



**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**

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**Author: Dr. Anagnostis Argiriou**  
**Partner: CErTH/ INAB**

**For further information please contact: Dr. Anagnostis Argiriou**  
**Email: [argiriou@certh.gr](mailto:argiriou@certh.gr)**

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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
ERDF PP5	National Institute of Research & Development for Food Bioresources	IBA	Romania
ERDF PP6	Constanta Chamber of Commerce, Industry, Shipping And Agriculture	CCINA	Romania
ERDF PP7	Development Agency of Idrija and Cerkno	ICRA	Slovenia
ERDF PP8	European Food Chain Parliament-Foodlawment	EEPF	Hungary
10% PP1	Odessa National Academy of Food Technologies	ONAFIT	Ukraine
10% PP2	Chamber of Commerce and Industry of the Republic of Moldova	CCIRM	Republic of Moldova
10% PP3	Institute for Food Technology	FINS	Serbia

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#### **D3.2a- Profiling of regional food research entities**

**Abstract:** The report presents the results of the profiling of the regional research entities focusing to the food sector.

## Project Document Information

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## **EXECUTIVE SUMMARY**

In the framework of WP3- “Analysis of policies and strategies for food innovation” the partners identified the key R&D players (both public and private) in the 9 regions/ countries that are active in the development of research and technology results for the Food sector. A total of 148 entities such as Universities, research institutes as well as SMEs with a strong and relevant R&D profile were profiled. The partners are committed to continue with the mapping exercise at least until the end of the project by utilizing the online facility/ database.

The geographical scope of the exercise was mainly regional; however it was expanded to a national one given the small size of some regions/ countries (Slovenia, Moldova) and the fact that some regions did not exhibit significant presence of agrofood R&D players and it was necessary to examine entities of a national character (e.g. in Pazardjik and Plovdiv, Bulgaria).

The majority of the research entities are active in Food technology; Crop production; Agricultural sciences; Biological sciences; Veterinary medicine; Nutrition and food hygiene.

Below are a few interesting results stemming from the integration and analysis of the questionnaires and reports from the participating SEE regions:

- The majority (~70%) of key agrofood R&D players report that they offer knowledge-based services to third parties, and thus exhibit an initial interest and drive to cooperate with the industry and engage in innovative activities with a view to exploiting their research efforts;
- The large majority (~75%) have reported participation in international research projects in the past 5 years;
- 80% of the examined agrofood R&D entities have reported international journal publications in the past 5 years;
- Approximately 35% have reported the existence of patents stemming from their research activities;
- A small number of spin- off companies has been reported (5 in Italy, 7 in Romania, none in the other regions/ countries).

The general picture is that the majority of the food research entities in the participating SEE countries are already engaged in international research cooperation activities which enable them to enhance their scope, experiences, capacities and research profiles. However, they

exhibit difficulties in materializing their research efforts in products, patents and spin- off companies. We have to acknowledge of course the fact that in general patents for food and drink products are less often that in other economic sectors (e.g. automotive, pharmaceuticals, chemicals, etc.).

In the framework of the profiling of research entities, a preliminary assessment of the Strengths, Weaknesses, Opportunities and Threats of the research capacities of the SEE regions and countries was performed. These results will be further refined in the standard D3.3. SWOT analysis and they will be validated using information and data from various sources.

The information, data and results of the profiling of key agrofood R&D players will be used to enable the matchmaking of research and industry with a view to furthering research cooperation within the region but also trans- regionally and internationally. They will also be utilized for dissemination purposes since they complete the picture of the agrofood research capacities of each region/ country.

# **1. INTRODUCTION, SCOPE AND METHODOLOGY**

## **1.1 INTRODUCTION**

Under activity 3.2a of WP3- “Analysis of policies and strategies for food innovation” the partners identified the key R&D players (both public and private) in the 9 regions/ countries that are active in the development of research and technology results for the Food sector. Entities such as Universities, research institutes as well as SMEs with a strong and relevant R&D profile were primarily targeted. Their profiles, research activities and capabilities and the research results that could potentially be applied to the Food sector were investigated by using questionnaire surveys and processing of existing data. Part for this information will be appropriately compiled in an access restricted web-based database integrated to the project website, (see WP2).

## **1.2 KEY ISSUES FOR THE PROFILING OF RESEARCH ENTITIES**

### **1.2.1 GEOGRAPHICAL SCOPE**

The geographical scope of the RTD entities profiling and analysis is regional, i.e. the region of Central Macedonia in Greece, the region of Puglia in Italy, etc. However it was proven more realistic to address these issues on a national level because of the small size of one country or the fact that innovation policies are quite often drawn at a national level. Therefore, it was suggested that the partners start their mapping and analysis on a regional level moving up to a national level if and when necessary.

The target value of 250 research entities has not been fulfilled yet. Up to the point that this report was compiled a total of 148 research entities were profiled. Admittedly the number of existing food related research entities in the participating SEE regions and countries was overestimated; however there are also other reasons for the smaller that estimated number of profiled research entities, namely:

- The fact that 2 Serbian partners were included as IBA partners in the Application stage, with a full budget and set of responsibilities; however in the contracting process only 1 partner from Serbia was included *as an associated partner* having no budget or adequate resources to undertake a full mapping;
- By the time the overall report had to be compiled, the Hungarian partners did not provide their report and questionnaires.

**The partners are committed to continue with the mapping exercise at least until the end of the project by utilizing the online facility/ database.**

<b>Country</b>	<b>Target number RTD entities to be profiled</b>	<b>RTD entities profiled so far</b>
Greece	50	19
Italy	50	25
Bulgaria	35	33
Romania	35	35
Slovenia	20	8
Hungary	25	-
Serbia	15	14
Ukraine	10	7
Moldova	10	7
<b>Total</b>	<b>250</b>	<b>148</b>

### **1.2.2 ROLE OF EACH PARTNER**

The profiling of RTD entities in Greece was the task of EKETA- INA; in Bulgaria of AUP; in Romania of IBA; in Serbia of FINS. In the other SEE countries it was the responsibility of the sole partner participating in the project.

CERTH- INAB was responsible for setting up the appropriate methodology and tools for the implementation of the activities and for monitoring, integrating and homogenizing the deliverable.

### **1.2.3 METHODOLOGY**

The partners utilised their networks, databases and other sources of information in order to make a first list of the research entities active in food innovation at a regional and national level (see note above about the geographical scope). They identified key persons in the organisations to undertake the profiling. The profiled research organisations were asked to fill in their own questionnaires and the project partners helped them in clarifying certain issues. However, the partners were encouraged to establish direct contacts and interviews with the most important research entities in order to prepare for their more active engagement and involvement in the future project activities.

The model questionnaire used for the profiling of the research entities is presented at the annex.



## 2. REGION OF CENTRAL MACEDONIA, GREECE

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

The Region of Central Macedonia is characterised by a particularly advanced AgroFood sector, both in terms of primary agricultural production, and in regard to the manufacturing sector of the food industry. A significant number of companies with intense exporting character- mainly towards the EU- are active in the region. Among the main challenges the AgroFood sector of Central Macedonia faces is the valid assessment of the technology and know- how needs of the SMEs with regard to the introduction of agro- biotechnologies in the production process. SMEs face competition from foreign companies that have already introduced both biotechnological methods and products. In order to keep up with the competition, SMEs need to proceed with significant investments in technology, keeping close cooperative ties with research institutes and technology providers.



The restructuring of the production processes of the AgroFood industry by exploiting the results of new technology will contribute to the reduction of production costs in the primary agricultural and the secondary manufacturing AgroFood sector; the rationalization of the production processes, the transportation of goods, the critical point control; and the standardization of products and the improvement of the quality of products through the implementation of innovative techniques, diversification of products according to consumer needs, control and standardization.

The region accounts to approximately 21% of the national output of agriculture. Cereals, industrial crops, fruits and animal products are of particular importance for the regional economy and compared to the national averages. Without doubt, the favourable geographical position of the Region of Central Macedonia is a strong advantage along with the significant Greek investing activity in the Balkan area. Nevertheless the Region has not yet developed a clear productive identity at an international level nor has it secured an immediate access to the big Central European markets for its products and services<sup>1</sup>. Despite the fact that the Region features a large variety of agricultural products of critical mass and strong local agricultural specialisation, the primary agricultural sector is falling behind when it comes to its linkages and relationships with technology and innovation, food manufacturing, certification, standardisation, trade and commerce.

The food and beverages manufacturing industry in the region of Central Macedonia accounts for a significant part of the economy. A significant number of companies with intense exporting character are active in the region. The food companies of the region constitute around 14% of the total number of food industries in Greece; they provide 26% of the employment in the region's industry. Similarly the beverage companies of the region constitute around 14% of the total number of beverage industries in Greece and provide 2.8% of the employment in the region's industry.

Food manufacturing has until recently accounted for a significant portion of the economy. Nowadays it follows a declining course which is intensified by the global financial and economic crisis. The competitiveness deficit of the secondary sector is among others the result of delays in the implementation of basic infrastructure for the traffic of goods, the unfavourable administrative and investing environment.

The food and drink sector in the Region of Central Macedonia is a traditional economic sector. The majority of the companies are small and medium- sized; many are family owned. Most of the companies lack the strategic vision and the resources to invest in Research and Development. R&D investment of food and drink manufacture has traditionally been relatively low in comparison to other industries.

The food and drink sector is exposed to European and international competition from companies that offer more competitive prices and/ or products with significant added- value. In order to keep up with the competition, SMEs need to push forward with significant innovation and technology investments in cooperation with research institutes and technology providers.

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<sup>1</sup> Adapted from the "Operational Plan for the Region of Central Macedonia 2012- 2014- Strategic Planning", August 2011, <http://goo.gl/7OY6M>.

The main challenges for the food industry (*Source: “Operational Plan for the Region of Central Macedonia 2012- 2014- Strategic Planning”*) are:

- The development of favourable, viable and operational synergies between the primary agricultural sector and the secondary food manufacturing sector;
- The restructuring and rationalisation of the production processes;
- The reduction of the production cost in the primary agricultural and the secondary manufacturing AgroFood sector;
- The standardisation of products and the enhancement of their quality;
- The diversification of products according to consumer needs;
- The valid assessment of the technology and know- how needs of the SMEs with regard to the adoption of innovation and technological solutions;
- The enhancement of cooperation between food industry and research entities;
- The increase in the demand, use and finance of research and innovation projects.

## **2.2 SHORT DESCRIPTION OF THE REGIONAL RESEARCH AND INNOVATION FRAMEWORK**

### **Regional innovation policy framework**

Until the Kallikratis plan of January 2011 (aiming at the restructuring of the decentralised administration and the reduction of the number of municipalities), regions in Greece had limited administrative and budgetary autonomy. The latest reform increases the autonomy of the region by transferring powers from central government to the regional authorities. The scope of the powers transferred has not yet been fully determined but is almost certain to include the overall development strategy of the Regions and potentially the RTDI sector.

Until now the common practice has been for regional authorities to cede part of the regional budget to GSRT, which launched common calls for more regions, under the precondition that an equal amount of money would be directed to the regions for funding RTDI actions through GSRT's programmes. However, the problem with the involvement of the region's innovation policy making was not mainly the lack of authority and of financial resources but the lack of capacity and capability in policy making.

Thus, in practice the design of RTDI measures is actually done by General and Special Secretariats of the corresponding Ministries, while the monitoring of the measures of the Regional Operational Programmes (2007-2013) for the 13 Regions is the responsibility of the Intermediate Managing Authority (IMA) of the corresponding Region.

### **Agricultural Research funding in Greece**

The past all funding originated from the Ministry of Agriculture. Now days more than 80% of funding comes from specific competitive research projects. The leverage has moved from the ministry of Agriculture and food to the ministry of Development through the Secretariat of Research and Technology. In the mean time the Ministry of Agriculture has expanded its activities and now is named Ministry of Rural Development and Food. In this way the cooperation between public sectors (Universities – Research Institutes) as well as with the private companies is a necessity. This shift has already a significant impact on effectiveness. In the last few years although financing was almost the same effectiveness of Greek research in general and that for agricultural enterprises increased. The total public research expenditure in Agricultural production and technology does not exceed 6% of the total public spending in research and development.

The main founders of public agricultural research, supporting the various research units on a competitive basis are:

- The Ministry of Rural Development and Food is a minor founder although is the body determining the agricultural research policy.
- The main research founder is the General Secretariat of Research and Development of the Ministry of development following rules and priorities set by EU.
- The Ministry of Education and Religious Affairs is funding independently research conducted in the various university laboratories, not necessarily following the priorities set by of the Ministry of Rural Development and Food.
- The Ministry of Interior is funding through the Prefectures for specific local interests problems.
- Several other partially public organizations, foundations and companies are also funding agricultural research in Greece, such as the Public Power Corporation S.A. and the State Scholarships Foundation.
- The private research is limited to few only companies which supply the Greek market mainly with reproductive plant materials and technology for food production.

## 2.3 KEY INFORMATION FROM THE PROFILING OF THE REGIONAL RESEARCH ENTITIES

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	No. of international publications (last 5 years)
1.Hellenic Health Foundation (HHF)	Research Institute	-Research on protection and improvement of human health -Nutrition epidemiology, Public health Nutrition, Traditional foods, Mediterranean Diet, Diet and Elderly, Eating out habits Cancer Chronic Diseases	-Nutrition -Diet -Epidemiology	-International:2 -National:2	-Research staff permanent: researchers of the Dept of Epidemiology, Harvard School of Public Health and the Dept. of Hygiene, Epidemiology and Medical Statistics of the Medical School of Athens -Research staff temporary: 25 -Technical Staff:4  -Administrative staff: 6	-	11
2.Fisheries research institute - fish processing lab.(FRI)	Research Institute (ELGO - NAGREF - FISHERIES RESEARCH INSTITUTE)	-Studies on chemical pollutants in fish and fish products -Studies on PUFAs in seafood -Studies on processing and preserving of fish products -Identification of fish species and traceability in the fish market -Aquaculture nutrition	-Collaboration between FRI and local fish industries in the frame National and European Research projects -Quality controls on fishery products -Educational seminars aiming further education of the industry – workers -Identification of fish species for retailers -Advise and technology transfer to the aquaculture industry	-International:2  -National:1	-Research staff permanent:5 -Research staff temporary: 2 -Technical Staff:15  -Administrative staff: 6	-	18
3. Laboratory of Milk Hygiene and Technology / School of Veterinary	Academic Department			-National:1	-Research staff permanent:2 -Research staff temporary: 1		2

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	No. of international publications (last 5 years)
Medicine					-Technical Staff:1 -Administrative staff: 1		
4. Laboratory of Hygiene of Foods of Animal Origin / School of Veterinary Medicine	Academic Department			-National:1	-Research staff permanent:4 -Research staff temporary: 1 -Technical Staff: 0 -Administrative staff: 1		2
5. Laboratory of Animal Husbandry, School of Veterinary Medicine, Auth (LAHVET)	Academic Department	-Veterinary Medicine (Production, processing and preserving of meat and meat products)	-Contracts with several farm unions to provide veterinary support and management advice for their farms. -Contracts with private companies either pharmaceutical or food processing unit to provide consulting and strategic planning.	-International:3 -National:1	-Research staff permanent:3 -Research staff temporary: 7 -Technical Staff: 0 -Administrative staff: 1	-Patents: 5	3
6. Centre for Research and Technology Hellas – Institute of Applied Biotechnology (CERTH-INAB-FBPT)	Research Institute	-Study of the metabolic pathway of glucosinolate synthesis in cruciferous plants -Effect of methylation and Histone Deacetylase inhibitors on quality characteristics of crops -Terpenoid synthesis in Salvia -Production of high value secondary metabolites in yeast systems	-Construction of cDNA libraries -Expression of metabolic compounds in yeast -Yeast two hybrid analysis	-International:1	-Research staff permanent:2 -Research staff temporary: 8 -Technical Staff: 1 -Administrative staff: 1		
7. 3RD MILITARY	Other public entity	-Analysis of food products of	Education of students of	-National:1	-Research staff		

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	No. of international publications (last 5 years)
VETERINARY HOSPITAL(3RD KNO)		<i>animal and plant origin, water analysis</i> <i>-Inspection of food industries</i>	<i>school of agricultural and veterinary medicine</i>		<i>permanent:17</i> <i>-Research staff</i> <i>temporary: 0</i> <i>-Technical Staff: 1</i>  <i>-Administrative staff: 4</i>		
8. Natural Resources and Renewable Energies Laboratory (NRRE Laboratory)	Research Institute	-Pomegranate Industry wastes handling through modern membrane techniques for high added value products recovery -Grape marc handling for high added value products recovery and bioethanol production -Olive Industry waste waters handling through modern membrane techniques for high added value products recovery		-National:3	-Research staff <i>permanent:2</i> -Research staff <i>temporary: 12</i> -Technical Staff: 3  -Administrative staff: 1		1
9. Agricultural Faculty – Department of animal Production	Research Institute	-Agricultural sciences (-Production, processing and preserving of meat and meat products -Processing and preserving of fish and fish products)	-Animal Genotyping -Visits to experimental farms -Tests on animal products -Embryo and sperm conservation	-International:1	-Research staff <i>permanent:14</i> -Research staff <i>temporary: 0</i> -Technical Staff: 4  -Administrative staff: 4		26
10. Institute of Technology of Agricultural Products (ITAP)	Research Institute (National Agricultural Research Foundation) (N.AG.RE.F.)	-Food technology (-Production, processing and preserving of meat and meat products -Processing and preserving of fish and fish products	-Aseptic packaging of fruit and vegetables purees and diced products -Shelf life determination of food products (salads, fish, meat, dairy) using new technologies; i.e. Modified	-International:9 -National:4	-Research staff <i>permanent:8</i> -Research staff <i>temporary: 2</i> -Technical Staff: 16  -Administrative staff: 9	-Patents: 1	28



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	No. of international publications (last 5 years)
11. MAICH-CIHEAM / Food Quality and Chemistry of Natural Products (MAICH-CIHEAM / FQC)		-Manufacture of dairy products)	Atmospheres Packaging (MAP), High Hydrostatic Pressure (HHP) -Development of models for pathogenic and spoilage microorganisms inactivation -Scientific and technological support to food industry, agricultural cooperatives, Ministry of Agriculture -Physicochemical and microbiological analyses for the food industry -Organoleptic evaluation -Genetic identification analyses				
	Research Institute	-Agricultural sciences -Other research on agricultural production and technology (-Manufacture of food products, beverages and tobacco)	-ISO 17025 quality analyses for food products - Applied research adjudicated by the industry	-International:3 -National:7	-Research staff permanent:2 -Research staff temporary: 0 -Technical Staff: 2  -Administrative staff: 1		35
	Research Institute	-Agricultural sciences -Protection of soil and groundwater -General research on agriculture production and technology -Increasing economic efficiency and competitiveness -Manufacture of food products and beverages (-Processing and preserving	-Farm management consultation -Dissemination of Good agricultural practices to farmers -Olive oil quality testing -Visits to experimental farms	-International:17 -National:5	-Research staff permanent:11 -Research staff temporary: 8 -Technical Staff: 15  -Administrative staff: 9		37
12.NATIONAL AGRICULTURAL RESEARCH FOUNDATION – Institute of Olive trees and Subtropical plants (N.AG.RE.F)							



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	No. of international publications (last 5 years)
13.Department of food technology (DFT)	Technical University	of fruit and vegetables -Manufacture of vegetable and animal oils and fats)					
		-Water Supply -Protection of ambient water -Protection of soil and groundwater -Nutrition and food hygiene -General research on agriculture production and technology -Animal products -Crops -Food technology (-Production and preserving of meat - Production and preserving of poultry meat - Production of meat and poultry meat products -Processing and preserving of fruit and vegetables)		-International:2 -National:5	-Research staff permanent:18 -Research staff temporary: 18 -Technical Staff: 8  -Administrative staff: 3	Patents:1	31
14. Food and Beverage Production and Technologies (CERTH/INA)	Research Institute (Centre for Research and Technology Hellas – Institute of Applied Biosciences	-Nutrition and food hygiene -General research on agriculture production and technology  (-Study of the metabolic pathway of glucosinolate synthesis in cruciferus plants -Effect of methylation and	-Construction of CDNA libraries -Expression of metabolic compounds in yeast -Yeast two hybrid analysis -Genomics and Transcriptomics -Traceability of Food products using Molecular methods	-International:2 -National:2	-Research staff permanent:2 -Research staff temporary: 9 -Technical Staff: 2  -Administrative staff: 0		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	No. of international publications (last 5 years)
15. CERTH-INA/ Plant Technologies and Germplasm Propagation Unit (CERTH/INA)		Histone Deacetylase inhibitors on quality characteristics of crops -Terpeneoid synthesis in Salvia -Production of high value secondary metabolites in yeast systems -Traceability of Food products using Molecular Methods)					
	Research Institute	-General research on agriculture production and technology -Crops -Other research on agricultural production and technology -Agricultural sciences	-GMO Detection -Germplasm micropropagation -Grafted vegetables -Gene silencing technologies	-International:1 -National:3	-Research staff permanent:2 -Research staff temporary: 4 -Technical Staff: 1  -Administrative staff: 1		11
16. CERTH - Biodiagnostic Technologies	Research Institute (Center for Research and Technology Hellas- Institute for Agrobiotechnology y CERTH-INA)	-General research on protection and improvement of human health -Veterinary medicine (-Identification of SNPs associated with resistance/ susceptibility to scrapie -Genotyping of sheep and goats for susceptibility to prion diseases -BSE transmission studies (fish))	-SNP genotyping	-International:4 -National:1	-Research staff permanent:1 -Research staff temporary: 3 -Technical Staff: 1  -Administrative staff: 1	Patents:1	7

