-Applied Scientific Research -Biodiversity of pathogens -Virus control -Service programs for the certification of propagation material -Technical Support -Service for health checks to mediterranean Plant Protection Services -Training	*International: 33* *National: 5*	Research staff permanent :19 Research staff – temporary: 40 Technical staff:10 Administrative staff: 18		International: 120
				Total International 125 ***Total National: 90***	***Total numbers*** ***Res. Perm. 591*** ***Res temp. 272*** ***Tech. 272*** ***Admin: 117***	***- Total Patents: 47*** ***- Total Spin off companies: 8***	***- Total International: 1027*** ***- Total National: 337***

The profiling analysis was conducted by addressing **31 RTDs**, whereas **25** entities were finally profiled (80,6%). The low number of RTDs profiled compared to the project's target number follows a merging process of many entities.
Furthermore some difficulties incurred in collecting data even after several contact attempts. The regional dimension prevail (88,0 %) , only 3 RTDs were from outside Apulia as recommended by the project profiling methodology.

The RTDs **staff dimension** on average shows **24,0 permanent researchers** units per entity and **11,3** is the value of **temporary personnel**.
Technical staff average number is **18,9** units per RTD, whereas same data for **Administrative** staff is **4,7**.
The **Research Area**s where the RTDs show more activity, according the NABS classification, are :

- Agricultural sciences,
- Biological sciences,
- General research on agriculture production and technology,
- General research on protection and improvement of human health,
- Nutrition and food hygiene.

The **Productive Sectors** (NACE classification) analysis should be considered applicable only to some institutes, those working and acting directly on improvement and innovation of food products (specifically ISPA, UNIBA UNIFG). The main part of the interviewed entities execute their research on horizontal themes or areas, not directly linked to a single or specific food product (some sectors of biotechnologies, or ICT applications, etc.).
Anyway, the main productive sectors mainly addressed are:

- 15.10 - Production, processing and preserving of meat and meat products
- 15.30 - Processing and preserving of fruit and vegetables
- 15.50 - Manufacture of dairy products
- 15.60 - Manufacture of grain mill products, starches and starch products
- 15.90 - Manufacture of beverages

The data shows **60,0%** of profiled RTDs offering **knowledge- based services** to third parties, while the **68,0%** of them reported **international projects** in the past 5 years, **96,0 %** of Entities profiled have **international journal publications** in the same period and **84,0%** of RTDs reported **international collaborations** with other foreign RTD .
The numbers above mentioned reveal that Apulian RTDs system is at the same time internationally linked from an academic and project activity point of view and territorially embedded with knowledge services offered to third parties also at local level.

The number of registered **patents** by Apulian Agro-food RTDs in the past 5 years is **47** and 36,0% of profiled Entities have reported the existence of at least one patent.
The National Institute for Nanotechnology (CNR-Nano) based in Lecce accounts for more than 50% of the patents total amount followed by the Institute of Science of Food Production (CNR-Ispa) with 10 registred patents in the considered period (15 including the year 2006) and by the CNR-Issia with 6 registered patents.

The **spin-off** companies created in last 5 years in the agro-food sector are **8** which correspond to **19%** of profiled RTDs. The Polytechnic University of Bari accounts for 50% of the spin-off registered including only one spin-off really operating in agro-food sector, followed by the Department of Agro-Environment and Territorial science of Bari University with 2 spin-off companies.

2.4 PRELIMINARY SWOT RESULTS

Please present the preliminary results of the SWOT in a tabular form as in below and provide some short comments:

Strengths	Weaknesses
1. Open exchange of experience in research and technology development (16 responses)	1. Not enough start ups (10 responses)
2. Highly skilled personnel (12 responses)	2. Low size of budget for R&D (9 responses)
3. Public-private cooperation (10 responses)	3. Poor linkage between firms and research entities (7 responses)
4. Strong research base (9 responses)	4. Weak understanding between researchers and industry complicates joint projects (6 responses)
5. Increasing number of collaboration with firms (8 responses)	5. Lack of formal collaboration between actors (5 responses)
Opportunities	**Threats**
1. New R&D European and regional programmes (15 responses)	1. Bureaucracy barriers (16 responses)
2. Networking (14 responses)	2. Funding programmes to support research with content far from current research interests (9 responses)
3. Availability of EU R&D funds for research (12 responses)	3. Failure to attract international researchers (9 responses)
4. Surplus of well educated researchers (6 responses)	4. Brain drain (8 responses)
5. Increasing demand for more/better varieties (4 reponses)	5. Few incentives for university researchers to engage in collaboration with the industry (6 responses)

The low number of spin-off companies is seen by the Apulian RTDs as symptom of weakness together with low size of budget for R&D, weak understanding between researchers and industry, as much as, bureaucracy barriers, research funding programmes with content far from current research interests and failure to attract international researchers are considered are considered obstacles to carrying on properly activities and threats for the future.