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	No. of international publications (last 5 years)
17. Computational Genomics Group	Research Institute (Centre for Research and Technology Hellas – Institute of Agrobiotechnology)		-Custom Databases -Analysis of gene interactions	-International:3	-Research staff permanent:1 -Research staff temporary: 7 -Technical Staff: 0  -Administrative staff: 0		6
18.DEMOCRITUS UNIVERSITY OF THRACE, DEPARTMENT OF MOLECULAR BIOLOGY & GENETICS, APPLIED MICROBIOLOGY AND MOLECULAR BIOTECHNOLOGY RESEARCH GROUP (MBG-DUTH)	Academic Department	Food technology (Probiotics & prebiotics, alcoholic beverages production)	-Food Bioprocessing - Visits to food industrial plants	-National:6	-Research staff permanent:2 -Research staff temporary: 3 -Technical Staff: 0  -Administrative staff: 0	Patents:1	23
19. Faculty of Veterinary Science - University of Thessaly	Academic Department	-Food technology - Veterinary medicine (The antioxidant effect of essential oils in foods of animal origin / The antimicrobial effect of essential oils against food borne pathogens in foods of animal origin / Aflatoxins /		-International:1 -National:10	-Research staff permanent:3 -Research staff temporary: 0 -Technical Staff: 0  -Administrative staff: 0		10

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	No. of international publications (last 5 years)
		<i>The behaviour of STEC, Salmonella or other foodborne pathogens in foods of animal origin)</i>					
				<b>- Total International:51</b> <b>- Total National:53</b>	<b>Total number of personnel:332</b>	<b>- Total Patents:9</b> <b>- Total Spin off companies:0</b>	<b>268</b>

Code	Question	Value	Percentage % (unless otherwise indicated)
-	How many research entities were initially contacted for profiling, i.e. how many questionnaires were sent out?	30	
-	How many research entities were finally profiled?	19	63% (profiled/ contacted)
-	How many research entities were regional?	13	68%
-	How many research entities were from outside the region?	6	32%
A9, A10	What is the average research staff of the entities (permanent and temporary)?	11	-
A11, A12	What is the average of the entities technical and administrative staff?	~6.5	-
B2	Which are the Top 5 Research areas that the research entities reported they were active at?	-Food technology -Agricultural sciences -Veterinary medicine -General research on agriculture production and technology - Nutrition and food hygiene	
B2	Which are the Top 5 Sectors that the productive sectors reported they were active at?	-Production, processing and preserving of meat and meat products -Processing and preserving of fish and fish products -Processing and preserving of fruit and vegetables -Manufacture of beverages - Manufacture of vegetable and animal oils and fats	
B3	How many research entities have reported that they offer knowledge- based services to third parties?	14	74%
C1	How many research entities have reported international projects in the past 5 years?	14	74%
D1	How many research entities have reported international journal publications in the past 5 years?	17	89%
D2	How many research entities have reported the existence of patents?	5	26%
D2	If so, how many patents were reported?	9	n/a
D3	How many research entities have reported the existence of spin- off companies?	0	0%
D3	If so, how many spin- off companies were reported?	-	-
E1	How many research entities have reported international collaborations in general?	5	27%
F1	Shortly describe the existing and possible future services offered to food companies	-Research regards the development of innovative products -Advisory and support services to dairy companies -Food Microbiology -Chemistry -Manufacture of food products and beverages	

## 2.4 PRELIMINARY SWOT RESULTS

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>1. Highly skilled personnel (15)</li> <li>2. Strong research base (15)</li> <li>3. Public-private cooperation (10)</li> <li>4. Open exchange of experience in research and technology development (7)</li> <li>5. Increasing number of collaboration with firms (7)</li> </ul>	<ul style="list-style-type: none"> <li>1. Low size of budget for R&amp;D (15)</li> <li>2. Not enough start ups (5)</li> <li>3. Poor linkage between firms and research entities (4)</li> <li>4. Weak understanding between researchers and industry complicates joint projects (2)</li> <li>5. Other (2)</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>1. New R&amp;D European and regional programmes (16)</li> <li>2. Networking (11)</li> <li>3. Availability of EU R&amp;D funds for research (10)</li> <li>4. Surplus of well educated researchers (6)</li> <li>5. Other (2)</li> </ul>	<ul style="list-style-type: none"> <li>1. Bureaucracy barriers (11)</li> <li>2. Failure to attract international researchers (9)</li> <li>3. Brain drain (7)</li> <li>4. Few incentives for university researchers to engage in collaboration with the industry (7)</li> <li>5. Funding programmes to support research with content far from current research interests (6)</li> </ul>

## 2.5 CONCLUDING REMARKS

Below are some key comments from the profiling of the research entities in the region of Central Macedonia:

- The majority of the profiled research entities are active in Food technology; Agricultural sciences; Veterinary medicine; General research on agriculture production and technology; Nutrition and food hygiene;
- The key productive sectors they are active at are Production, processing and preserving of meat and meat products; Processing and preserving of fish and fish products; Processing and preserving of fruit and vegetables; Manufacture of beverages; Manufacture of vegetable and animal oils and fats;
- The majority (~73%) of key agrofood R&D players report that they offer knowledge-based services to third parties, and thus exhibit an initial interest and drive to cooperate with the industry and engage in innovative activities with a view to exploiting their research efforts;
- The large majority (~74%) have reported participation in international research projects in the past 5 years;
- Almost 90% of the examined agrofood R&D entities have reported international journal publications in the past 5 years;
- Approximately 26% of the profiled entities have reported the existence of patents stemming from their research activities;
- No spin- off company has been reported.

In general, it is noted that profiled research entities from Central Macedonia are as they reported successful in participating in international projects which allow them to gain experiences and enhance their capacities; however they score lower with regards to the production of patented products and the creation of spin- off companies. In other words, the commercialization of research results is a weak point which calls for attention and support.

As for the key results of the preliminary SWOT analysis, we note the following key S, W, O and T aspects:

- Key Strengths: Highly skilled personnel and Strong research base;
- Key Weaknesses: Low size of budget for R&D;
- Key Opportunities: New R&D European and regional programmes and Networking;
- Key Threats: Bureaucratic barriers and Failure to attract international researchers.

### **3. REGION OF APULIA, ITALY**

#### **3.1 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<sup>2</sup>, 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 dairy industry, coffee and meat transformation (Bank of Italy 2011).

### **3.2 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 dairy 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.

### 3.3 KEY INFORMATION FROM THE PROFILING OF THE REGIONAL RESEARCH ENTITIES

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 industrial use -Methods for assessment of biological diversity in	- 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)
Institute of Biomembrane and Bioenergetics (IBBE)	Research Institute	<ul style="list-style-type: none"> <li>- Protection of soil and groundwater</li> <li>- General research on protection and improvement of human health</li> <li>- Nutrition and food hygiene</li> <li>- Manufacture of food beverage</li> <li>- Biological SCIENCE</li> </ul>	agricultural environments and confined field -Educational visits to schools of every order and degree - 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	<ul style="list-style-type: none"> <li>- Protection of ambient water</li> <li>- Protection of soil and groundwater</li> <li>-Earth and related science</li> </ul>	<ul style="list-style-type: none"> <li>- Visit to experimental plants;</li> <li>- Characterization of polluted sites</li> <li>- Chemical analysis of solid and liquid samples</li> <li>- Consultancy on water resources management plans</li> </ul>	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	<ul style="list-style-type: none"> <li>- General research on agriculture production and technology</li> <li>- Crops</li> </ul>	<ul style="list-style-type: none"> <li>-Analysis of nematodes, nematocides essays and products for biological control</li> <li>-Identification of Longidoridae nematodes and soil analysis in pre or post-implantation for the diagnosis of nematodes virus vectors of the screw, sequencing microorganisms</li> <li>-Assessment of the degree of resistance of cultivated varieties and essays on tolerance / resistance to nematodes</li> <li>-biochemical analysis</li> <li>-Identification of microorganisms in the soil, root-knot nematode on Solanaceae, and cyst nematodes and foliar</li> <li>-Analysis of genes of interest for the protection of plants and plant disease diagnostics</li> </ul>	- International: 1 -National: 4	Research staff permanent :19 Research staff – temporary: 2 Technical staff:8 Administrative staff: 1	Patents: 1	- International:1 22

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 of Marine Sciences (ISMAR)	Research Institute	<ul style="list-style-type: none"> <li>- Protection of ambient water</li> <li>- Fishing and fish-farming</li> </ul>	<ul style="list-style-type: none"> <li>-Control on fish production</li> <li>-Control on experimental fishing vessel</li> <li>-Algal strains supply</li> <li>-Cooperation with Public Administrations for coastal areas management</li> </ul>	<ul style="list-style-type: none"> <li>-</li> <li>International: 1</li> <li>National: 4</li> </ul>	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	<ul style="list-style-type: none"> <li>- Food technology</li> <li>- Manufacture of food products and beverages</li> <li>- General research on agriculture production and technology</li> </ul>	<ul style="list-style-type: none"> <li>-Selection/ Characterization of microorganism for wine industry-Selection/ Characterization of microorganism for dairy industry</li> <li>-Molecular characterization of plant germplasm</li> </ul>	<ul style="list-style-type: none"> <li>-National: 4</li> </ul>	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	<ul style="list-style-type: none"> <li>- General research on protection and improvement of human health</li> <li>- Nutrition and food hygiene</li> <li>- General research on agriculture production and technology</li> <li>- Food technology</li> <li>- Manufacturing and processing techniques</li> </ul>	<ul style="list-style-type: none"> <li>- Training course on detection techniques for mycotoxins and toxigenic fungi in the food chain</li> <li>- Analysis of mycotoxins in various agri-food products</li> <li>- Supplying typical cultures of fungi of phytopathological, mycotoxicological and agri-food interest</li> <li>- Visits to experimental farms and to demonstration catalogue plots with horticultural plants and fruit trees</li> </ul>	<ul style="list-style-type: none"> <li>-</li> <li>International: 11</li> <li>National: 8</li> </ul>	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	<ul style="list-style-type: none"> <li>- General research on protection and improvement of human health</li> <li>- Animal products</li> <li>- Fishing and fish-farming</li> </ul>	<ul style="list-style-type: none"> <li>-Protein sequencing and protein identification</li> <li>-Animal production trials</li> <li>-Chemical and biochemical characterization of food and feed</li> </ul>	<ul style="list-style-type: none"> <li>-</li> <li>International: 1</li> <li>National: 1</li> </ul>	Research staff permanent :11 Research staff – temporary: 3 Technical staff:3 Administrative staff: 1		International: 25
Institute of Sciences of Food Production (ISPA- MI)	Research Institute	<ul style="list-style-type: none"> <li>- Nutrition and food hygiene</li> <li>- General research on agriculture production and technology</li> <li>- Food technology</li> </ul>	<ul style="list-style-type: none"> <li>- Bacterial collection for exchange with free public (universities, local authorities and EPR) and private (private research and starter industries) institutions</li> <li>Controls on milk, cheese, salami and beer productions</li> </ul>	<ul style="list-style-type: none"> <li>National: 8</li> </ul>	Research staff permanent :3 Research staff – temporary: Technical staff:		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)
Institute of Sciences of Food Production (ISPA- SS)	Research Institute	- General research on protection and improvement of human health - Agricultural sciences	Selection of starter cultures for quality cheese -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	Administrative staff: 1 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 registration for Certified (virus-free) multiplication	- 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)
Agricultural Research Council (CRA-SCA)	Research Institute	<ul style="list-style-type: none"> <li>- Water Supply</li> <li>- Agricultural sciences</li> <li>- Protection of soil and groundwater</li> <li>- Nutrition and food hygiene</li> <li>- General research on industrial production and technology</li> <li>- Crops</li> </ul>	<ul style="list-style-type: none"> <li>- Training on geostatistics</li> <li>- Field days</li> <li>- Agro-meteorological analysis</li> <li>- Crops and cropping systems simulations</li> </ul>	<ul style="list-style-type: none"> <li>- International: 4</li> <li>- National: 2</li> </ul>	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	<ul style="list-style-type: none"> <li>- General research on agriculture production and technology</li> <li>- Food technology</li> <li>- Agricultural Science</li> </ul>	<ul style="list-style-type: none"> <li>- Service Control and certification of propagating material of the Vite</li> <li>- Materials category Initial and Base</li> </ul>	<ul style="list-style-type: none"> <li>- National: 16</li> </ul>	Research staff permanent :9 Research staff – temporary: 12 Technical staff:7 Administrative staff:	Patents: 1	- International: 30
Agricultural Research Council (CRA-ZOE)	Research Institute	<ul style="list-style-type: none"> <li>- Nutrition and food hygiene</li> <li>- General research on agriculture production and technology</li> <li>- Animal products</li> <li>- Veterinary medicine</li> <li>- Food technology</li> </ul>	<ul style="list-style-type: none"> <li>- Technical assistance to the sustainable cultivation</li> <li>- Forage production and nutritive value</li> <li>- Quality Forage</li> <li>- Potential production in marginal environments</li> <li>- Characterization flora fodder Gargano area and southern Italy in general</li> <li>- Bacterial uses in agriculture</li> <li>- Enhancement areas marginal for livestock</li> <li>- Intensive forage production</li> </ul>	<ul style="list-style-type: none"> <li>- National: 1</li> <li>- International: 9</li> </ul>	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	<ul style="list-style-type: none"> <li>- General research on agriculture production and technology</li> </ul>	<ul style="list-style-type: none"> <li>- Consultancy for the identification of DNA markers for different species and varieties.</li> <li>- Consultancy for the implementation of breed traceability/trackability systems based on genomic markers in the meat chain</li> <li>- Consultancy for genetic management and conservation of endangered livestock breeds</li> </ul>	<ul style="list-style-type: none"> <li>- National: 1</li> <li>- International: 3</li> </ul>	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)	- <i>Academic Department</i>	<ul style="list-style-type: none"> <li>- Food technology</li> <li>- Other research on agricultural production and technology</li> <li>- General research on industrial production and technology</li> <li>- Protection of ambient water</li> <li>- Protection of soil and groundwater</li> <li>- Other research on the environment</li> </ul>		<ul style="list-style-type: none"> <li>- <i>National:</i> 10</li> <li>- <i>International:</i> 7</li> </ul>	Research staff permanent :58 Research staff – temporary: 14 Technical staff:48 Administrative staff: 12	<ul style="list-style-type: none"> <li>- Patents: 1</li> <li>- Spin off: 2</li> </ul>	<ul style="list-style-type: none"> <li>- International: 25</li> <li>- National: 11</li> </ul>
Department of Production, Engineering, Mechanical and Applied Economical Science for Agro-Zootechnical Systems (PRIME UNIFG)	- <i>Academic Department</i>	<ul style="list-style-type: none"> <li>- Nutrition and food hygiene</li> <li>- Veterinary medicine</li> <li>- Increasing economic efficiency and competitiveness</li> <li>- Manufacturing and processing techniques</li> <li>- Manufacture of motor vehicles and parts (including agricultural tractors)</li> <li>- Manufacture of food products and beverages</li> </ul>		<ul style="list-style-type: none"> <li>- <i>National:</i> 12</li> <li>- <i>International:</i> 3</li> </ul>	Research staff permanent :18 Research staff – temporary: 22 Technical staff:5 Administrative staff: 4	Patents: 1	<ul style="list-style-type: none"> <li>- International: 24</li> <li>- National: 6</li> </ul>
Department of Agricultural and Environmental Science, Chemistry and Plant Defence (DiSACD UNIFG)	- <i>Academic Department</i>	<ul style="list-style-type: none"> <li>- Biological sciences</li> <li>- Earth and related sciences</li> </ul>	<ul style="list-style-type: none"> <li>- Committed research and analysis</li> <li>- Varietal discrimination required by the client</li> <li>- Measurement of total antioxidant in foods</li> <li>- Measurement of total antioxidant wheat</li> </ul>		Research staff permanent :30 Research staff – temporary: 2 Technical staff:10 Administrative staff: 2		<ul style="list-style-type: none"> <li>- International: 31</li> <li>- National: 6</li> </ul>

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)	- <i>Academic Department</i>	- General research on industrial production and technology - Increasing economic efficiency and competitiveness - Manufacturing and processing techniques		<i>National: 2</i>	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)	<i>Research Institute</i>	-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	<i>International: 3</i> <i>National: 40</i>	Research staff permanent :5 Research staff – temporary: 11 Technical staff:3 Administrative staff: 5		International: 23 National :73
Mediterranean Agronomic Institute of Bari (IAMB)	- <i>Other public entity</i>	- 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	<i>International: 33</i> <i>National: 5</i>	Research staff permanent :19 Research staff – temporary: 40 Technical staff:10 Administrative staff: 18		International: 120
				<b>Total International 125</b> <b>Total National: 90</b>	<b>Total numbers Res. Perm. 591</b> <b>Res temp. 272</b> <b>Tech. 272</b> <b>Admin: 117</b>	<b>- Total Patents: 47</b> <b>- Total Spin off companies: 8</b>	<b>- Total International: 1027</b> <b>- Total National: 337</b>

Code	Question	Value	Percentage % (unless otherwise indicated)
-	How many research entities were initially contacted for profiling, i.e. how many questionnaires were sent out?	31	
-	How many research entities were finally profiled?	25	80,6% (profiled/ contacted)
-	How many research entities were regional?	22	88%
-	How many research entities were from outside the region?	3	12%
A9, A10	What is the average research staff of the entities (permanent and temporary)?	35.3	-
A11, A12	What is the average of the entities technical and administrative staff?	23.6	-
B2	Which are the Top 5 Research areas that the research entities reported they were active at?	-Agricultural sciences, -Biological sciences, -General research on agriculture production and technology, -General research on protection and improvement of human health, -Nutrition and food hygiene.	
B2	Which are the Top 5 Sectors that the productive sectors reported they were active at?	- Production, processing and preserving of meat and meat products - Processing and preserving of fruit and vegetables - Manufacture of dairy products - Manufacture of grain mill products, starches and starch products - Manufacture of beverages	
B3	How many research entities have reported that they offer knowledge- based services to third parties?	15	60%
C1	How many research entities have reported international projects in the past 5 years?	17	68%
D1	How many research entities have reported international journal publications in the past 5 years?	24	96%
D2	How many research entities have reported the existence of patents?	9	36%
D2	If so, how many patents were reported?	47	n/a
D3	How many research entities have reported the existence of spin- off companies?	5	19%
D3	If so, how many spin- off companies were reported?	8	-
E1	How many research entities have reported international collaborations in general?	21	84%

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 Areas** 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 registered 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.

### 3.4 PRELIMINARY SWOT RESULTS

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

### 3.5 CONCLUDING REMARKS

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<sup>2</sup>. 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<sup>3</sup>, 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

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<sup>2</sup>Source: <http://www.nanoforum.org/dateien/temp/nanotechnology%20in%20agriculture%20and%20food.pdf>

<sup>3</sup> CNR-Nano Institute in Lecce, CNR Institute of Photonics and Nanotechnologies in Bari, University research and degrees in the biotech and nanotech sector.

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.

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.

## **4. REGION OF PAZARDJIK, BULGARIA <sup>4</sup>**

### **4.1 SHORT PROFILE OF THE NATIONAL AGRICULTURAL PRODUCTION AND THE FOOD INDUSTRY**

Agriculture has traditionally been an important sector in the economy of Bulgaria. In the last two decades the agricultural industry has undergone dramatic economic changes since the country started its transition to a market economy in 1989, through the preparation of the country's accession to the European Union to becoming a member of the European Union in 2007. In the early 1990s, the agricultural sector underwent significant reform including land restitution and privatization which was characterised by inefficient governmental agricultural policies, poor legislation, lack of investment capital, the de-population of rural areas and a large number of qualified and experienced specialists leaving the agriculture sector.. The EU accession process began in 1999 with the introduction of the Special Accession Programme for Agriculture and Rural Development (SAPARD) which led to membership of the EU in 2007 and the introduction of the Common Agricultural Policy (CAP) in Bulgaria.

A working and efficient agro-processing industry capable of producing products for domestic and international markets, and efficient rural services are crucial elements for the improvement of the agricultural sector in Bulgaria.

Now Bulgarian agriculture and food processing industry are operating in the conditions of increasingly competitive domestic and export markets. Bulgaria has its traditions in producing foods, already known on the European markets, but the successful future development of the processing industry and its ability to compete with the dynamic food processing industry in Europe, depends on its preparedness to develop through innovations.

Rural Development in Bulgaria is managed by the Ministry of Agriculture and Food. Rural Development policy is defined in the Bulgarian National Strategy Plan for Rural Development and a single Rural Development Programme (RDP) covering the whole country. The National Rural Development Strategy for Bulgaria puts strong emphasis on improving the competitiveness of the agri-food sector and improving the quality of life and diversification opportunities in rural areas (as a pre-condition for economic growth and retaining population in those areas). An appropriate attention is also paid to environment and land management as a means to preserve national resources and improve the countryside.

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<sup>4</sup> This report relates to the whole agrifood science and research capacity of the country taking into consideration the unavailability of RTD entities in the Region of Pazardjik.

The agricultural sector and the rural dwellers are still faced with structural problems in production, low productivity and quality of the products and difficulties competing with imported products. The result is low income, poverty and lack of jobs. Furthermore problems with complying with all EU requirements are still observed in particularly for the small scale farmers, leading to negative environmental impacts from production. Consequently, in general the quality of rural life in Bulgaria still needs the support from the NRDP.

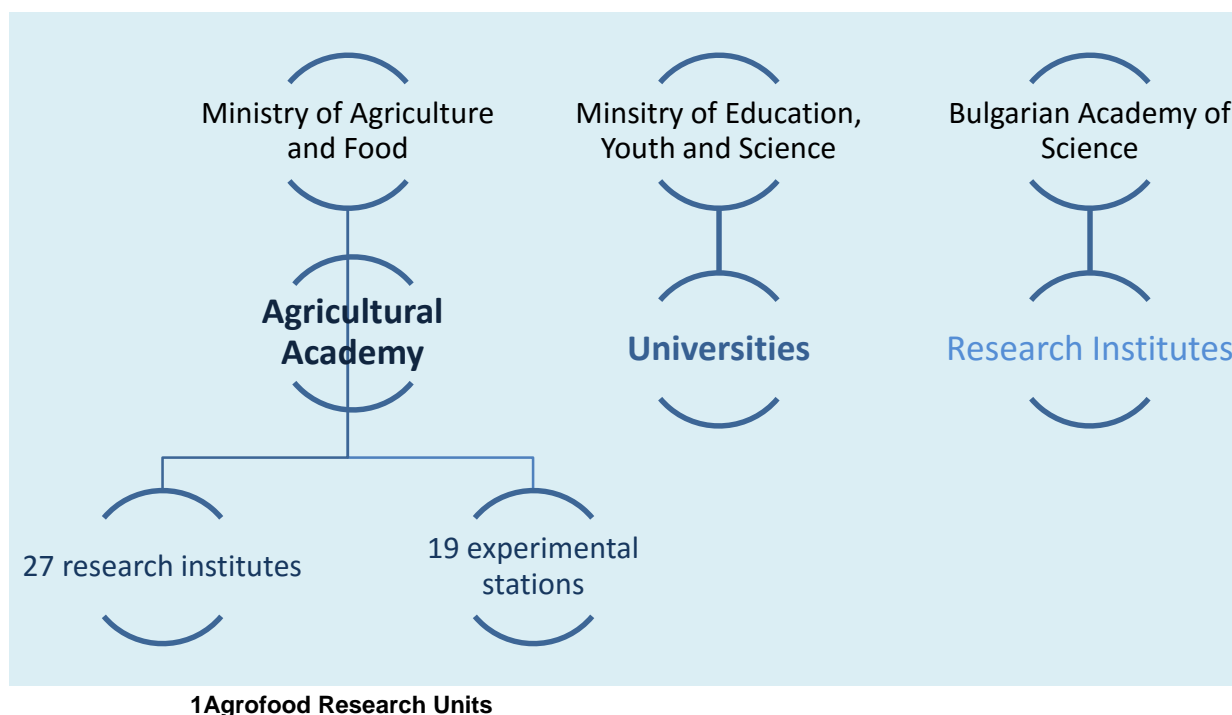
In the developed countries the share of agriculture is smaller than those of manufacturing and service sectors, while in Bulgaria it is still relatively high. On the other hand, however, the level of investment in research and development activities is very low and continues to fall because the R&D is funded and implemented mostly by the public sector.

#### ***4.2 SHORT DESCRIPTION OF THE NATIONAL RESEARCH AND INNOVATION FRAMEWORK***

Agri-food science was hit hard by the structural and financial crisis in the sector. On one hand scientific research lowered its effectiveness, while on the other hand public authorities and the newly established structural units in the sector showed complete lack of interest in using the results from the research activities.

Promoting the cooperation among agricultural producers, processors and research institutes will create favorable conditions for the development of new products and for the introduction of new technologies, both in agriculture and food processing industry.

The organization and coordination of agri-food research at national level is described in the following chart:



Agricultural research in Bulgaria is mainly administered by the Ministry of Agriculture and Forestry. The greatest part of the scientific research in the agri-food sector is done within the units of the Agricultural Academy. Agricultural Academy includes in its structure: Central administration based in Sofia, 27 research institutes, 19 experimental stations, 2 experimental bases with the institutes; Agricultural market information system – AMIS; National Agricultural Museum. The Academy is a legal entity subordinated to the Ministry of Agriculture and Food, with its own budget.

Agricultural Academy collaborates with the Bulgarian Academy of Sciences, universities and colleges in the country and also with similar research organizations from abroad.

The **Bulgarian Academy of Sciences** is a national autonomous organization for scientific research. It comprises research institutes and other self-governing units, as well as the community of academicians (full members), corresponding members and foreign members of the Bulgarian Academy of Sciences. The Research field Biodiversity, bioresources and ecology includes: IBER Institute for Biodiversity and Ecosystem Research; IF Institute for Forestry; IPPG Institute for Plant Physiology and Genetics; NMNH National Museum for natural history.

One of the tasks of the **Agricultural Academy (AA)** is the creation of new and improved plant varieties and animal breeds. Varieties developed in the AA are recognised, with very few exceptions, by the Executive Agency for Variety Testing, Field Inspection and Seed Control (EAVTFISC) under the Ministry of Agriculture and Food, and received successfully legal

protection by the Patent Office. They are sought after by farmers and seed producers not only because of their qualities, but also because they have been designed for Bulgarian soil and climatic conditions.

Over the past 20 years, and especially since Bulgaria's entry into the EU, the system of recognition of varieties/hybrids has been considerably facilitated. Powerful companies have substantial financial resources not only for breeding and research, but also for implementation and dissemination. The financial resources available to the institutes of the AA do not make them competitive in the promotion and distribution of new varieties/hybrids.

Agro-food science is also carried out within the two most relevant **universities**: the Agricultural University Plovdiv and the University of Food Technologies-Plovdiv, as well as within the specialized Faculties at other 4 universities (Trakiya University, the Sofia University, the University of Forestry-Sofia and the Plovdiv University).

***The following main focus in thematic agro-food research may be summarized:***

In the area of plant breeding and biotechnology, attention is paid specifically to molecular methods and molecular markers in breeding and selection. Research aimed at plant health and plant protection is seen as important, it includes also research of residues of pesticides in plants. Research in plant production is focused not only on traditional crops like grain and potatoes but also on industrial plants and energy crops. Conservation of local breeds and varieties is paid attention to. Forest trees breeding and forest genetic resources conservation are among priority areas in forestry-related research. Within the wide area of animal breeding, animal production and health, main research focus is on animal and fish genetic resources, reproduction and breeding resulting in improving animal stock. Further development of molecular methods in breeding is stressed. Also research in animal feeding and nutrition is supported. Research into animal diseases including zoonoses and cell therapies is in focus. Development of biotechnology for soil protection and food preservation is specifically mentioned. The broad area of research into environment and natural resources is aimed mainly at improving land management practices (including grassland and pastures), water resources management, environmental impact of technology and bioremediation. Research in agricultural technology includes both organic/low input technologies as well as traditional methods in a technologically advanced context. Key research directions in food and nutrition area are: food technology and processing, food quality, food chain management, functional food and nutrition for different population groups. Rural development is as seen important particularly in terms of developing rural infrastructure and social and human potential in rural areas.

**The 7th Framework Programme** is the third in which Bulgaria has been involved as a full member. In the time between the start of the Programme in 2007 and February 2012, 2,355 eligible applications have been submitted, involving a total of 3,014 participants. In the period in question, 403 project proposals (518 participants) have been approved for financing and 375 contracts have been awarded. In this respect Bulgaria ranks 23rd by success rate and 25th by amount of financing received. Compared to the same period for the previous framework programme, there has been a decline in these indicators.

In terms of the areas covered, Bulgarian researchers have been most active in the thematic area of Information and Communication Technologies, followed by Environment, and Foods and Biotechnologies.

Bulgaria's **National Scientific Research Strategy** to 2020 is currently the primary national document in the field of innovation policy. It states some objectives relating to science policy and measures and instruments for ensuring higher quality of research and innovation. The Strategy also defines the 6 priority thematic areas, one of which is “Health and quality of life, bio technologies and organic food”.

### 4.3 KEY INFORMATION FROM THE PROFILING OF THE REGIONAL RESEARCH ENTITIES

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)
1.Department of Plant genetics and Breeding, Agricultural University Plovdiv (AUP)	Public University	General research on agriculture production and technology	<ul style="list-style-type: none"> <li>-Molecular analysis of plant material</li> <li>-Characteristics of common bean mutant lines</li> <li>-Molecular and Genetic Approaches to Improving Food and Energy Value of Rapeseed Oil</li> <li>-Molecular Differentiation of Paulownia</li> <li>-Effects of various herbicides on Early-Ripeness and Yield of cotton</li> <li>- Embryogenesis in seedless grapes and hybrid combinations of (Vitis vinifera L.).</li> <li>-Somatic embryogenesis in liquid culture</li> </ul>	International-1 National-1	Research staff permanent :8 Research staff – temporary: 2 Technical staff:3	None	International-7 National-6
2.Department of Animal Science, Agricultural University-Plovdiv	Public University	Immunological monitoring, zoohygienic, biochemical, physiological, ethological and other studies in animals; Advice in field of reproduction, nutrition and breeding; Control of milk production	<ul style="list-style-type: none"> <li>-Investigations in field of biological animal husbandry</li> <li>-Inclusion of traditional and nontraditional additives in compound feed for different categories of pigs and poultry</li> <li>-Improve the biological properties and improvement of production technology of animal production</li> <li>-Ethology of animals</li> <li>- Hygiene and ecology of animal breeding</li> </ul>	None	Research staff permanent :14 Research staff – temporary: 4 Technical staff:2	None	International-7 National-7
3.Department of Ecology& Environmental protection, Agricultural University-Plovdiv	Public University	Soil quality – sampling of soil invertebrates	<ul style="list-style-type: none"> <li>-Study of fish communities and parasites communities of fish to evaluate the ecological risk for environment</li> <li>-Antifungal action of plant extracts and inorganic salts against economically important to the region of Bulgaria</li> </ul>	International-1 National-1	Research staff permanent : 7 Research staff – temporary: 3 Technical staff:1	None	International-8 National-10
4.Department of Horticulture, Agricultural University Plovdiv	Public University	Studying on biological behaviors, morphological characteristics, physiological properties on vegetable crops under various technology of growing. Investigation of application of mineral and leaf fertilizers, different type of plant stimulation on vegetable and ornamental crops. Main crops that are studied in Department are tomato, pepper, cucumber, cabbage, onion, melon, eggplant, zucchini,	<ul style="list-style-type: none"> <li>-Development and improvement technologies for conventional and organic growing of vegetables and flowers in order to improve the quality and to increase the nutritional value of products.</li> <li>- Selection of pepper and cape gooseberry cultivars and varieties with increased content of nutrients and higher health effects.</li> <li>- Organized training for the production of</li> </ul>	International-1 National-1	Research staff permanent : 10 Research staff – temporary: 2 Technical staff:1	None	International-22 National-26

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)
5. Department of Melioration and Land Surveying, Agricultural University, Plovdiv	Public University	carrots, chrysanthemum, china aster etc.  -Evapotranspiration and yield of some cereal crops, irrigated and under regulated water deficit in the condition of South Bulgaria - Influence of the method of irrigation on the yield and physiological indexes of soybean, sunflower, sugar beet, grain corn and fruit trees. - Optimizing models for grapevine cultivars zoning by using GIS	safe vegetable foods with improved nutritional content. - Organized the meeting for experience exchange between producers of safe vegetable foods. Advising private firms by managing the irrigation process with different irrigation techniques to get sustainable yields.	International-1 National-1	Research staff permanent : 7 Research staff – temporary: 1 Technical staff: 2	None	International-9 National-10
6. Department of Plant Physiology and Biochemistry, Agricultural University, Plovdiv	Public University	Plant Physiology and Plant Biochemistry	Investigation on stress responses and selection of tolerant genotypes of main crop plants	International-1 National-1	Research staff permanent : 8 Technical staff: 3	None	International-4 National-5
7. Crop Science Department Agricultural University–Plovdiv	Public University	Effect of some agrotechnical factors on quality and productivity on the main field crops – cereals, legumes, industrial, oil and medicinal. Filed crops and heavy metals	Variety testing	None	Research staff permanent : 11 Technical staff: 3	None	International-6 National-7
8. Department of Fruit Growing Agricultural University–Plovdiv	Public University	-Technologies for Creation and cultivation of intensive fruit orchards. Introduction and study of new varieties. - Accelerated ways to produce grafted pear and quince varieties. - Technologies for Production of planting material.. Orchards soil management systems. Cover plants and mulching	Creation and cultivation of intensive fruit plantations	International-1 National-1	Research staff permanent : 8 Technical staff: 3	None	International-11 National-14
9. Department Economy, Management and marketing Agricultural	Public University	- Improving competitiveness of wine industry, competitive advantage of wineries, management of competitiveness of wineries - Marketing of dietetic and bio products	- Development of business plan - Consultancy on management and marketing of food products - Training courses - Lectures	International-2 National-0	Research staff permanent : 8 Technical staff: 1	None	National-10



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)
University – Plovdiv		<ul style="list-style-type: none"> <li>- Planning and organization of vegetable production, controlling of processes</li> <li>- Management and marketing of starch and grain products</li> </ul>					
10. Department of Microbiology and Ecological Biotechnologies Agricultural University– Plovdiv	Public University	<ul style="list-style-type: none"> <li>- Effects of pesticides on soil microflora. Use of microorganisms in bioremediation processes. Usage of soil conditioners.</li> <li>- Possibilities for obtaining microbial pesticides based on bacteria and fungi to protect the environment and human health.</li> <li>- Development of technologies for obtaining lactic acid healthy product</li> <li>- Ecological methods for storing vegetables and fruit based on lactic acid bacteria and plant extracts.</li> </ul>	<ul style="list-style-type: none"> <li>- Control of food products and beverages (milk, vegetable, fruit and meat products and beverages)</li> <li>- Pest control with biopesticides</li> <li>- Biological plant protection</li> </ul>	International-2 National-4	Research staff permanent : 7 Technical staff: 2	None	International-17 National-11
11. Agricultural University – Plovdiv Department Viticulture	Public University	Research in the area of viticulture, ampelography and production of planting material.	<ul style="list-style-type: none"> <li>-Extension Services in Viticulture</li> <li>-Consultancy on project development for establishing grapevines</li> </ul>	International-1	Research staff permanent : 9 Technical staff: 5 Research staff – temporary-1	None	International-6 National-20
12. Dept Biotechnology University of Food Technologies,	Public University	<ul style="list-style-type: none"> <li>-Processing and preserving of fruit and vegetables</li> <li>-Production, processing and preserving of meat and meat products</li> <li>Processing and preserving of fish and fish products. Processing and preserving of fruit and vegetables</li> </ul>	Consulting, auditing of companies from different food branches	International-2	Research staff permanent : 7 Technical staff: 2	None	International-6
13. Institute of Plant Genetic Resources “K. Malkov”	Research Institute	Plant Genetic Resources Department Preservation, management and utilization of genetic resources in Bulgaria. As a national coordinator in the program for Plant Genetic Resources offers to the Bulgarian partners abilities for free germplasm exchange, registration and free	Genebank	International-5 National-4	Research staff permanent :28 Research staff – temporary: 1 Technical staff:60 Administrative staff: 9	Patents-52	International-24 National-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)
14. Institute of Agriculture - Karnobat	ex situ storage of plant accessions (wild and local forms, breeding lines and cultivars). Breeding new cultivars of wheat, triticale, peanuts, sesame and rice						
	Research Institute	<ul style="list-style-type: none"> <li>- Barley, oat and coriander breeding</li> <li>- Ship breeding</li> <li>- Cultivation <i>technologies</i> and crop protection</li> </ul>	<ul style="list-style-type: none"> <li>- Training of farmers</li> <li>- Consultations on good agricultural practices</li> <li>- Variety demonstration field trails</li> <li>- Analysis of soil and plant materials</li> <li>- Production of certified seed of barley, oat and wheat varieties</li> </ul>	International-1 National-5	Research staff permanent : 17 Technical staff: 29 Administrative staff: 8	Patents-21	National-6
	Research Institute	Interrelation between milk protein polymorphism and individual coagulation ability of animals. Effectively management of animal genetic resources for producing of quality and safety foods.	<ul style="list-style-type: none"> <li>- Improvement of quality and quantity of milk and meat production by selection</li> <li>- Selection programmes</li> <li>- Management programmes</li> </ul>	International-1 National-3	Research staff permanent :22 Technical staff:4 Administrative staff: 21	Patents-1	International-1 National-9
	Research Institute	<ul style="list-style-type: none"> <li>-Breeding of cereals, sunflower and legumes</li> <li>-Seed production of cereals, sunflower and legumes</li> <li>- Agronomy practices in the main field crops</li> <li>-Biotechnology</li> </ul>	<ul style="list-style-type: none"> <li>-Expert advice and evaluation</li> <li>-Agrochemical analysis of soils; Bread making quality evaluation;</li> </ul>	International-1 National-1	Research staff permanent : 37 Technical staff: 149 Administrative staff: 43	None	International-18 National-22
17.Maritsa Vegetable Crops Research Institute	Research Institute	<ul style="list-style-type: none"> <li>-Vegetable quality by improving biological value and sensory characteristics, pest and diseases resistance, high temperature and drought tolerance</li> <li>- Integrated systems for pest control as well as on useful microorganisms as alternative solutions for soil fertility management are the topics of primary importance.</li> <li>- Horticultural</li> </ul>	<ul style="list-style-type: none"> <li>- Soil analysis and recommendations for fertilization</li> <li>- Advice for plant health status</li> <li>- Technology transfer</li> </ul>	International-5 National-22	Research staff permanent :26 Technical staff: 41 Administrative staff: 9	None-	International-25 National-26

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)
18. Institute of plant genetic resources	Research Institute	-Institute of plant genetic resources - Plant breeding - Plant biotechnology		International-29 National-28	Research staff permanent :28 Technical staff:56 Administrative staff: 2	Patents-20	International-41 National-30
19. Institute of Cryobiology and Food Technology	Research Institute	Cryobiology and lyophilization carries out investigations on a cellular and molecular level for establishment of the mechanisms related to the stability of plant and animal organisms in cases of cryogenic and low temperature-Processing and preservation of fruit and vegetables -Manufacturing of grain mill products -Manufacturing of bread and beer -Production of soft drinks -Production of ethyl alcohol from fermented materials	-Consultations - Analyses, expert support - Extension services - Open days, lectures	International-2 National-22	Research staff permanent :24 Technical staff: 53 Administrative staff: 27	Patents-11	International-30 National-30
20. Food Research and Development Institute	Research Institute	-Processing and preserving of fruit and vegetables- -Processing technology (blanching, pasteurization, sterilization, drying); -Preserving technology (refrigeration, freezing, freeze-drying); -Food safety and quality.	-Physicochemical, microbiological, spectral and sensory testing of groups foods and drinks provided in Nationally Accredited Lab - Dissemination of research results, know-how and experience to SMEs from the Bulgarian food industry	International-1 National-1	Research staff permanent :15 Technical staff: 20 Administrative staff: 5	Patents-1	International-9 National-5
21. Institute of Agricultural Economics	Research Institute	Increasing skills for problems analysis, aiming agriculture and rural areas modernization	-Consultations - Lectures - Advices - Outlooks - Project design	International-4 National-9	Research staff permanent :28 Research staff – temporary: 1 Technical staff:60 Administrative staff: 9	None	International-22 National-27