On the other side the profiling analysis showed Apulian Agro-food RTDs seeing strengths and opportunities, primarily on networking and exchange of experience in research, presence of highly skilled personnel and availability of Regional and EU R&D funds.

2.5 CONCLUDING REMARKS

Please provide some overall comments on the profiling of the regional research entities

The Apulian agro-food research system is mainly made of public entities, very few are the private RTDs active in the considered field.

The profiling analysis reveal that Apulian RTDs system is at the same time internationally linked from an academic and project activity points of view and territorially embedded with knowledge services offered to third parties also at local level.

The profiled Apulian Agro-food RTDs registered **45** patents in the past 5 years. The National Institute for Nanotechnology (CNR-Nano) based in Lecce accounts for more than 50% of the patents total amount. Even tough not always directly related to it, the high number of **nanotechnologies patents** in the Apulia Region constitutes a critical mass of knowledge in a sector considered high potentially important for the improvement of the agro-food sector. Nanotechnology is predicted to transform the entire food industry, changing the way food is produced, processed, packaged, transported, and consumed[1]. Even tough the future of "nanofood" will depend strongly on whether the traditional food sector and consumers will endorse it. Nonetheless the presence of an important nanotechnology scientific and academic hub at regional level[2], could represents a potential ***smart ability*** for the Apulian territory as a whole and an important *atout* also for the agro-food sector (**cross clustering**).

The Institute of Science of Food Production (CNR-Ispa) registered 10 patents in the considered period (15 including the year 2006) followed by the CNR-Issia with 6 registered patents. As easily predictable the Institute of Science of Food Production patents are the most significant for the agro-food sector, less predictable is the fact that those findings are really relevant for the Apulian territory, giving tools and methodologies to improve the food safety of cereals (important commodity in the local economy) and also input to develop new "functional" foods by processing typical products, such as olives and artichokes (innovation based on analytic knowledge) Those links represent an example of territorially **embedded regional innovation** with R&D institute providing target innovation support aligned to the needs of local industry. An interesting case is the probiotic product line "Vivium" a result of scientific cooperation between (CNR-Ispa) and two companies specialised in processing of vegetable products. Vivium is the result of a technology transfer activity from research to business, funded by the MIUR for the project "Ortobiotici Pugliesi, and it's innovativeness is based on scientific studies and on patents worldwide exclusively licensed by the CRN to the food company group and nationalised in many countries.

The **spin-off companies** created in last 5 years in the agro-food sector are 8 which correspond to 19% of profiled RTDs. The Polytechnic University of Bari accounts for 50% of the spin-off registered including only one spin-off really operating in agro-food sector, followed by the Department of Agro-Environment and Territorial science of Bari University with 2 spin-off companies.

In Apulia the Agro-food Research system seems to be well integrated with territory also thanks to the Regional policies enforcing the cooperation among players (Districts, SMEs, RTDs, Associations,..).

In this wisdom the Region granted **26 networks of research labs** to provide services to local companies by using advanced equipments, integrated methodologies and technologies and promoting joint projects, according to a massive approach.

[1] Source: http://www.nanoforum.org/dateien/temp/nanotechnology%20in%20agriculture%20and%20food.pdf

[2] CNR-Nano Institute in Lecce, CNR Institute of Photonics and Nanotechnologies in Bari, University research and degrees in the biotech and nanotech sector.

The starting "**BIO-NET PTP Apulian network of Research labs**" (2012) represents an example of a cluster based services offered to the Agro-food sector (Biodiversity for the valorisation and safety of Apulian typical food products).

In the past **5 years** many big projects proposed by Apulian RTD jointly with SMEs have been awarded under the National Operating Program Research and Competitiveness 2007-2013 for more than **40 million €**. The rationale of the NOP is economic catch-up of several southern regions of Italy lagging behind. The purpose of the Operating Programs is to promote the competitiveness of the economic system of these regions, and improve the scientific, technological and economical position of the whole country in the international context.

The projects were founded according a **cluster** theme approach in order to avoid waste of economic resources and to create critical mass of money and human capital around a specific theme considered strategic for the territory. The main agro-food chains present in Apulia (diary products; wheat and bakery; meat products; olive oil; grapes and wine) were included in the NOP awarded projects together with specific training programmes entitled to create high specialised profiles in the research sectors related to agro-food and to life-sciences in general.

In conclusion, the Apulia RTD system seems to develop according to the Italian policies and national trends, trying to create valorisation of local products and boost enterprises innovativeness through product development programs, targeted innovation projects and human capital enforcement .
An important role is playing the **regional policies**, coherent with that national framework, which are creating the precondition to facilitate innovation by sustaining the development of the Apulia agro-food sector based on a cluster approach, gathering together all the actors involved (Districts, SMEs, RTDs, Universities, Education and training centres, Associations, consultancy firms, etc..).
The **Apulian Agro-food Research System** registers some excellence points in the applied research well known at international level (i.e. mycotoxins, food safety, post-harvest technologies, dairy products technologies) nonetheless difficulties in project deployment with SMEs emerged and low seems to be the financial resources allocated for R&D.