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)
22.Agricultural Institute – Shumen	Research Institute	Genetics, Nutrition, Technology Modern aspects of feeding, breeding and welfare of pigs, buffaloes and cattle, including aborigine breeds, for safety and quality production	- Selection programmes - Breeding schedules - New sorts and breeds - Feeding and technological schemes	International-1  National-8	Research staff permanent :23 Research staff – temporary: 2 Technical staff:27 Administrative staff: 12	Patents-5	International-19  National-8
23. Department of Ecology and Quality of Animal Production, Meat quality laboratory	Research Institute	- Researches on the quality parameters of meat and meat products in relation to the animal nutrition , fatty acid profile of meat lipids , lipolysis in milk - Researches on the ecological factors affecting animal production	- Courses on evaluation of lamb, pork and beef carcasses and meat and dairy technology	International-5  National-4	Research staff permanent : 5  Technical staff:5	None	International-3  National-7
24.Field Institute – Chirpan,	Crops – Research Institute	- Breeding of high yielding and high-quality cotton and durum wheat cultivars. Seed-production of cotton, durum and common wheat. - Development of technologies for main field crops. Laboratory and field experiments with various crops, machinery, fertilizers, pesticides, growth regulators, defoliant. Study the technological parameters.	Scientists provide expert consultations to the agricultural producers and specialists on all problems regarding cotton and wheat, give technologies for the basic field crops in the region under irrigated and non-irrigated conditions. At a suitable time assistance is rendered at places. Recommendations are given for the cultivar selection with regard to the soil and meteorological conditions of the particular region. The soil supply is evaluated by means of laboratory analyses and characteristic of the main properties is made.	National-3	Research staff permanent :14 Technical staff:50 Administrative staff: 14	Patents-2	International-29  National-28
25.Institute of Ornamental Plants - Sofia	Research Institute	Creation of new cultivars of spray carnation, chrysanthemum, liliium, gladiolus, tagetes; tissue culturing;	Creation of new ornamental cultivars for dry and worm conditions;	National-1	Research staff permanent :7 Technical staff:9	Patents-5	International-6  National-4

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)
26. Institute of roses and aromatic plants		conservation of native ornamental plants in vitro and ex situ			Administrative staff: 4		
	Research Institute	-Breeding, seed production and organic farming - Extraction and distillation of oil bearing crops - Production of perfumery and cosmetics - Control weeds and pests	- Sort supporting and seeds production; production of super qualitative sowing material of essential oil and medicinal plants. - Technology development for oil bearing and medicinal plants growing; integrated system for plant protection. - Raw materials processing; extraction and distillation - Research laboratory; made analyses of essential oil, cosmetics products, plant drugs, detergents, soils etc.	International-1 National-1	Research staff permanent :8  Technical staff:21 Administrative staff: 10	None	International-9  National-12
	Experimental Station for Agriculture SE	-Selection of new varieties tobacco -Agrotechnical of Fruit Growing	- Consultancy in the field tobacco, viticulture and horticulture - Soil analysis - Production of elite seed tobacco - Production of planting material	National-1	Research staff permanent : 2 Technical staff:4 Administrative staff: 4	Patents-1	National-6
	Experimental Station -Lom, SE - 3600	Research work at main filed cultures in conditions of carbonate chernozem, cultivation efficiency of some drought-resistant cultures.	visits to farms -giving information to farmers	National-1	Research staff permanent :3 Technical staff:1 Administrative staff: 1	None	National-13
29. Experimental Station for Apricot and Agriculture, Silistra	Experimental Station	- Research work: -creation of new apricot cultivars study of introduced apricot cultivars -establishing appropriate rootstock for apricot - study of rootstock combinations - Research activities covering Apricot biocoenological studies, pest and	- visits to farms -giving information to farmers - courses, seminars - production of apricot plant and rootstock material -rearing technology for the cultivation of apricots	International-1 National-1	Research staff permanent :3 Technical staff:4 Administrative staff: 6	None	International-10  National-14

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)
30.Experimental station of soybean - Pavlikeni		disease biology and control; -Techniques of Integrated Pest Control, Integrated Fruit Production and Biological Fruit Production					
	Experimental Station	- Breeding of soybean, winter and spring forage pea, vetch and red clover. - Improvement of technological links and working out of complete ecological technologies for production of grain, seeds and forage -	-Variety maintaining, seed production of certified varieties - Ecological technologies for grain production	International-1 National-2	Research staff permanent :5 Technical staff:5 Administrative staff: 1	None	International-5 National-17
31. AGRICULTURAL EXPERIMENT STATION - KARDZHALI	Experimental Station	-Technology of tobacco cultivation -Technology of hazelnut production - Technology of walnut production	-Advisory service in tobacco cultivation and manufacturing - Advisory service in walnut and hazelnut production	National-1	Research staff permanent :3 Administrative staff: 2	Patents-1	International-5 National-7
32. Experimental Station of Agriculture, Pomorie	Experimental Station	Planting technologies for Pistacia vera, Diospyros kaki, Actinidia arguta, Actinidia deliciosa, Amygdalus communis,	- Advisory service	National-5	Research staff permanent :4 Technical staff: 10 Administrative staff: 2	None	National-5
33. Complex Experimental Agricultural Station-Yambol	Experimental Station	Comparative study of the effect of whole Intact grain and compound feed on the productive performance of East Balkan Pigs.	Consulting farmers in the region with regards of animal breeding, feeding in order to achieve maximum results	None	Research staff permanent :1 Technical staff: 1 Administrative staff: 1	None	International-2 National-6
				<b>Total International : 70</b> <b>Total National: 132</b>	<b>Total numbers Res. Perm. 414</b> <b>Res temp. 17</b> <b>Tech. 639</b> <b>Admin: 187</b>	<b>- Total Patents: 124</b> <b>- Total Spin off companies:</b>	<b>- Total International: 367</b> <b>- Total National: 409</b>

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)
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Code	Question	Value	Percentage (unless otherwise indicated)	%
-	How many research entities were initially contacted for profiling, i.e. how many questionnaires were sent out?	40		
-	How many research entities were finally profiled?	33	82%	
A9, A10	What is the average research staff of the entities (permanent and temporary)?	~13	-	
A11, A12	What is the average of the entities technical and administrative staff?	~25	-	
B2	Which are the Top 5 Research areas that the research entities reported they were active at?	-Crops -General research on agriculture production and technology -Animal products -Food technology -Nutrition and food hygiene		
B2	Which are the Top 5 Sectors that the productive sectors reported they were active at?	-Processing and preserving of fruit and vegetables -Processing and preserving of meat and meat products -Manufacture of vegetable and animal oils and fats -Manufacture of food products and beverages - Processing and preserving of fish and fish products.		
C1	How many research entities have reported international projects in the past 5 years?	24	72%	
D1	How many research entities have reported international journal publications in the past 5 years?	28	84%	
D2	How many research entities have reported the existence of patents?	11	33%	
D2	If so, how many patents were reported?	124	n/a	
D3	How many research entities have reported the existence of spin- off companies?	0	0%	
D3	If so, how many spin- off companies were reported?	-	-	
E1	How many research entities have reported international collaborations in general?	70	-	



#### 4.4 PRELIMINARY SWOT RESULTS

<b>Strengths</b>	<b>Weaknesses</b>
<ol style="list-style-type: none"> <li>1. Developed network of RTD units in the AgroFood sector as well as established system of research, training, teaching and advisory bodies;</li> <li>2. Strong traditions in the agro-food science and education;</li> <li>3. Availability of highly skilled personnel in some areas of the agro-food sector;</li> <li>4. A growing number of collaboration activities between R&amp;D entities and companies in the sector;</li> <li>5. Orientation towards internationalization and open exchange of experience in research and technology development;</li> </ol>	<ol style="list-style-type: none"> <li>1. Research infrastructure and equipment is not state-of-the-art and is not managed effectively for implementing of precise and profound scientific research;</li> <li>2. Extremely low size of the state budget earmarked for scientific development;</li> <li>3. Inadequate absorption of funds under the national and European programmes, including the Research Framework Programmes and the EU Structural Funds;</li> <li>4. Unfavorable labor conditions leading to weak involvement of young people in the research process /ageing personnel/;</li> <li>5. Lack of private sector involvement in scientific activity and effective partnerships between scientific organisations, universities and business; lack of private investments in the sector.</li> </ol>
<b>Opportunities</b>	<b>Threats</b>
<ol style="list-style-type: none"> <li>1. Access to European and international organisations and research infrastructure and involvement in international research networks; availability of EU funds for research and exchange of knowledge;</li> <li>2. Introduction of priorities in science / priority areas of the Science Development Strategy of Bulgaria until 2020 include: Health and quality of life, biotechnologies and organic food/;</li> <li>3. Constantly growing demand for bioproducts and healthy food as well as for greater and of better quality diversity of sorts, brands, biofuels etc;</li> <li>4. Launch of new European and regional</li> </ol>	<ol style="list-style-type: none"> <li>1. Loss of intellectual potential; unattractiveness of the sector to the young people; negative public attitude to the image of the scientist;</li> <li>2. Continuing inadequate attention on part of the Government for developing science, education and research (the lowest % of GDP earmarked for science in the EU); corruption and bureaucracy barriers;</li> <li>3. Weak correspondence between funding programs support and current research interests and innovation needs; slack market of scientific products and small absorption capacity;</li> <li>4. Inadequate response of the educational</li> </ol>

programs for scientific and technology development;	system in the country to the requirements and needs of the business in 21st century;
5. Establishment of partnerships, networks, clusters, technology transfer units and other forms of cooperation; concentration of resources.	5. Inadequate or insufficient regulatory basis for developing symbiosis between science and business.

**In 2000 – 2010, agricultural sciences were affected by the most substantial changes** (from ranking second by priority to technical science with 30 % of the total funds invested in R&D in 2000, to a mere 9 % of the expenditure for R&D in the country ten years later), followed by medical sciences (from 7 % in the total R&D expenditure in 2000 to 38 % of all funds spent in 2010) and technical sciences whose share declined by 9 percentage points. Changes in structural terms are almost lacking in the other fields of science. The exceedingly sharp fluctuation of budget expenditure for R&D by social and economic targets does not support positive trends and does not prevent negative ones. On the contrary, **state financing of research and development is fragmentary without long-term vision or substantiation** of government policy in the field of science and innovation.

The economic crisis has a considerable negative effect on the number of personnel engaged in R&D. After a long period of growth, the latest data from 2010 show a **decline in the number of staff engaged in R&D, with a particularly pronounced decline for supporting staff** (-14 % compared to 2009). The **ageing** of R&D personnel continues. The age structure of staff engaged in R&D in the state sector and higher educational establishments is identical.

Over the past 20 years or so, the process of commercialization of scientific results by publicly financed research organizations has been plagued by one main weakness: **the contacts between business and science – varied and in many of the cases informal and hidden – are either ineffectively or not at all institutionalized**. On the one hand, these organizations fail to supply real market-based mediator services and on the other – in many cases demand for such services is lacking because of **the lack of enterprise among scientists, researchers and the management of R&D and academic institutions**. A survey of the 25 largest universities in terms of lecturers under employment contract shows that only in isolated cases do universities engage in entrepreneurship by establishing and participating in business enterprises targeted at commercialization of R&D results. A specific form of entrepreneurship popular among universities is the establishment of unincorporated partnerships, set up under the Law on Obligations and Contracts mostly for R&D, education and training but which only in isolated cases directly commercialize R&D results. Preference for this legal form of association is due to the easier administrative and accounting requirements; at the same time,

they are also less transparent and have lower requirements for reporting compared to commercial corporations.

Opportunities for future development of the research organizations are found in establishing partnership networks and available European programmes and funds for research.

The prevailing numbers of RTD units consider that their strengths are the highly qualified staff and the disadvantages – the limited finances for research and the poor links between the researchers and industry.

## **4.5 CONCLUDING REMARKS**

- Most of the research institutes and universities in that scientific area (Agrofood) are specialized in agriculture and they are working on problems related to the technologies of growing perennial crops, fruits and vegetables and raising animals rather than the processing and food production.
- The research institutes are distributed throughout Bulgaria – located both in big cities and in medium-size towns.
- The scientific potential is varied in number and in profiles, age and scientific degrees of the research staff.
- In the region of Pazardzhik there are neither universities, nor research institutes. The nearest scientific centre is the city of Plovdiv, in which the biggest number of universities and research institutes specialized both in the area of agriculture and strictly in the food sector are concentrated.
- A specific feature of Bulgaria is the fact that the University of Food Technologies is a separate institution from the Agricultural University, as well as the research institutes most often are concentrated on studies related to agricultural technologies and not exactly food technologies, although in some of them new technologies of ready products obtained from processing of agricultural raw materials are being comprised in their research – such as the Agricultural University – Plovdiv, the Institute of Highland Agriculture and Animal Husbandry in Troyan, the Institute of Plant Genetic Resources, the Institute of Animal Science – Kostinbrod, the Agrobiointitute, etc.
- Participation in national projects prevails in the activities of all the institutions. International projects are quite unevenly distributed among the different research organizations.

- A similar to the above-mentioned tendency is also reported for the publications – the bigger number is published in national journals.
- Equipment in most of the universities and research institutes is out-of-date. Modern equipments like NMR, LC-MS, RT-PCR, DNA sequencer, etc. are rarely to be found with an exception of the Agricultural University, the University of Food Technologies, the Technical University and the Agrobiointitute.
- Spin-offs are not to be found anywhere.
- The prevailing patents were acquired before 2000 and the reported later ones refer mainly to new plant cultivars and animal breeds.
- It is not uncommon to find a large number of small projects in which Institutes and individual scientists participate. At the same time, perhaps too many Institutes seem to be making a conscious effort to let themselves be guided by the priorities of the European Commission's Framework Programmes.
- A few Institutes, due to their remit, have little or no possibility of acquiring additional funding in national or international competitions. For others, there appears to be scope for the generation of additional income through commercializing products, providing services or expert advice that could be more fully exploited.
- Overall, more should be done to support the Institutes in creating competitive consortia, both inside their organizational structure and with partners outside it.

## 5. ROMANIA

### 5.1 SHORT PROFILE OF THE COUNTRY, THE AGRICULTURAL PRODUCTION AND THE FOOD INDUSTRY

#### ROMANIA - Country Profile

Romania is situated in the geographical centre of the Europe, in the northern part of the Balkan area, half way between the Atlantic Ocean and Ural Mountains, in and out of the Carpathian Mountains arch, alongside with the Danube inferior stream (1075 km), having an opening at the Black Sea.

The Romanian neighbours are: Bulgaria, Republic of Moldavia, Republic of Serbia, Ukraine and Hungary.

Romania has a population of 21413815 inhabitants, (at 1 January 2011) and a surface of 237.500 km<sup>2</sup>; it is the second biggest East European country after Poland (312.685 km<sup>2</sup>) having almost the same surface as the United Kingdom of the Great Britain and Northern Ireland. Romania is splitted in several administrative units called *counties* (41). To apply the European regional development policy, on the Romanian teritory has been created 8 *development regions* as a free agreement between counties councils and local councils.

*Main industries are:*

- textile and leather industry;
- metallurgical industry;
- building machines industry;
- mining industry;
- wood processing industry;
- construction materials industry;
- chemical and petrochemical industry;
- food industry;
- IT industry

In 2011, the economy was based on services (45,4% of GDP), followed by the industry (26,3%) and construction (9,8%). The agriculture had a contribution of 6.5%.

Regarding the working population, 32% is involved in agriculture and production.

## **Agriculture Production**

Regarding the contribution of agriculture, forestry and fishery, the contribution to GDP is 6%, in comparison with the EU member states which is about 1,7%. The used agricultural area in Romania represents 62,1% out of 23,8 million ha. Almost 8,3 million ha is arable land.

Almost 4.9 million people work in agriculture, fishery and forestry industry, meaning 42.8% out of the total labour force.

The value of agricultural production was 16,000 million euro in 2010, with a distribution of:

- +6.6% the vegetal one
- -6.8% animal one
- 26.5% agricultural services

In 2011, a production of 7,132 thousand tones of wheat and 11,718 thousand tones of corn were registered. Regarding the records for sun flower and potatoes, these are: 1,789 thousand tones and respectively 4,077 thousand tones.

## **Food Industry**

The Romania's turnover from the food industry is around 10 billion euro annually, meaning a contribution of 8% to the GDP.

The food industry offers jobs for almost 200,000 people, being the third industry base on turnover.

- food production in March 2012 increased with 107,8% against March 2011;
- food production in March 2012 increased with 118.2% against February 2012;
- food production in the first three months of 2012 increased with 103.3% against the similar period of 2011.

The sub-sectors: the meat processing had a turnover of 1.3 billion euro, bakery had 1.1 billion euro and non-alcoholic drinks had 1 billion euro. Important contributions had meat production with 840 million euro and dairy with 800 million euro.

The number of economic agents in food industry is slightly bigger than 10,000 units, a constant number between 2006 – 2010.

## **5.2 THE NATIONAL RESEARCH AND INNOVATION SYSTEM**

The research-development and innovation system in Romania is a centralised system, based on the financing of the R&D&I programmes, especially those of the National Authority for Scientific Research (ANCS/NASR), which is in the coordination of the Ministry of Education, Research, Youth and Sports (MECTS/MERYS).

### **5.2.1 INNOVATION GOVERNANCE AND FUNDING**

#### ***(i) Political level***

It belongs to the Commissions for Education, Science, Youth and Sport from Senate and The Chamber of Representatives, which are submitting to the Parliament the law proposals and other legal documents related to science, education, youth and sport.

#### ***(ii) Operational level***

The National Council for Science & Technology Policy is the governmental body at high level, to establish the priorities and the legal framework of the National Strategy of Research-Development and Innovation 2007 – 2013, accordingly with the Governmental Programme and the sectorial strategies, in consultation with the stakeholders.

The Ministry of Education, Research, Youth and Sport (MECTS/MERYS) is the central piece of the system, prepare and implement specific policies through the National Authority for Scientific Research (ANCS/NASR).

#### ***(iii) Advisory Commissions***

MECTS has several advisory commissions such as: Advisory Commissions for Research, Development and Innovation, National Council for Ethics, National Council for Scientific Research, Romanian Committee for Research Infrastructure, Council for Innovation and National Council for Development and Innovation.

#### ***(iv) Implementing units***

MECTS implements and operates the financial execution of the National Plan for Research-Development and Innovation 2 through the Executive Unit for Financing the High Education, Research, Development and Innovation (UEFISCDI).

MECTS is in permanent contact with the European Commission concerning the research-development and innovation programmes by the support of the Romanian Office for

Science and Technology (ROST), located in Brussels, which has the mission to promote the romanian researchers participation in specific programmes of the EU and to improve the links with partners from other member countries.

***(v) Academic research system***

This includes the Romanian Academy and the sectorial academies: Academy of Medical Sciences (ASM), Academy of Agricultural Sciences and Forestry (ASAS), Academy of Technical Sciences (AST) .

***(vi) Coordinating Agencies in strategic areas***

Romanian Association for Standardisation (ASRO), Romanian Association for Certification (RENAR), Nuclear Agency and Romanian Space Agency (ROSA).

***(vii) Research-Development and Innovation Units***

There are 264 research-development and innovation units (168 of national interest: 48 national R&D institutes, 56 certified public universities and 52 institutes, 14 centers of research of the Romanian Academy, 32 certified private universities and 17 institutes and R&D centers in agriculture and 51 R&D agricultural stations belonging to the Academy of Agricultural Sciences and Forestry.

There are about 2,000 organisations with R&D activities, out o which 850 in the private sector (accordingly with the ANCS statistics of 2009).

The network of the technology transfer centers and innovation institutes (RENITT) includes 47 specific entities (13 centers of technology transfer, 19 centers of technological information, 15 business and technology incubators) and 4 S&T parks (accordingly with ANCS statistics of 2010).

***(viii) Research-development personnel:***

At end 2009, 42,420 people have been registered in the R&D system, out of which 30,645 (72.2%) researchers, out of which 14,916 having PhDiploma (43.6% women). The most numerous researchers were in technical and engineering sciences (46%), in natural sciences (14.1%).

85% of the employees of the R&D system are graduated of high education bodies and majority (56%) work full-time in the system.



***(ix) Regional/National entities which act to support research-development,******technology transfer and innovation***

Out of the 6 specific programmes, included in the National Plan for Research-Development and Innovation 2, the programmes called „Partnering Priority Areas” and „Innovation” are closer to the report subject. The created consortia to run the projects are done by:

- research-development units (including academic entities and universities);
- industrial partners (companies);
- supporting organisations for innovation and businesses;
- entities for technology transfer and innovation.

Together with the funding bodies, they are key-players of the research, development and innovation system.

### 5.3 KEY INFORMATION FROM THE PROFILING OF THE REGIONAL RESEARCH ENTITIES

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)
Banat University of Agricultural science and veterinary medicine- Interdisciplinary Research Platform	University		None	-National:5 -International:4	Research staff permanent: 26 Research staff – temporary: 26 Technical staff: Administrative staff:		-International: 30 -National: 30
National Institute of Research and Development for Biological Sciences	Research Institute		Phytochemical evaluation of some plant extracts and food supplements produced and commercialized by SMEs in the field.	-International: 3 -National:4	Research staff permanent: Research staff – temporary: Technical staff: Administrative staff:	Patents: 1	-International: 16 -National: 12
The National Institute of R&D for Food Bioresources IBA Bucharest	Research Institute	Determination of heavy metals and minerals in food and food packaging	- Overall migration tests for all types of food packaging materials - Specific migration tests (styrene, formaldehyde, heavy metals, bisphenol) for food packaging materials - Heavy metals (Pb, Cd, Cr, Hg) content in plastic and paper and board packaging materials - Heavy metals (Pb, Cd, Cr, Hg, As, Mn) and minerals (Na, K, Ca, Mg, Cu, Zn, Fe) in food - Water vapours and gases (O2, N2, CO2) permeability of flexible films used for food packaging - Amino-acids analysis in food products	-National: 3	Research staff permanent :3 Research staff – temporary: 0 Technical staff:2 Administrative staff: 0	Patents: 1	- National: 42
Food Science, Food Engineering and	University	Functional ingredients and functional food, high nutritional value food	Physical and chemical analyses Microbiological analyses Technological documentation for new	International: 3 National: 3	Research staff permanent: 40 Research staff –		International: 30 National: 30

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)
Applied Biotechnology		Enzyme, protein, pigments and bioadditives biotechnology Food quality and safety optimisation	products manufacturing Organisation of improvement courses for economical agents or other structures		temporary: 6 Technical staff: 8 Administrative staff: 3		
INCBBA Bucharest Molecular Biology Laboratory	Research Institute	<ul style="list-style-type: none"> <li>- Development and testing of complex methods of investigation of predisposition to obesity and breast cancer, based on analysis of electric bioimpedance and of the genomic regions 5q and 16q</li> <li>- Qualitative and quantitative PCR methods for detection of authorized/unauthorized GMO's existing in food, ingredients, seeds</li> <li>- Assessment of production conditions in Romanian aquaculture farms in addressing the food safety system HACCP</li> <li>- Detection of fruits pathogens that occur in different storage conditions and are influenced by climate change</li> <li>- Authentification of Triticum aestivum using advanced analytical techniques</li> </ul>	<ul style="list-style-type: none"> <li>- Detection and quantification of RoundReady Soy and MON810</li> <li>- Determination of monosodium glutamate of plant and animal</li> <li>- Determination of food forgery</li> </ul>	-National: 3	Research staff permanent :3 Research staff – temporary: 0 Technical staff:0 Administrative staff: 0		National: 2
Department Food Chemistry and Colloidal Biochemistry/ INCDBA IBA Bucharest	Research Institute	Main research topics based on food quality that includes: the quality of raw materials, of processed food and of the end food products nutritional information insurance that products meet specifications and government health standards supervise and advise on processing operations study the composition of food and	<ul style="list-style-type: none"> <li>- Physical-chemical analysis for food products</li> <li>- Training courses regarding nutritional information to company SC Vel Pitar</li> <li>- Training courses regarding procedures and methods of analysis for cereal and sugar to Agency for Payments and Intervention in Agriculture</li> <li>- Training courses regarding methods of analysis for wheat to ITCSMS, Timis</li> <li>- Chemical analysis of food products for companies</li> </ul>	-National: 2	Research staff permanent :5 Research staff – temporary: 0 Technical staff:2 Administrative staff: 0	Patents: 3	

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)
Interdisciplinary Department/ INCDBA IBA Bucharest		the changes foods undergo in storage and processing development of the methods for determination food grade purity and the additive levels used in food products development of the analytical methods concerning food frauds					
	Research Institute	Interdisciplinary research activities: collaborative actions between food sciences, ICT, psychology and economy	Participating to the industry's events Attracting industry to participate into research projects Inviting industry to participate at different events organized by the institution Inviting industry to participate at several European projects	-International: 3 -National: 3	Research staff permanent :4 Research staff – temporary: 0 Technical staff:0 Administrative staff: 0		
	Research Institute	<ul style="list-style-type: none"> <li>Sensory methodologies for evaluation of foods (descriptive and hegonic)</li> <li>Development of the analytical methods concerning food frauds</li> </ul> Researches related with food design, control, nutrition	<ul style="list-style-type: none"> <li>Sensory analysis of food products</li> <li>Training courses regarding sensory evaluation for researchers, industry clients</li> </ul>	-International: 3 -National: 2	Research staff permanent :4 Research staff – temporary:0 Technical staff:0 Administrative staff: 0	Patents: 4	International: 6 National: 6
Faculty of Food Engineering/ Department of Food Technologies, Food Products and Environment Safety	University	<ul style="list-style-type: none"> <li>Beer, alcohols and yeasts technology and quality</li> </ul>		-International: 1 -National: 1	Research staff permanent : Research staff – temporary: Technical staff: Administrative staff:		International: 6 National: 1
Meat pilot station –processing/	Research Institute	<ul style="list-style-type: none"> <li>Functional food, alimente functionale,</li> </ul>	<ul style="list-style-type: none"> <li>Elaboration meat products prototypes</li> <li>Elaboration meat technologies</li> </ul>	National: 2	Research staff permanent :3	Patents: 1	National: 3

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)
INCDBA Bucharest IBA		<ul style="list-style-type: none"> <li>innovative technologies for meat processing bioactive compounds, enzymes, proteins ;</li> <li>development of products and technologies;</li> <li>traditional products;</li> <li>superior species recovery</li> </ul>	<ul style="list-style-type: none"> <li>Training specialised persons in the field of meat technology</li> </ul>		Research staff – temporary: Technical staff: 1 Administrative staff:		
University Politehnica of Bucharest, Faculty of Applied Chemistry and Material Science, Department of Organic Chemistry “C. Nenitescu”	University	<ul style="list-style-type: none"> <li>Composition and characterisation of liquid food products and authentication for Romanian vegetable oils and wines.</li> <li>Quality control for various food products.</li> <li>Natural products – extraction and characterization.</li> </ul>	<ul style="list-style-type: none"> <li>Composition and characterisation of liquid food products</li> <li>Authentication for Romanian vegetable oils and wines</li> <li>Quality control for various food products</li> <li>Natural products – extraction and characterization</li> <li>Catanionic organogelators derived from D-sorbitol and natural fatty acids</li> <li>The anti-bacterial activity of magnetic nanofluids</li> <li>Thin films for controlled drug release and targeting systems</li> </ul>	-National: 5	Research staff permanent :14 Research staff – temporary: 4 Technical staff:4 Administrative staff: 3		International: 17 National: 10
High Energy Secondary Standard Dosimetry Laboratory	Research Institute	<ul style="list-style-type: none"> <li>Using of electron beam technology in order to improve the microbiological quality of natural supplements obtained from medicinal herbs.</li> </ul>	None	National: 1	Research staff permanent:6 Research staff – temporary: 0 Technical staff:3 Administrative staff: 0	Patents: 1	International: 2 National: 1
Microbiology ELISA Laboratory/ INCDBA Bucharest IBA	Research Institute	<ul style="list-style-type: none"> <li>Research regarding GMO's (RUR soybean and MON810 maize) incidence in annual crops (2006 – present).</li> <li>Beneficiary of this activity is Ministry of Agriculture and Rural Development as a requirement of European Commission.</li> <li>Researchs regarding mineral</li> </ul>	<ul style="list-style-type: none"> <li>Microbiological control of raw materials and food products.</li> <li>Mycotoxins control of raw materials and food products.</li> <li>GMOs control in soya and maize crops.</li> </ul>	National: 2	Research staff permanent :4 Research staff – temporary: 0 Technical staff:6 Administrative staff: 0		National: 8

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)
		salts content as a preservatives of meat products. <ul style="list-style-type: none"> <li>Research regarding crops (wheat, rye, maize) contamination with fungi and mycotoxins.</li> <li>Research regarding manufacture of using sourdough fermented by lactic acid bacteria.</li> <li>Research regarding food safety based on the tyoe of manufacture technology.</li> </ul>					
National Research and Development Institute for Industrial Ecology	Research Institute	<ul style="list-style-type: none"> <li>development of new analytical techniques/methods for pollution level control of water, air, soil, sediments and wastes with different types of pollutants, including priority substances</li> <li>Development of modern method/methodologies and/or improving national standard methods of analysis in the field of biology-bacteriology and ecotoxicology</li> <li>Developing systems to identify sources of pollution with petroleum products, based on a specific methodology for the environmental judicial analysis, using specific source biomarkers to characterize crude oil types from the Romanian industry</li> <li>Development of a testing strategy to assess the risk generated by dangerous</li> </ul>	<ul style="list-style-type: none"> <li>Physical-chemical, bacteriological and biological analysis of Drinking water Mineral water Surface Water Surface Waters used for drinking water Surface Water used to support fish life Waste Waters Water for agricultural irrigations Mixing water for concrete Boiler Water</li> <li>Air: Ambient Air: physicochemical indicators</li> <li>Emissions from permanent sources</li> <li>Soil Analysis of the following pollutants: metals, PAHs, total petroleum hydrocarbons, phenolic compounds, pesticides, polychloro biphenyls, etc</li> <li>Waste and sludge:</li> </ul>	-International: 3	Research staff permanent :55 Research staff – temporary: 0 Technical staff:66 Administrative staff: 8		

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)
		substances on the environment (contribution to the implementation of REACH) • Researches regarding the impact of pollutants emission • from permanent and mobile sources to air quality • Mathematical modelling studies of pollutants and noise dispersion in air. • Greenhouse emission monitoring and determination of specific parameters from solid and liquid fuels • industrial waste management • mobility of hazardous substances in aqueous environments • the use of advanced materials in technological processes specific to environmental protection • hazard assessment of various wastes • solutions to reduce soil pollution with heavy metals by phyto-remediation • industrial and municipal wastewater treatment; • surface and underground water treatment/potabilization; • biological and chemical sludge conditioning/processing; • valorisation of useful products from wastewater and waste; • polluted soils remediation. • instruments and data	Waste and sludge characterization and dangerousness establishment for storage acceptance Characterization of the sludge's from waste water treatment plants in order to be used in agriculture • Environmental balances , impact studies, risk assessment studies • Strategic audit (SWOT analysis, Baldrige questionnaires) and models for development and implementation of sustainable enterprise strategy ; • Clean Production (CP) Assessment (planning and organisation, sources and pollution causes analysis, CP measures based on BREF-BATs) for various industries, implementation of clean technologies; • Diagnosis analysis for evaluation of the existing wastewater treatment plants efficiency • Design and implementation of management systems, • Audit of the management system, Environmental audit, Accidental and occupational health risk assessment.				

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)
		processing and interpretation in the environmental impact and ecological risk using modern mathematical methods: Dempster Shafer theory, ER algorithm, rough set theory					
National Institute of Gerontology and Geriatrics "Ana Aslan"/ research section "Ageing biology"	Research Institute	<ul style="list-style-type: none"> <li>• Oxidative stress biochemistry of the aging process and its pathology; interrelations between enzymatic systems and medicine related to oxidative stress;</li> <li>• Exploring fat metabolism; studies on plasmatic lipids, lipoproteins and apolipoproteins and their relation with ageing and its pathology;</li> <li>• the evaluation of some parameters that indicate biological redox status of pathological processes associated with ageing (atherosclerosis, diabetes) and of the effects of geroprotective therapy on the cellular balance between pro-oxidants;</li> <li>• Pharmacological biochemistry studies; experimental model making for ageing pathology</li> <li>• to determine nutritional status, eating habits and health condition of elderly people in different settings including nursing homes, hospitals and home assistance and to identify unmet nutritional needs among elderly;</li> </ul>	<ul style="list-style-type: none"> <li>• Measurements of biomedical, biochemical, immunological, microbiological parameters and tumoral markers</li> <li>• Clinical geriatric evaluation; Radiological services, abdominal, cardiac and vascular ecography, bone density, ECG, EEG, mamography; psychological evaluation</li> <li>• Geriatric therapy; medicinal therapy in accordance with the diagnostic, psychotherapy, sport</li> </ul>	-International: 3 -National: 3	Research staff permanent :17 Research staff – temporary: 4 Technical staff:0 Administrative staff: 0		International: 37 National:30



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)
National Research and Development Institute for Cryogenics and Isotopic Technologies, Team: Isotopic processes and investigations - Mass spectrometry, ICSI Rm. Valcea	Research Institute	<ul style="list-style-type: none"> <li>to determine the impact of the methyl donor bioactive compounds through metabolomic approach of nutrigenomics in elderly.</li> <li>The use of stable isotopes in the investigation of various phenomena/processes relating to fields of science such as environment sciences, health and agriculture/the sector of foodstuffs.</li> <li>The development of support research for new analysis and control techniques; the identification of new cost-effective authentication methods for foodstuffs.</li> <li>The creation of referential analytical databanks for the authentication of the origin of various products.</li> </ul>	<ul style="list-style-type: none"> <li>The use of stable isotopes in the investigation of various phenomena/processes relating to fields of science such as environment sciences, health and agriculture/the sector of foodstuffs.</li> <li>The development of support research for new analysis and control techniques; the identification of new cost-effective authentication methods for foodstuffs.</li> <li>The creation of referential analytical databanks for the authentication of the origin of various products.</li> <li>Also, ICSI Rm. Valcea offer research-development and technological-transfer services in domains:</li> <li>expertises and technological perfections to isotopic separation plants CNE PROD and CNE INVEST Cernavoda. This expertises consist in design and redesign of technological equipments and instalations, evaluation of plants functional performances and their optimization. ICSI Rm. Valcea execute, activate and equip with ordinate filler of high performance the reconcentration columns of heavy water from Unit 2 CNE INVEST Cernavoda;</li> <li>engineering expertises and services regarding extension of life time and maintaining of capacity for heavy water production to instalations from ROMAG</li> </ul>	<i>-International: 1</i> <i>-National: 4</i>	Research staff permanent :7 Research staff – temporary: 0 Technical staff:7 Administrative staff: 0		

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)
			DROBETA Turnu Severin; <ul style="list-style-type: none"> <li>feasibility studies, medium expertises, risk analysis and studies regarding the deaffectation of isotopic separation plants.</li> <li>In gas products and services section ICSI Rm. Valcea offer the following services: cylinders cleaning; ISCIR inspection in authorized atelier; gas analysis according with ISO 9001 in laboratories RENAR accredited; inertization of equipment for chemical and food industry.</li> </ul>				
Department of Industrial Biotechnology UASVM Bucharest - Faculty of Biotechnology	University	<ul style="list-style-type: none"> <li>Finding the best formulation for salting mixture in order to produce low salt frankfurters</li> <li>Enzymatic treatments of fish to improve texture and taste of fish products</li> <li>Lipid oxidation on frying process</li> <li>Traceability of milk and cheese related with certain biomarkers (bioactive compounds) released depending on type of cows feeding</li> </ul>	<ul style="list-style-type: none"> <li>Food quality analysis</li> <li>Food safety analysis</li> <li>Food shelf life studies</li> <li>Food packaging tests</li> </ul>	- international: 16	Research staff permanent :15 Research staff – temporary: 10 Technical staff: 5 Administrative staff: 2		
University „Vasile Alecsandri” Bacau; Faculty of Engineering; Department of Chemistry and Food Safety and Environmental Engineering (CISAPM)	University	<ul style="list-style-type: none"> <li>Synthesis of heterocyclic compounds with potential biological activity</li> <li>Farmacomodulation using the method of synthesis on solid support under microwave action</li> <li>The use of unconventional methods (microwave, ultrasound) in the isolation of active principles of plants</li> <li>Purification (chromatography)</li> </ul>	None	- National: 1 - International: 2	Research staff permanent :12 Research staff – temporary: 0 Technical staff:1 Administrative staff: 0		International: 7

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)
University „Vasile Alecsandri” Bacau; Faculty of Engineering; department of Food Engineering (ICA)		<ul style="list-style-type: none"> <li>and characterization (IR, UV-VIS, NMR, MS)</li> <li>• compounds obtained by synthesis, semisynthesis or isolated from plant material</li> <li>• Use of software for spectral methods of analysis and characterization of three product (IR, UV-VIS, NMR, MS)</li> <li>• Study of biological structure-activity relationships and thermal stability</li> </ul>					
	University	<ul style="list-style-type: none"> <li>• Quality of wheat flour and baked products based on the maturization of flour; The effect of ionizing radiation on sensory properties, physico-chemical and microbiological cereals; Implementation of modern techniques investigation and determination of protein structure preparations of animal origin (Dielectrophoresis and electrodiffusion, investigation with X-rays, etc.) in proposal for innovation biotechnology</li> </ul>		<ul style="list-style-type: none"> <li>- National: 2</li> <li>- International: 1</li> </ul>	Research staff permanent :12 Research staff – temporary: 6 Technical staff:2 Administrative staff: 0		International: 6 National: 2
Intitute for diagnosis and animal health	Research Institute	<ul style="list-style-type: none"> <li>• - National Reference Laboratory for Classical Swine Fever and African Swine Fever - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• - National Reference Laboratory for Avian Influenza and Newcastle Disease - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• - National Reference Laboratory for Foot and Mouth Disease and</li> </ul>	<ul style="list-style-type: none"> <li>• full information on animal health in Romania</li> <li>• implementation the technical programmes on animal health</li> <li>• veterinary diagnosis on all aspects regarding animal health and veterinary public heath</li> <li>• national body for veterinary expertise</li> <li>• setting up and management of laboratory aspects on animal welfare</li> <li>• veterinary training in the field of animal health and animal welfare</li> </ul>	<ul style="list-style-type: none"> <li>- National: 8</li> <li>- International: 6</li> </ul>	Research staff permanent :30 Research staff – temporary:34 Technical staff:130 Administrative staff: 28		- National: 3

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)
		<p>Other Vesicular Diseases in Animals - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></p> <ul style="list-style-type: none"> <li>- National Reference Laboratory for Arboviruses – Bluetongue and African horse sickness - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>- National Reference Laboratory for Rinderpest</li> <li>and Peste des petits ruminants - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>National Reference Laboratory for Sheep pox and goat pox - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>National Reference Laboratory for Rabies - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>National Reference Laboratory for Enzootic Bovine Leukosis - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>National Reference Laboratory for Equine Infectious Anaemia - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>National Reference Laboratory for Herpesviroses (Aujeszky's Disease, Infectious Bovine Rhinotracheitis/Infectious Pustular Vulvovaginitis, Equine Rhinopneumonitis) - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> </ul>	<ul style="list-style-type: none"> <li>national body in relation with Reference Laboratory of European Union in the field of animal health and animal welfare inter-comparison and proficiency tests)</li> <li>national body responsible for performing the annual inter-laboratory comparative tests for checking the diagnostic capability for animal diseases, for all authorized sanitary veterinary and food safety laboratories</li> <li>performing risk analysis for animal health, animal welfare, import of animals and animal origin products, medical laboratories, animal diseases, private veterinary medicine and food safety</li> <li>institution attested by National Authority for Scientific Research (ANCS) to perform research activities in the field of IDAH competences</li> </ul>				

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)
		<ul style="list-style-type: none"> <li>• National Reference Laboratory for Transmissible Spongiform Encephalopathies - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Anthrax - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Salmonellosis in Animals - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Brucellosis - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Tuberculosis</li> <li>• and Paratuberculosis - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Campylobacteriosis in Animals - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Contagious Bovine Pleuropneumonia - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Monitoring Antimicrobial Resistance in Animals - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory</li> </ul>					

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)
		<p>for Leptospirosis - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></p> <ul style="list-style-type: none"> <li>• National Reference Laboratory for Echinococcosis - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Diseases Caused by Protozoa - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Vectors Involved in Animal Diseases and Zoonoses - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Mycoses and Diseases Caused by Mycotixins - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Veterinary Toxicology - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Animal Welfare - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Bees and Other Useful Insects Diseases - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Molecular Biology - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> </ul>					

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)
		<a href="http://www.idah.ro">www.idah.ro</a> <ul style="list-style-type: none"> <li>• National Reference Laboratory for Fish Diseases- see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Bivalve - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a> Molluscs and Crustaceans Diseases</li> <li>• National Reference Laboratory for Monitoring of Microbial Contamination of Bivalve Molluscs- see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Marine Biotoxins Monitoring - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Vectors Involved in Animal Diseases and Zoonoses- see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory for Veterinary Toxicology- see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a></li> <li>• National Reference Laboratory</li> </ul>					

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)
NATIONAL INSTITUTE OF RESEARCH - DEVELOPMENT FOR MACHINES AND INSTALLATIONS DESIGNED TO AGRICULTURE AND FOOD INDUSTRY - INMA		for Animal Welfare- see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a> • National Reference Laboratory for Bees and Other Useful Insects Diseases - see general attributions of LNRs on <a href="http://www.idah.ro">www.idah.ro</a>					
	Research Institute	<ul style="list-style-type: none"> <li>Scientific research activities in the field of processes, technologies and technical equipment within aquiferous systems, especially the recirculating systems. (SAR).</li> <li>Research, achieving systems and technical equipment for transporting and handling products, increasing their operational reliability, energetic efficiency and diminishing manpower and financial consume.</li> <li>Researches on technologies, processes and technical equipment for harvesting and preserving fodder, preparing and distributing food to farm animals, obtaining yields appropriate to food market request.</li> <li>Scientific research on technologies, processes and technical equipment of soil fertilizing according to sustainable, environmental-friendly agriculture concept, with positive impact on environment and health.</li> </ul>	None	International: 2 National: 45	Research staff permanent :141 Research staff – temporary: 0 Technical staff:15 Administrative staff: 18	Patents: 16	- International: 5 - National: 22



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)
CENTER FOR TECHNOLOGIC & INDUSTRIAL COOPERATION		<ul style="list-style-type: none"> <li>Scientific research on technologies and technical mechanizing equipment for harvesting agricultural and horticultural products, in order to adapt them to Romania current agricultural needs.</li> <li>Researches on technologies and equipment of mechanizing the forestation works and forestry curtains setting up aimed to protect agricultural crops, control draught and preserve flora.</li> </ul>					
	Consulting	<ul style="list-style-type: none"> <li>Wastewater treatment</li> <li>Software tool development</li> <li>Life cycle assessment, economic analysis</li> </ul>	<ul style="list-style-type: none"> <li>Building international partnerships, partner search,</li> <li>Matching project ideas, preparation of applications</li> <li>Business plans, feasibility studies, market studies</li> <li>Demonstration and dissemination activities</li> </ul>	National: 1 International: 3	Research staff permanent :2 Research staff – temporary: 2 Technical staff: 1 Administrative staff: 1		
National R&D Institute for Biology & Animal Nutrition – IBNA – Animal Biology Department	Research Institute	<ul style="list-style-type: none"> <li>Taxonomy of animal populations</li> <li>Studies concerning the quantitative genetics of animal populations</li> <li>Methods of genetic improvement</li> <li>Evaluation of different contaminants effect from farm animal feed as first barrier in absorption and of defending the animal body, in vitro and in vivo studies.</li> <li>Immuno-genetic studies concerning modification from</li> </ul>	<ul style="list-style-type: none"> <li>In vitro studies</li> <li>Microbiologic analysis</li> <li>Mycologic analysis</li> <li>Mycotoxologic analysis, fast mycotoxine screening</li> <li>Animal serology analysis</li> </ul>	National: 2	Research staff permanent :11 Research staff – temporary: 0 Technical staff: 0 Administrative staff: 0		International: 9 National :5

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)
National R&D Institute for Biology & Animal Nutrition – IBNA – Nutrition Chemistry & Physiology Dept.	Research Institute	<p>mycotoxines. Modulation of immune cell feedback by the action of nutrition factors of farm animal feed</p> <ul style="list-style-type: none"> <li>• Selection assisted by genetic markers</li> <li>• Adaptation and development of enzymatic biochemistry methods; evaluation of the activity of enzymes with influence on proteic, mineral and vitaminic metabolism</li> </ul>	<ul style="list-style-type: none"> <li>• Chemical composition of the feeds</li> <li>• Feed Quality control methods</li> <li>• Fast evaluation of the feed nutrition value</li> <li>• Continuous re-evaluation of the feed nutrition value</li> </ul>	National:2	Research staff permanent :11 Research staff – temporary: 0 Technical staff:0 Administrative staff: 0		International: 5 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)
National Institute for Chemistry & Petrochemistry (ICECHIM) – Dept. for Analysis and testings	R&D Institute	<ul style="list-style-type: none"> <li>contrrolling the nutritional qualities for fat-enriched feed</li> <li>• Development of chemical methods for feed quality control and animal-origine food: biochemical markers for diary products, quality of cereal products to be used for concentrated feed</li> <li>• Development of methods for feed digestion and bio-availability of feed: chemical methods</li> <li>• Inter-labs inquiries concerning the chemical structure of feed: micro-elements determination (Cu, Fe, Mn, Zn, Pb and Cd) from medicinal plants; phosphorus measurement from veterinary using phosphats; etc.</li> </ul>					
		<ul style="list-style-type: none"> <li>• Analysis of synthesis organic compounds or in pure stage, solide and liquid;</li> <li>• Identification and dosing of organic compounds;</li> <li>• Analysis of Organic solvents;</li> <li>• Analysis of Essential oils</li> <li>• Analysis of organic impurities of alcoholic drinks;</li> <li>• Anaysis of pesticides</li> <li>• Characterisation of anorganic and organic substances for industrial use;</li> <li>• Separation and dosing of organic compounds, biological, pharmaceutical, food, etc</li> </ul>					
			<ul style="list-style-type: none"> <li>• Analysis and testings</li> <li>• Synthesis of nano-materials</li> <li>• Synthesis of photo-active materials for nano-medicine</li> </ul>	<b>International:1</b> <b>National: 1</b>	Research staff permanent :13 Research staff – temporary: 0 Technical staff: 3 Administrative staff: 0		<b>International:7</b> <b>National: 1</b>

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)
		<ul style="list-style-type: none"> <li>• Studies of thermic and photo-chemical stability of active biological compounds and drugs;</li> <li>• The capacity of oxigem generation of the phtalo-cyanines used in cancer therapy;</li> <li>• In vitro testings of the drugs for the photo-dinamic therapy of cell culture;</li> <li>• Detemination of Organic impurificators from the samples of air, water, soil and different types of wastes</li> </ul>					
Institute for Research & Development for Pedology and Agrochemistry Bucharest	<i>Research Institute</i>	<ul style="list-style-type: none"> <li>• Characterisation and quantifying the natural and the environmental resources;</li> <li>• Monitoring these resources;</li> <li>• Standards and Methodologies for preservation of natural and environmental resources;</li> <li>• Agrochemistry and plant nutrition;</li> <li>• Sustainable management of the natural and environmental resources; Soil pollution; Global changes; Rural development</li> <li>• Mangement of agricultural, urban and industrial wastes;</li> <li>• Using IT in pedology, agrochemistry and management of the environment;</li> </ul>	<ul style="list-style-type: none"> <li>• Research</li> <li>• Technological Development</li> <li>• Training</li> <li>• Technological transfer</li> <li>• Information and documentation services in agriculture and environment</li> </ul>	<i>National: 3</i>	Research staff permanent : 81 Research staff – temporary: - Technical staff: - Administrative staff: -	<i>Patent: 1</i>	<i>International: 4 National: 2</i>
National Institute of R&D for Potato and Sugar Beet Brasov	<i>Research Institute</i>	<ul style="list-style-type: none"> <li>• integrated and differentiated technologies for potato, sugar beet, medicinal plants and cereal, with low energetic</li> </ul>	<ul style="list-style-type: none"> <li>• Maintaining and improving the genetic heritage of potato</li> <li>• Selection of genotypes and creation of new potato varieties</li> </ul>	<i>National: 2</i>	Research staff permanent : 104 Research staff – temporary: -	<i>Patents: 7</i>	<i>International: 1 National: 6</i>

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)
		<p>expenditure, un-polluting and economic, for actual climatic changes;</p> <ul style="list-style-type: none"> <li>the physiological bases of yield formation, potato and sugar beet modelling and simulation;</li> <li>prognosis methods, alert and control of main potato, sugar beet and medicinal plants pests and diseases, testing and homologation of phyto-sanitary products;</li> <li>zoning, micro-zoning, management and marketing of potato, sugar beet, medicinal plants through utilization of information technology;</li> <li>testing culinary and technological qualities, storage behaviour for characterisation of NIRDPSB Brasov new varieties and lines;</li> <li>promotion and conserving native medicinal plants for reestablishment and restoration of soils, flora and auxiliary fauna.</li> <li>promotion ecological technologies for potato, sugar beet and medicinal plants, on the new UE orientation and market demands.</li> <li>To produce "in vitro" microtubers by classical methods</li> <li>Develop new methods of microtubers "in vitro" producing, through permanent immersion</li> </ul>	<ul style="list-style-type: none"> <li>Multiply new varieties</li> <li>Improve seed potato quality</li> <li>Optimizing the process of virotic tests in potato</li> </ul>		<p>Technical staff: 133 Administrative staff: 31</p>		

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)
		<ul style="list-style-type: none"> <li>To produce new products to address producers demands in seed production</li> <li>Develop tools for effective breeding( in vitro selection for stress resistance)</li> <li>Rapid multiplication by tissue cultures and "in vitro" multiplication of potato varieties, based on market demands</li> </ul>					
Univ. Sapiientia – Research Center BIBIRC	University	<ul style="list-style-type: none"> <li>Protection of environment, ground waters, protection and recovery of soil</li> <li>Agriculture crops, agricultural by-products; agriculture wastes, biotechnologies for soil remediation</li> <li>Biotechnologies for dairy industry</li> <li>Usage of Animal by-products</li> </ul>	<ul style="list-style-type: none"> <li>Analysis and testings</li> <li>Consultancy</li> <li>Lab measurements</li> <li>Bacteria for soil remediation</li> </ul>	National: 1	Research permanent : 27 staff Research temporary: - staff Technical staff: - Administrative staff: -	Patents: 5	International: 4 National: 1
Molecular & Atomic Spectroscopy Laboratory / Banat's University of Agricultural Sciences and Veterinary Medicine, Faculty of Food Technology	University	<ul style="list-style-type: none"> <li>Food analysis by molecular and atomic spectrometry methods</li> <li>Functional food design</li> <li>Sensors for food quality monitoring</li> </ul>	<ul style="list-style-type: none"> <li>Food quality control by spectrometric methods</li> <li>Contaminants analysis of food and row materials</li> <li>Design of new functional foods</li> </ul>	National: 2	Research permanent : 2 staff Research temporary: 1 staff Technical staff: 1 Administrative staff: 1		International: 6 National: 16
NATIONAL INSTITUTE FOR CHEMICAL PHARMACEUTICAL RESEARCH	Research Institute		<ul style="list-style-type: none"> <li>Herbal-based antioxidants</li> <li>Herbal-based colourants</li> </ul>	International: 2 National: 2	Permanent :- Research staff temporary: - Technical staff: - Administrative staff: -	Patents: 4	International: 2 National: 7

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)
Center for Organic Chemistry "Costin Nenitescu"	Research Institute	<ul style="list-style-type: none"> <li>- 2D-NMR and modern pulse sequences allowing complete signals assignment and stereochemical analyses;</li> <li>- NMR applied to food analysis;</li> <li>- NMR applied to biofluids and tissue extracts;</li> <li>- <sup>125</sup>Te-NMR spectroscopy</li> <li>Research on agricultural wastes and valorisation of agricultural biomass</li> <li>Fine synthesis and chemical characterisation of active compounds for pharma applications</li> <li>Process techniques and methods for nano-materials (mainly plastics or polymer-based)</li> <li>Software development for QSAR/QSPR studies for molecular activity predictions</li> </ul>	<ul style="list-style-type: none"> <li>Analysis of fine synthesis for determination of chemical structure of compounds</li> <li>NMR analysis and GC-MS characterisation of fine chemicals</li> <li>Analysis for Chemical control of hazardous substances (customs requests)</li> </ul>	<i>International: 1</i> <i>National: 3</i>	Permanent : 71 staff Research temporary: 0 Technical staff: 10 Administrative staff: 4		<i>International: 10</i> <i>National: 6</i>
National Institute for Chemistry & Petrochemistry (ICECHIM) – Dept. for Bioresources	Research Institute	<ul style="list-style-type: none"> <li>Technologies of obtaining metallic salts of fatty acids:</li> <li>- calcium salts as additives for feeding animals;</li> <li>- copper and calcium salts of oleyne and stearyne, used for ecologic fungicides used in fruit growing and horticulture</li> <li>- sodium salts as raw materials for personal used soap flakes;</li> <li>- potassium salts, used as insecticides in orchards and vineyards;</li> </ul>	<ul style="list-style-type: none"> <li>Technical assistance for upscaling lab technologies</li> <li>Consultancy in the area of chemical fertilizers and anorganic salts</li> <li>Professional trainings in the area of developing products for a performant agriculture</li> </ul>	<i>International: 1</i> <i>National: 2</i>	Permanent : 24 staff Research temporary: - Technical staff: 4 Administrative staff: -	<i>Patents: 3</i>	<i>National: 5</i>

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)
		<ul style="list-style-type: none"> <li>• - lithium salts used as additives in oils and greases</li> <li>• Fatty acids salt-based products formulations;</li> <li>• Derivates of fatty acids with special uses in horticulture</li> <li>• Technologies for modern agro-chemical structures:</li> <li>• - agro-chemical products as fertilisers;</li> <li>• - agro-chemical products as bio-stimulators;</li> <li>• - Ecologic liquid compositions as fertilisers;</li> <li>• - Slow-release micro-encapsulated urea;</li> <li>• - Microencapsulated NPK Fertiliser composition with slow-release;</li> <li>• Chemical fertilisers:</li> <li>• - urea – super-granules;</li> <li>• - ecologic fertilisers;</li> <li>• - phosphat-based fertilisers;</li> <li>• - urea+amonium sulphate fertilisers;</li> <li>• Technologies for yeast biomass conditioning, with decreasing of risk contamination of corn: concentrated emulsions and gels for seed and culture treatment;</li> <li>• Technologies of immobilisation of agro-used bacteria biomass on bio-polimeric matrix, to used them as soil insertions</li> </ul>					
National Institute	R&D for	<b>Research Institute</b>	<ul style="list-style-type: none"> <li>• Biotechnologies for environmental protection and</li> <li>• Technical assistance for upscaling lab technologies</li> </ul>	<b>National: 2</b>	Permanent : 10 Research staff		<b>International: 2</b>



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)
Chemistry & Petrochemistry (ICECHIM) – Dept. for Biotechnologies		<ul style="list-style-type: none"> <li>remediation</li> <li>- conversion of residues and agro-food byproducts into useful products;</li> <li>- bio-degradability of plastic material wastes;</li> <li>biotechnologies for contaminated water remediation</li> <li>Methods for bio-analysis of biotechnological and food products control and processes</li> <li>advanced methods and techniques for analysis, control and quality assurance of biotechnologicv substances and products;</li> <li>development of sensors , bio-sensors and immuno-sensors</li> <li>Biotechnological processes to obtain active biologic products</li> <li>- Microbial technologies to produce substances with anti-bacterial properties;</li> <li>- Pharma and medical biotechnologies;</li> <li>- biotechnologies for obtaining bio-fertilisers;</li> <li>- biotechnologies for obtaining products for chemical industry, leather industry and food industry;</li> <li>- processing, separation, purification and concentration of bio-products.</li> </ul>	<ul style="list-style-type: none"> <li>Consultancy in the area of bio-products for chemical, leather and food industry</li> <li>Analysis and testings of bio-degradability of industrial wastes</li> </ul>		temporary: - Technical staff: 1 Administrative staff: -		<b>National: 4</b>
University of Bucharest-Faculty of	University of	<ul style="list-style-type: none"> <li>selective catalytic oxidation</li> <li>catalysts for environment protection</li> </ul>		<b>National: 3</b>			<b>International: 5</b> <b>National: 2</b>

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)
<b>Chemistry-Dept. of Analytical Chemistry</b>		<ul style="list-style-type: none"> <li>• catalytic activation of light alkanes</li> <li>• chemo, enantio and diastereoselective</li> <li>• hydrogenations</li> <li>• catalysts for fine chemicals synthesis</li> <li>• catalysis by organo-metallic complexes, photo</li> <li>• catalysis, biocatalysis and supramolecular catalysis</li> <li>• combinatorial catalysis</li> <li>• conversion of alkanes and alkenes on acid-base</li> <li>• catalysts</li> <li>• enzymatic catalysis</li> </ul>					
<b>University of Bucharest-Faculty of Chemistry-Dept. of Catalyst Chemistry</b>	<b>University</b>	<ul style="list-style-type: none"> <li>• selective catalytic oxidation</li> <li>• catalysts for environment protection</li> <li>• catalytic activation of light alkanes</li> <li>• chemo, enantio and diastereoselective</li> <li>• hydrogenations</li> <li>• catalysts for fine chemicals synthesis</li> <li>• catalysis by organo-metallic complexes, photo</li> <li>• catalysis, biocatalysis and supramolecular catalysis</li> <li>• combinatorial catalysis</li> <li>• conversion of alkanes and alkenes on acid-base</li> <li>• catalysts</li> <li>• enzymatic catalysis</li> </ul>		<b>National: 1</b>			<b>International: 6</b>
				<b>Total International: 65</b>	<b>Total numbers Res. Perm. 745</b>	<b>- Total Patents:</b>	<b>- Total International:</b>

Inno- Food SEE- D3.2a- Profiling of regional food research entities



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)
				<b>Total</b> <b>National: 122</b>	<b>Res temp. 99</b> <b>Tech. 404</b> <b>Admin: 105</b>	<b>47</b> <b>- Total</b> <b>Spin off companies: 0</b>	<b>265</b> <b>- Total</b> <b>National: 221</b>

The profiling analysis was made by addressing to **35 RTDs**.

The RTDs staff dimension on average shows 21,2 permanent researchers units per entity and 2,8 is the value of temporary personnel.

Technical staff average number is 11,54 units per RTD, whereas same data for Administrative staff is 3.

The Research Area where the RTDs are more actively, according with the NABS classification:

- 0600 General research on agriculture production and technology,
- 0609 Other research on agricultural production and technology,
- 0606 Food technology ,
- 0400 General research on protection and improvement of human health,
- 0405 Nutrition and food hygiene
- 0604 Crops
- 0601 Animal products
- 0305 Protection of soil and groundwater

Regarding the Productive sectors where the interviewed entities execute their research, we can list some of them:

- 15.10 - Production, processing and preserving of meat and meat products
- 15.00 - Manufacture of food products and beverages
- 15.20 - Processing and preserving of fish and fish products
- 15.30 - Processing and preserving of fruit and vegetables
- 15.50 - Manufacture of dairy products
- 15.40 - Manufacture of vegetable and animal oils and fats
- 15.81 - Manufacture of bread; manufacture of fresh pastry goods and cakes

The above table shows that 82,85% of the interviewed entities offer knowledge based services to third parties. 68,5% of them participated in international projects over the past five years and 51,42% reported national projects in the same period of time. Regarding journal publications, 51,42% of them reported international journal publications and approximately 74,28% of them had national journal publications.

The registered number of patents by the Romanian RTDs over the past 5 years is 47. The National Institute of Research and Development for machines and installations designed to

agriculture and food industry had the highest number of patents (16), followed by the National Institute of R&D for Potato and Sugar Beet Brasov with 7 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.

Code	Question	Value	Percentage % (unless otherwise indicated)
-	How many research entities were initially contacted for profiling, i.e. how many questionnaires were sent out?	50	
-	How many research entities were finally profiled?	35	70% (profiled/ contacted)
A9, A10	What is the average research staff of the entities (permanent and temporary)?	24	-
A11, A12	What is the average of the entities technical and administrative staff?	15	-
B2	Which are the Top 5 Research areas that the research entities reported they were active at?	-General research on agriculture production and technology, -Other research on agricultural production and technology, -Food technology , -General research on protection and improvement of human health, -Nutrition and food hygiene -Crops -Animal products -Protection of soil and groundwater	
B2	Which are the Top 5 Sectors that the productive sectors reported they were active at?	- Production, processing and preserving of meat and meat products - Manufacture of food products and beverages - Processing and preserving of fish and fish products - Processing and preserving of fruit and vegetables - Manufacture of dairy products - Manufacture of vegetable and animal oils and fats - Manufacture of bread; manufacture of fresh pastry goods and cakes	
B3	How many research entities have reported that they offer knowledge- based services to third parties?	29	83%
C1	How many research entities have reported international projects in the past 5 years?	24	69%
D1	How many research entities have reported international journal publications in the past 5 years?	18	51%

Code	Question	Value	Percentage (unless otherwise indicated)	%
D2	How many research entities have reported the existence of patents?	12	34%	
D2	If so, how many patents were reported?	47	n/a	
D3	How many research entities have reported the existence of spin- off companies?	7	19%	
D3	If so, how many spin- off companies were reported?	8	-	

## 5.4 PRELIMINARY SWOT RESULTS

<b>Strengths</b>	<b>Weaknesses</b>
1. Open exchange of experience in research and technology development (22 responses) 2. Highly skilled personnel (24 responses) 3. Public-private cooperation (21 responses) 4. Strong research base (21 responses) 5. Increasing number of collaboration with firms (7 responses)	1. Not enough start ups (20 responses) 2. Low size of budget for R&D (29 responses) 3. Poor linkage between firms and research entities (10 responses) 4. Weak understanding between researchers and industry complicates joint projects (11 responses) 5. Lack of formal collaboration between actors (3 responses)
<b>Opportunities</b>	<b>Threats</b>
1. New R&D European and regional programmes (26 responses) 2. Networking (22 responses) 3. Availability of EU R&D funds for research (13 responses) 4. Surplus of well educated researchers (13 responses) 5. Increasing demand for more/better varieties (5 responses)	1. Bureaucracy barriers (13 responses) 2. Funding programmes to support research with content far from current research interests (11 responses) 3. Failure to attract international researchers (10 responses) 4. Brain drain (15 responses) 5. Few incentives for university researchers to engage in collaboration with the industry (14 responses)

As we can see from the SWOT table emerged from the questionnaires, the highest score obtained by a weakness is addressed to the low size of budget for R&D activities, followed by the weak understanding between researchers and industry which complicates even more the number of joint projects. It is necessary to maximize the highly skilled personnel (the main strength indicated) in order to take advantage on the opportunities, especially the new R&D European and regional programmes.

## **5.5 CONCLUDING REMARKS**

Romania benefits of research institutions, mainly public bodies, with high scientific human potential, with a modern infrastructure that can rival those of leading institutions in Europe. These institutions are able to support all the companies interested in food innovation projects.

In the year 2011, there were spent over 2786,8 million lei for research and development activities. This spending represented 0.48% from GDP, showing an increase of 0,48% instead of 2010.

The profiling of the Romanian research entities analysis shows that the research system in Romania is involved in international joint activities and also offers at national level services to third parties. The entities interviewed reported 47 patents in the past 5 years and most of them are accounted to INMA Bucharest.

Romania has a centralised research-development and innovation system, based on grants offered by the public funds, managed by the National Authority for Scientific Research (ANCS) and monitored by the Executive Unit for Financing High Education, Research, Development and Innovation System (UEFISCDI).

These are generalist governmental bodies and there are no specific REGIONAL or SECTORIAL programmes for food and agriculture, but within the National Plan for Research, Development and Innovation (PNCDI) there is the 5<sup>th</sup> thematic area: Agriculture, Food safety and security.

Last year competition selected 17 national collaborative (industry + research) projects under this thematic area.

The research units and the universities which have research activities on food and agriculture issues, compete mainly for this thematic area, but also for the 6<sup>th</sup> thematic area – Biotechnologies and 3<sup>rd</sup> Thematic area: Environment.

The R&D&I national expertise on food and agriculture is concentrated in one national specialised research unit – The National R&D Institute for Food Bioresources (IBA), one national institute specialised on potato, a couple of Universities for Agricultural Sciences and Veterinary Medicine in the major cities of Romania – Bucharest, Iasi, Cluj, Timisoara and several research centers and research companies, organised as innovative SMEs.



This is a small numbers of specialised food and agriculture research units for a country like Romania and on responding questionnaires, we received information about projects participation, articles, patents from research units acting in relevant sectors – like biotechnologies, chemistry, physics, etc.

All the responding units participated in national R&D projects in the last five years and majority of them paid attention to publishing articles and scientific papers too. Unfortunately, there are not so many articles with ISI impact, because there is no Romanian journal (especially on food and agriculture) with significant ISI quotation.

Between 2007-2013, there are available Structural Funds for Romania and one Priority Axis is dedicated to Improving Competitiveness by Research, Development and Innovation. One priority operation 2.3.1 was dedicated to create start-ups and spin-offs as commercial exploitation of research project results, but in the 6 years of operation programme, only 3 start-ups have been created (out of 90) on food and agriculture sector.

The National Technological Platform “Food4Life” as part of the European Technological Platform is the main framework for industry-research dialogue – and the platform is managed and maintained by the National R&D Institute for Food Bioresources (IBA).

For the next years it is expected that the National Plan for Research, Development and Innovation (PNCDI) to remain the main R&D framework where research units from food and agriculture to find public financial support for their projects.

In complementarity, it is expected to have the Structural Funds on the new EC format for the period 2014-2020.

## **6. REPUBLIC OF SLOVENIA**

### **6.1 SHORT PROFILE OF THE COUNTRY, THE AGRICULTURAL PRODUCTION AND THE FOOD INDUSTRY**

Republic of Slovenia is one of the smallest EU member states and covers 20,256 square kilometres. It borders with Austria in the North (the length of border is 324 km), with Italy in the west (235 km), Hungary in the northeast (102 km) and Croatia in the south and southeast (546 km). Slovenia has a population of about two million people. The larger towns are Ljubljana (the capital), Maribor, Kranj, Celje, Koper, Novo mesto, Nova Gorica, Velenje, Ptuj, Murska Sobota, Slovenj Gradec. In spite of its geographically small size, Slovenia is a convergence point of a range of different landscapes – Alpine and Mediterranean, Pannonian and Dinaric, each of which has its own characteristics and unique features as well as this area has always been the juncture of various cultural impacts. With its position between the Alps and the northernmost gulf in the Mediterranean, Slovenia represents one of the most important passages from the south-eastern Europe to the west.

Slovenian agro-food sector is relatively small in terms of its contribution to the national economy. Natural conditions for agriculture are relatively unfavourable in Slovenia. Availability of land for agricultural production is limited in Slovenia, with forests covering more than 60% of the country's territory. The agricultural area accounts for about 30% of total land and its area has been steadily declining due to expansion of forests, built-up territories and new transport infrastructure. The greatest share of the structure of agricultural land use is covered by permanent grassland and pastures (58 %), followed by fields (36 %) and perennial crops (6 %). Agricultural production in Slovenia still depends greatly on weather conditions; as a consequence, the volume of crop production varies considerably between years. The sectorial structure of agricultural output has remained almost unchanged in last decade, with livestock and crop production accounting for about 50% of GAO each. Milk and beef production are the most important livestock sub-sectors, followed by pig and poultry production. In the structure of crop production, beside forage plants, fruits and wine together represent the highest share of GAO, followed by cereals. According to the last agricultural census (SORS, 2012) there is 74.646 farms with the average size of only 6,4 ha – farms are thus around 3-times smaller compared with the EU average.

Slovenian food processing industry is economically and technologically rather advanced, when compared to other EU new member states, however the key competitive pressure recently comes from the expansive companies from incumbent members. Despite the fact, the production of food and beverages is still one of the most important activities of the Slovene

processing sector. In 2011, 1.183 business subjects were registered in the food processing sector out of which 599 companies and 584 individual entrepreneurs, providing employment for 15.987 employees. The incomes generated amounted to EUR 2,1 billion, while the value added amounted to EUR 0,471 billion. The number of registered business subjects in the food processing industry increased significantly in the last five years however the number of employees is in decline. Meat processing and the bakery sectors are two major activities, in terms of the number of companies and employees, together accounting for more than a half (57% in 2011) of all employed in the food industry.

## **6.2 SHORT DESCRIPTION OF THE REGIONAL RESEARCH AND INNOVATION FRAMEWORK**

In Slovenia, to a large extent, scientific research is conducted at **Universities**. Slovenia has five Universities, namely: University of Ljubljana, University of Maribor, University of Primorska, University of Nova Gorica and Euro-Mediterranean University. The first three are public universities, funded for their academic tasks mostly by the Government, while the University of Nova Gorica presents a public-private partnership. The Euro-Mediterranean University is an international network of universities (38 countries) and it was established as one of the six priority areas of the Union for the Mediterranean with the aim to enhance the collaboration among partner institutions. Within the five universities, there are more 60 different Higher Education Institution (HEI) in all academic fields. Currently prevailing funding system for higher education in Slovenia separates the educational funding (which follows the number of students enrolled, the number of staff employed and the number of programmes), from the research one. When it comes to research, HEIs are treated as any other public research unit and apply for research funds through public calls for research programmes/projects at Slovenian Research Agency, so one could say competitive funding prevails. The HEI's can also raise support for the research activity from business sector. Due to relative independence of the research units (often called institutes) it is difficult to clearly establish the amount of financing coming to HEI from different sectors (Erawatch, 2012).

The national statistics show that in 2010 the R&D funds for the HEI sector primarily came from the Government (75,7 %), followed by the business sector (11,95 %), funds from abroad (10,4%), and by the HEI sector itself (1,95 %). In 2010, HEIs performed 13,82 % of total R&D in Slovenia or 0,29 % of the total GDP (SORS, 2011).

In addition to the Universities there are 47 **Public research organisations** (PRO), non-university research institutes, which contribute to the country's knowledge base with a comparable share as the university system. PRO employ 2,036 researchers (FTE count) in

2010 (SORS, 2011). The public research institutes (15), which are having the Republic of Slovenia as their founder, are entitled to institutional funding. The percentage that institutional funding represents, varies from institute to institute, but, on average, institutes report that 10–30% of their budget is covered in this way. Institutes can apply to Slovenian Research Agency for the research programme funding with their research groups, for the applied projects if they have co-financing from business sector and for the so called Targeted research projects. The funding is obtained also through direct contracts with the business sector and through international cooperation (Erawatch, 2012). The research institutes receive most of the funding from the public funding: according to 2010 data, as much as 77 % of total funding was received from the Government, 13 % were coming from business sector and 10 % from abroad. With each strategic document in the area of STI, a need to align better the research implemented by the institutes with the needs of the Slovenian business sector is stressed, but no shift has occurred yet. The Government sector accounted in 2010 18.1% of total R&D activity (SORS, 2011).

The third category of research performers in Slovenia is **Business sector R&D units** which have experienced a considerable growth in the last decade. Structure of the business R&D expenditure reflects the predominant role of manufacturing in the country, and within the manufacturing sector two sectors stand out: chemicals, specifically pharmaceuticals, and machinery and equipment, especially electrical equipment. Another concentration of business R&D can be found in fabricated metal products, machinery and equipment (34%; 2010), especially in TV and communication equipment. In 2010, manufacturing in total Business Expenditures for Research and Development (BERD) presented a share of 78%, and the share of services was 20%. The statistical data (SORS, 2011) shows that in the business sector 8.427 (7.056 in FTE) persons were employed; 3.887 (3.389 in FTE) classified as researchers and 3.530 (2.892 in FTE) as technicians in 2010. The research organisations in the business sector, however has a significantly lower educational level than those in the public research sector, since only 11% of all researchers holding the PhD work in the business sector (SORS, 2011). Among the types of research, the largest amount (68,5 %) of BERD in 2010 was devoted to the applied research, followed by 25 % of experimental research/development. The basic research received only 6,5 % of total BERD.

The interface between the universities, PRO and Business sector R&D are the **Public-private Research and Technology Organisations**. These institutions can be split into two categories in Slovenia: (1) bridging institutions, namely Technology Centres, Technology Platforms, Centres of Excellence, Clusters) and (2) support institutions, namely Technology parks.

One of the early ideas of the bridging institutions was the formation of **Technology Centres** (from 1994 onwards). Technology centres are independent legal entities established by several companies for the purposes of R&D in a specific field or branch, as well as for the provision of R&D equipment subsequently made available to companies for their development projects. There are currently 28 active technology centres operating in the fields ranging from textile processing, footwear, tool-making, and electrical engineering, information and safety technologies. The mode of co-financing has changed over the years, from the co-financing of the costs of operation to financing of the programmes.

The **Cluster initiative** in Slovenia, beginning in 2000, was one of the top priority measures when introduced. The cluster promotion started carefully: during the first year of the programme only three pilot clusters were established. In the subsequent year, their number increased to five, but a real breakthrough in clustering was achieved in 2003. Clusters were primarily sector based and linked together companies within the same industrial sector and research institutions in the particular field. The total 2003 budget for cluster policy was approximately 1,5 million €. In 2004, 18 cluster offices were operational. All together 29 projects related to clustering were supported: 3 pilot cluster projects, 13 early stage clusters and additional 13 cluster initiatives, bringing together 350 companies and 40 education/research institutes. Nevertheless all made efforts, the success of the cluster initiative was not convincing enough and after the change of Government in the end of 2004, the cluster support programme was discontinued.

**Technology Parks** is another early introduced measure (1994) and are supported by Ministry of Economy through PAEFI. Here, too, the modes of financing have changed several times since their establishment – until 2005 the services the parks offered to SMEs located within the parks were subsidised, but in 2005 and in 2006 a special public call, supported also by the European Regional Development Fund provided substantially increased resources for construction of new premises and new research infrastructure investments. Currently, the support to Technology parks is provided through PAEFI via the programme on innovation infrastructure. Four parks are functional, the biggest being Ljubljana Technology park (<http://www.tp-lj.si/en/>), where close to 300 enterprises are located.

And, finally there are **Centres of Excellence** and **Competence centres** which are seen as support tools, which will enable the concentration of high-quality research in priority areas and horizontally integrate all stages in knowledge development: from basic research to the development of commercial application. They aim at bringing together the critical mass of knowledge and research infrastructure to allow for the potential scientific break-through at the international level and enable participation of Slovenian scientists in the international networks of excellence. At the same time they should be concentrated in the areas where strengthening

of scientific resources would also result in increased technology transfer and development of new technologies for Slovenian industry. Centres of excellence aims at strengthening academic excellence and co-operation by building critical mass and by linking up to top centres abroad. It funds high-quality multidisciplinary groups of researchers. Currently there are eight CoEs, in which 70 industrial partners participate. The CoEs undertake fundamental research, but in addition to scientific publications they should also give rise to patents, innovations and spin-offs. The first ten CoEs were formed on a relatively small scale, but in the current OP period eight centres were selected for funding from 2009 to 2013, with nearly EUR 80 million allocated. The centres, each of which has a budget of around EUR 10 million, represent strongholds of Slovenian science and their formation is thus the result of a de facto bottom-up process. Each CoE is required to form a distinct legal entity. Competence centres (CCs), a science-industry linkage programme, are similar to CoEs but with a much stronger role for industrial partners, applied research and industry networks. The programme is aimed at strengthening the capability to develop and use new technologies to create new products, processes and services in important technology areas. They are meant to build critical mass. In contrast to CoEs but like development centres the CCs have a co-financing structure that includes public funds as state aid. The programme has a number of thematic priorities and a call for proposals was issued in mid-2010. The programme has an overall budget of 45 million EUR. Seven CCs in which 46 companies and 16 research organisations are participating have been awarded EUR 6,4 million each.

### 6.3 KEY INFORMATION FROM THE PROFILING OF THE REGIONAL RESEARCH ENTITIES

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)
<i>Slovenian Institute for Hop research and Brewing</i>	Research Institute	<ul style="list-style-type: none"> <li>-Hop breeding</li> <li>-Agricultural technology</li> <li>-Plant physiology</li> <li>-Nutrition</li> <li>-Hop marketing</li> <li>-Protection of hops against diseases and pests</li> <li>-Rural development</li> </ul>	<ul style="list-style-type: none"> <li>Certification-hop yield</li> <li>-Consulting in the technological process of production of beer and similar beverages him.</li> <li>-Determination and confirmation of the presence of agri-food products</li> </ul>	<i>International: 1</i> <i>National: 1</i>	17 Structured research staff 3 Unstructured research staff 19 Technical Staff 4 Administrative staff	0	<i>International:31</i> <i>National: 30</i>
Nutrition Research & Development Department	Research Institute	<ul style="list-style-type: none"> <li>- Human nutrition (development of functional food, semi-products and components for food supplements).</li> <li>- Animal nutrition (researching physiological needs of animals, quality of feed and adequate supply of nutritious substances).</li> </ul>	Chemical analysis of food and feed	<i>International: 5</i> <i>National: 4</i>	8 Structured research staff	0	<i>International:2</i> <i>National:3</i>
Agriculture and Forestry institute of Nova Gorica	Public institution	<ul style="list-style-type: none"> <li>-Sensory evaluation of dairy and meat products, must and wine</li> <li>- Laboratory analysis of soil, feed, wine and other grape and wine</li> <li>- Parent material and substrates</li> <li>-Diagnostics of pathogens</li> <li>-Development of alternative methods of plant pest</li> </ul>	<ul style="list-style-type: none"> <li>-Agro-Food Laboratory Services</li> <li>-Sales of fruit seedlings</li> <li>-Financial services for farms, micro companies and associations</li> <li>-Milk laboratory services</li> </ul>	<i>International:0</i> <i>National: 12</i>	19 Structured research staff 1 Unstructured research staff	0	Number of scientific articles published in last 10 years:50
University of Ljubljana, Biotechnical Faculty, Department of Animal Science, Chair for Agricultural Economics, Policy and Law	Academic Department	<ul style="list-style-type: none"> <li>-Monitoring the economic situation of the Slovenian food industry</li> <li>-Purchase and consumption habits of Slovenians in the area of food and agricultural products</li> <li>-Applications sensory testing prototypes that enable greater market success</li> </ul>	<ul style="list-style-type: none"> <li>-Competitive analysis of agro-sector</li> <li>-Market analysis-food</li> </ul>	<i>International:0</i> <i>National:2</i>	4 Structured research staff 3 Unstructured research staff	0	<i>International:4</i> <i>National:2</i>
Agricultural Institute of Slovenia	Public Research Institute	Genetics and refining, production technology and physiology, plant	Counseling, laboratory services and study	International:24 National: 108	175, 85 of them	0	No data



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)
University of Ljubljana, Biotechnical Faculty, Department of Animal Science, Institute of dairy and probiotics		nutrition, plant physiology, control of milk and meat, keeping the book of the breed, sustainable agriculture, monitoring and analysis of the situation and development of agriculture, analysis of agricultural policy.			researchers		
	Research Institute	Laboratory performs physical-chemical analysis, microbiological testing and sensory analysis. They providing training and research in the field of development of methods and analytical techniques in the dairy industry. They provide reference materials for laboratories and organizing proficiency testing.	-analysis for quality control of raw milk - The reference method - Classical microbiological testing - Sensory analysis -preparation of samples for inter-laboratory comparisons and statistical treatment of results - Professional training (workshops), counseling and support	International:0 National:3	8 Structured research staff 7 Unstructured research staff 9 Technical Staff 1 Administrative staff	0	Number of scientific articles published in last 10 years: 63
	Academic Department	Research related to animal nutrition, providing quality feed and improving the nutritional value of foods of animal origin for the production of safe and healthy food for the people.	Consulting for individual clients	International:0 National:1	6 Structured research staff 2 Unstructured research staff 5 Technical Staff 1 Administrative staff	0	Number of scientific articles published in last 10 years: 62
University of Ljubljana, Biotechnical Faculty, Department of Biochemistry and Food Chemistry	Academic Department	-Research phenolic compounds and other secondary metabolites from natural sources. -Design and use of a database of secondary metabolites and other quality parameters of raw materials and food	Counseling, laboratory services and study	International:22 National:6	69	1	International: 314 National:101



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)
		products. - Interactions of flavonoids with model cell membranes, proteins and DNA. - Stability of antioxidants (ascorbic acid, coenzyme Q10), included in the liposome. - The development of optical biosensors for the detection of polyphenolic compounds. - Luninescence methods for the determination of antioxidant activity in plant extracts. - Thermophilic archaea: heat-resistant bioactive compounds (antioxidants, proteins, lipids (arheosomi)). - Pathogenic changes in protein conformation (sinuklein, prion protein). - Physicochemical characterization of additives in the food industry, phenolic acids and certain metabolites.					
				<b>-Total International:52</b> <b>-Total National:137</b>	Total numbers of all personal: 361 Structured research staff: 216 -Unstructured research staff: 16 -Technical Staff: 123 -Administrative staff: 6	<b>-Total Patents:1</b> <b>-Total Spin off companies: 0</b>	<b>-Total International:351</b> <b>-Total National:136</b> <b>- No of scientific articles published in last 10 years:175</b>

Code	Question	Value	Percentage % (unless otherwise indicated)
-	How many research entities were initially contacted for profiling, i.e. how many questionnaires were sent out?	10	
-	How many research entities were finally profiled?	8	80% (profiled/ contacted)
A9, A10	What is the average research staff of the entities (permanent and temporary)?	29	-
A11, A12	What is the average of the entities technical and administrative staff?	~16	-
B2	Which are the Top 5 Research areas that the research entities reported they were active at?	-Animal products -General research on agriculture production and technology -Food technology -Nutrition and food hygiene -General research on industrial production and technology	
B2	Which are the Top 5 Sectors that the productive sectors reported they were active at?	- Manufacture of food products and beverages -Processing and preserving of fruit and vegetables -Manufacture of dairy products - Processing and preserving of fish and fish products - Production, Processing and preserving of meat and meat products	
C1	How many research entities have reported international projects in the past 5 years?	4	50%
D1	How many research entities have reported international journal publications in the past 5 years?	7	90%
D2	How many research entities have reported the existence of patents?	1	13%
D2	If so, how many patents were reported?	1	n/a
D3	How many research entities have reported the existence of spin- off companies?	0	0%
D3	If so, how many spin- off companies were reported?	-	-
E1	How many research entities have reported international collaborations in general?		%

## 6.4 PRELIMINARY SWOT RESULTS

<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>1. Open exchange of experience in research and technology development (7)</li> <li>2. Highly skilled personnel (6)</li> <li>3. Public-private cooperation (5)</li> <li>4. Increasing number of collaboration with firms (5)</li> <li>5. Strong research base (4)</li> </ul>	<ul style="list-style-type: none"> <li>1. Low size of budget for R&amp;D (7)</li> <li>2. Not enough startups (6)</li> <li>3. Poor linkage between actors (2)</li> <li>4. Lack of formal collaboration between actors (2)</li> <li>5. Poor research base (0)</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>1. Availability of EU R&amp;D funds for research (8)</li> <li>2. New R&amp;D European and regional programs (6)</li> <li>3. Networking (3)</li> <li>4. Increasing demand for more/better varieties (1)</li> <li>5. Surplus of well-educated researchers (1)</li> </ul>	<ul style="list-style-type: none"> <li>1. Funding programs to support research with content far from current research interests (6)</li> <li>2. Few incentives for university researchers to engage in collaboration with the industry (5)</li> <li>3. Bureaucracy barriers (4)</li> <li>4. Low awareness of regional research capacity (3)</li> <li>5. Brain drain (2)</li> <li>6. Need of adaption to new tools, rules and priorities (2)</li> <li>7. Failure to attract international researchers (1)</li> <li>8. Other, please specify: Reducing the budget for research at the state level (1)</li> </ul>

## 6.5 CONCLUDING REMARKS

In the final analysis participated 8 RTDs. Of these, 4 research institutes, 2 Academic Departments and 2 Public Institutions. In most questionnaires were missing some important information about the institutions so we get some data from other sources, which may not be completely accurate.

Eight institutions employ 361 people, 232 of them are researchers. In the last five years they have participated in 189 projects in the field of food industry and agriculture. There has been registered only one patent. Research Companies are not establishment spin-off companies.

Institutions think that their strengths and capabilities to provide comparative advantages in the Agro Food research sector in Slovenia are open exchange of experience in research and technology development and highly skilled personnel. As weakness in first place indicate low size of budget for R&D, and in second place not enough startups. As opportunities they see availability of EU R&D funds for research. They indicate funding programs to support research with content far from current research interests as the greatest threat.

There are only a few entities in Slovenia where R&D and innovation aiming at food industry are executed, moreover the typology of research is mainly scientific, and therefore with some limitations applicable to the business sector. Research and development in the area of food industry is mainly the domain of two largest Slovenia's universities: The University of Ljubljana and the University of Maribor.

The **Biotechnical Faculty** of the University of Ljubljana carries out research, professional, and advisory services in the areas of nature (biology, microbiology), agriculture, forestry and fishery (forestry, animal science, agronomy) and in the closely related production technologies (wood science, food science, biotechnology). Researchers at the Biotechnical faculty participate in numerous national and international interdisciplinary projects. The research work related to food is organised under several Chairs within the department of Food Science and Technology and Department for animal science (Dairy institute, Chair for agricultural economics, policy and law).

The **Agricultural Institute of Slovenia** is a public research institution founded in 1898. The status of a public research institution implies a governmental non-profit making institution with defined activities in the sense of public service. In frame of its registered activity the Institute carries out the following tasks: (a) basic, applied and developmental research in the area of agriculture and food; (b) expert projects defined by laws, (c) advising, studies and laboratory service; (c) supervision and verification of quality of agricultural products and products used for agriculture; (d) publication of findings and results of research, expert and

control work. It employs about 160 employees with approximately half of them with a post-graduate degree.

**Institute for Hop Growing and the Brewing Industry** in Žalec ([www.ihps.si](http://www.ihps.si)) is a research, developmental, advisory and educational public organization. It is acting for the needs of various governmental bodies as well as for the needs of home and foreign agribusiness industry. Its principal functions are research and advisory service in the fields of industrial plants growing i.e. hop breeding, agricultural technology, plant physiology, nutrition, hop marketing, protection of hops against diseases and pests and the related prognosis, as well as the application of chemical solutions used for the protection of plants, rural development, and ICT information management in agribusiness. Moreover, the research fields are complemented by national and EU research and development (R&D) projects aiming at agriculture, food industry, environmental issues, as well as the development and preservation of the countryside.

**Emona RCP – Nutrition Research and Development**, Ljubljana ([http://www.e-rpc.si/o\\_podjetju\\_angla.html](http://www.e-rpc.si/o_podjetju_angla.html)) is a R&D unit of the enterprise Jata Emona and is involved in various R&D projects in the area of human and animal nutrition. Main goal in field of Human nutrition is development of functional food, semi-products and components for food supplements. In field of animal nutrition researching physiological needs of animals, quality of feed and adequate supply of nutritious substances. In Chemical laboratory they develop and perform chemical analyses of raw materials and of finished products and control the quality of the same Technology transfer.

## 7. HUNGARY

### 7.1. REGIONAL BREAKDOWN

In order to advance the adjustment to the regional policy of the European Union, the system of planning-statistical regions was worked out. It was enforced by Act XCII of 1999 and LXXV of 2003 modifying Act XXI of 1996 on Regional Development and Regional Planning. These regions represent the second level of NUTS (Nomenclature of Territorial Units for Statistics).



NUTS level 1 was created in Hungary according to Regulation No. 1059/2003/EC of the European Parliament and the Council.



## 7.2. HUNGARIAN SPATIAL STRUCTURE

In socio-economic development significant disparities evolved between the many different parts of the country, which were influenced by the different natural endowments of various areas as well as by historical effects. **The most developed part of Hungary is the region of Central Hungary, comprising the capital.** Western areas are usually more developed than the eastern regions, and a north-south split can also be detected. These disparities are apparent in settlement structure, demographic trends, the state of economic development and circumstances of life.

**Central Hungary** is the part of the country with the smallest area but with the highest population, where 29% of the population is concentrated.

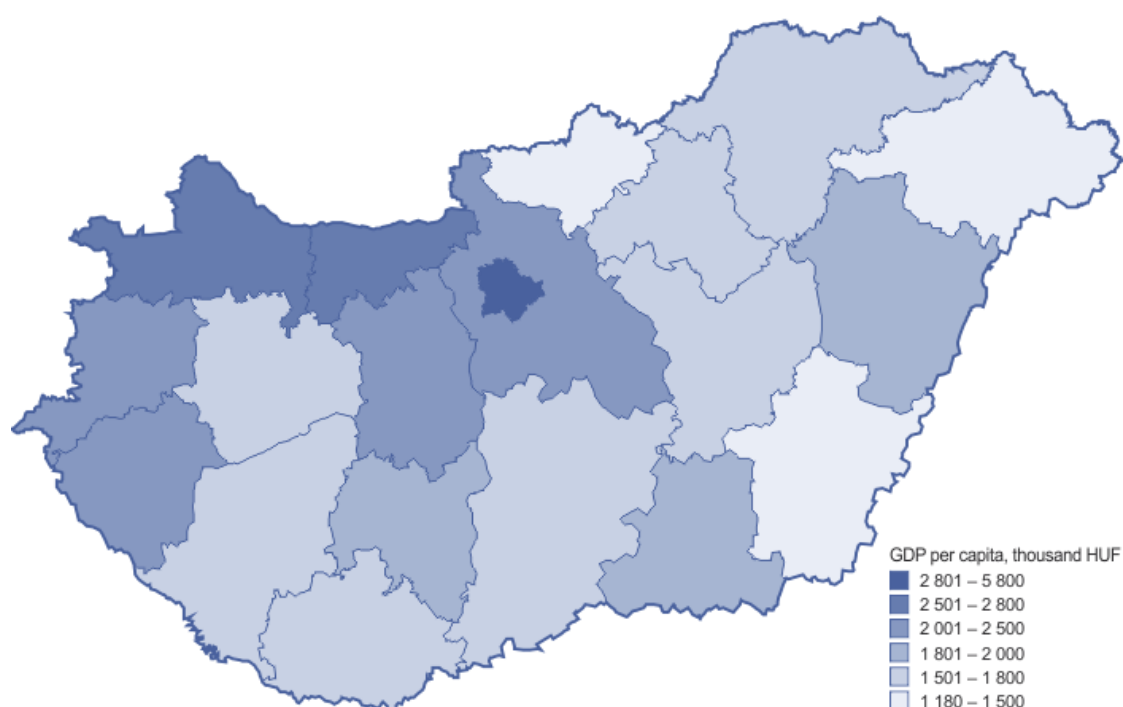
In the remaining six regions the distribution of the population is more even (9–15%) but inhabitants live in essentially differing settlement conditions. In the settlement structure of the regions of Transdanubia and Northern Hungary there are typically small villages with less than 1,000 inhabitants. The two regions in the Great Plain consist of settlements with long boundaries and larger population, where settlement density is considerably lower than in other areas of the country. Following Central Hungary the share of urban population is the highest in the regions of the Great Plain (68%–72%), although this level of urbanisation is still coupled with a relatively high number of inhabitants living in farmsteads, which is mainly characteristic of Bács-Kiskun, Csongrád and Békés counties in Southern Great Plain (9%).

**The population decline** in the last few years has affected all the regions in the country with the exception of Central Hungary. Natural decrease, characteristic of all the country, is the most intensive in the 'oldest' regions: Southern Great Plain and Southern Transdanubia. In economically more developed areas of Hungary positive net migration offset or moderated the negative impacts of vital events. Internal migration is directed from the eastern parts of the country mainly to the central and western areas: in addition to the region of Central Hungary, traditionally having a positive net migration, Central Transdanubia and Western Transdanubia increasingly become areas of destination, while a negative net migration of 52–53 thousand people is recorded in each of the regions of Northern Hungary and Northern Great Plain in the period of 2000–2009. In Northern Hungary the biggest loser of migration is Borsod-Abaúj-Zemplén county, and in Northern Great Plain it is Szabolcs-Szatmár-Bereg county. A specific feature of internal migration is the restructuring of population within Central Hungary from the beginning of the 1990s. Owing to outflows from the capital mainly to the agglomeration, the population loss of Budapest was 45 thousand following the turn of the

millennium. In the last few years the main source of the positive internal net migration in Pest county was already those coming not from the capital but from other areas of the country.

Based on **gross domestic product per capita**, the indicator used for the spatial comparison of the level of economic development, the most developed region of Hungary is Central Hungary, followed by Western Transdanubia and Central Transdanubia. Far below average come Southern Transdanubia, Southern Great Plain and Northern Great Plain, with Northern Hungary at the bottom of the rankings by state of economic development.

Gross domestic product (GDP) per capita, 2009



**The outstanding performance of the central region** is due to the economic potential of the capital, with Budapest providing 38% of the gross domestic product of Hungary. Regional differences in economic development are indicated by the fact that the value for the capital is five times that of Nógrád county, which is in the last position in the rankings of the capital and counties. (In comparison to the rest of the EU the lag of Hungary's regions is considerable: Central Hungary, with the best performance, is in the middle of the rankings, while the rest of the regions are in the last third.)

The composition of gross value added by economic branches shows that in Central Hungary the share of branches providing services is outstandingly high, and in the economic structure of the two more developed Transdanubian regions and of Northern Hungary the importance



of industry is well above the average. In regions having lower GDP per capita, agriculture has a more important role than in Hungary as a whole, in accordance with natural assets.

### ***7.3 SHORT PROFILE OF HUNGARY, THE AGRICULTURAL PRODUCTION AND THE FOOD INDUSTRY***

#### ***7.3.1. THE AGRICULTURE OF HUNGARY***

ungarian agriculture is characterised by **declining competitiveness and loss of position and markets both at home and abroad**. The gravest problem of the domestic farming world is the lack of adaptation to changing market conditions. A contributory factor to this unfortunate situation was the fact that the change of agricultural regime, that had in any case been well over due, did not taken place according to an up to date agricultural strategy, after adequate preparations before joining the EU.

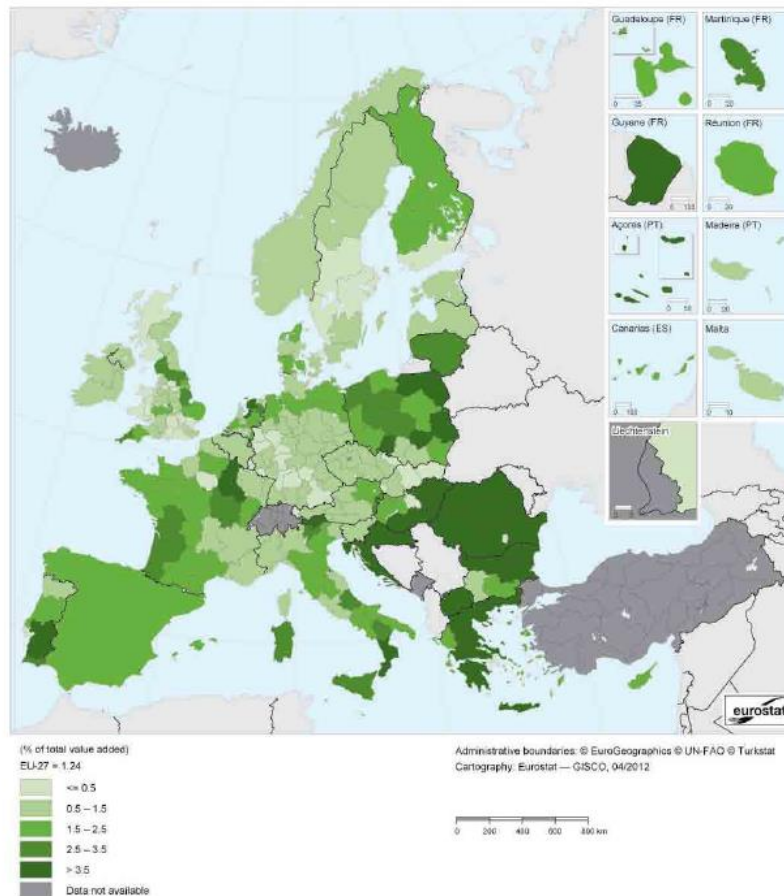
The shift of production structure toward extensive farming, low income producing capacity, is exceptionally harmful. In attempting to make improvements it is advisable to consider the present situation in the light of forthcoming changes in European farming and agricultural policies. Improvements in competitiveness require a strategy based on consensus and a serious of complex tasks to execute. Factors to be considered are the expected liberalisation of agricultural markets, the domestic approaches relating to bio-technology and GMO plants, evaluation of bio-energy production, future of CAP, harmony of domestic industrial structure, settlement of land ownership questions and rapid technological developments with particular emphasis on supporting scientific research, cooperation of farmers, effective co-operation between private and state concerns and a new type of synthesis of agriculture and countryside.

#### ***7.3.2. ECONOMIC ACCOUNTS FOR AGRICULTURE***

##### ***7.3.2.1 The role of agriculture in the Hungarian economy***

Agricultural production accounted for 35% of the economy in 2009 according to EUROSTAT and although it was of different importance in the different regions according to their geographical location, agriculture was considered to be a dominant sector.

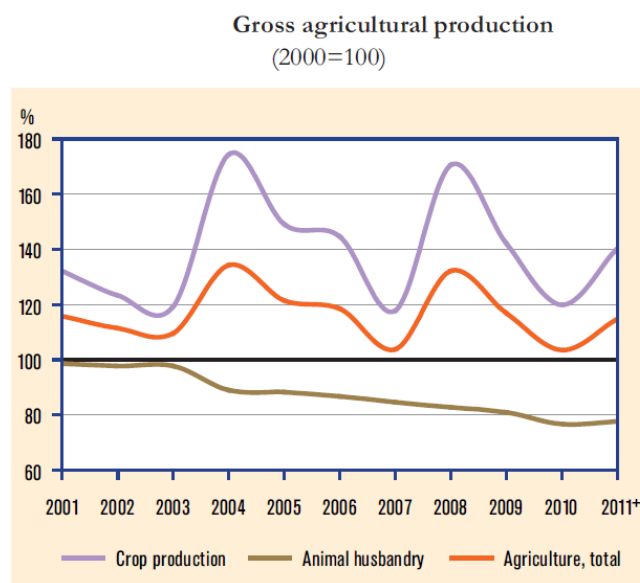
Share of agriculture in the economy, gross value added at basic prices, by NUTS 2 regions, 2009 <sup>(1)</sup>  
(% of total value added)



<sup>(1)</sup> Cyprus, Latvia, Lithuania, Luxembourg, Malta and Poland, 2008; Belgium, Spain, Slovenia, Norway and Croatia, national level.  
Source: Eurostat (online data codes: agr\_r\_accts and nama\_r\_e3vab95r2)

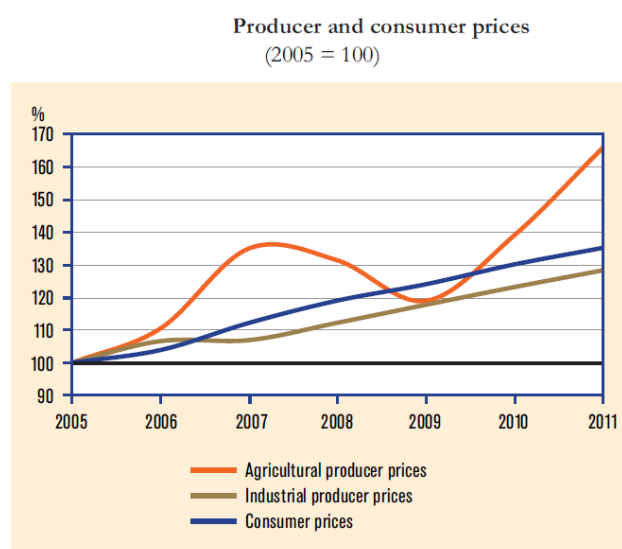
Agriculture, forestry and fishing were the only sectors within the gross domestic product that were able to show significant increases in volume in 2010-2011. Agricultural performance increased continuously and at a steady rate throughout the year 2011, the growth due primarily to the increase of added value within the plant production sector, according to preliminary data from 2012.

There is a strong periodicity regarding agricultural production within the time-frame of 2000 to 2011:



Source: HUNGARIAN CENTRAL STATISTICAL OFFICE, 2012

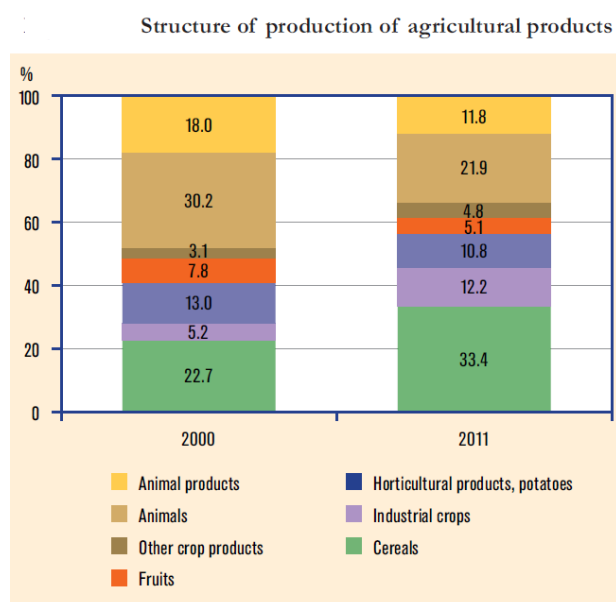
... which is reflected with a delay in agricultural prices, but overall, agricultural prices grow at a higher rate than industrial and consumer prices.



Source: HUNGARIAN CENTRAL STATISTICAL OFFICE, 2012

### 7.3.2.2 Structural changes in agriculture

The following characteristic changes occurred in the agricultural structure during the past years.



Source: HUNGARIAN CENTRAL STATISTICAL OFFICE, 2012

Production of basic crop products

Denomination	2009	2010	2011 <sup>a)</sup>	
	thousand tons		as % of EU-27 <sup>a)</sup>	
Wheat	4,419	3,745	4,107	2.7
Maize	7,528	6,985	7,992	12.1
Sunflower	1,256	970	1,375	14.0
Sugar-beet	737	819	856	0.8
Vegetables	1,614	1,144	1,475	1.8
Fruits	884	766	513	1.8
Grape	550	295	450	1.2

a) Data of 2010.

The Hungarian maize and sunflower production is determinative inside the EU their production volume increased between 2009 and 2011.

However the traditional fruit, vegetable and grape production decreased in the same period

Source: HUNGARIAN CENTRAL STATISTICAL OFFICE, 2012

Table 11.2. Livestock (1<sup>st</sup> December)

(thousand heads)

Inside the livestock breeding pigs and sheeps significantly the cattle population smaller decreased with the increased population of horses and poultry

Denomination	2009	2010	2011
Cattle	700	682	694
Pigs	3,247	3,169	3,025
Sheep	1,223	1,181	1,081
Poultry	40,264	42,213	41,488
Horses	61	65	74

Source: HUNGARIAN CENTRAL STATISTICAL OFFICE, 2012

Production of major animal products

Denomination	2009	2010	2011 <sup>a</sup>	
	in natural units		as % of EU-27 <sup>a</sup>	
Animals for slaughter, thousand tons	1,356	1,329	1,361	..
Cows' milk, million litres	1,712	1,641	1,690	1.1
Hen eggs, million	2,741	2,732	2,487	2.3
Wool, tons	4,483	4,070	3,989	2.2
Honey, tons	22,000	16,500	19,800	8.1

a) Data of 2010.

Inside the animal products the production of honey which is more dominant within the EU means 8% magnitude.

Source: HUNGARIAN CENTRAL STATISTICAL OFFICE, 2012

### 7.3.2.3. Volume of output

The volume of output of crop products – according to preliminary data – was 19% lower in 2012 than in 2011.

**The largest loss was recorded in the production of cereals:** first of all the production of maize declined considerably because of the extremely rainless weather. This volume decrease of more than 40% resulted in a 26% fall in the group of cereals.

The volume of industrial crops was down by 12%, firstly as a consequence of the considerable decline of rape and turnip rape output, secondly owing to the lower fall of sunflower production. The volume of output of forage plants, vegetables and horticultural products and potatoes was 13%, 11% and 15% lower respectively than in the previous year. The price of the latter plant also declined, which was due to the price-reducing impact of a considerable stock from the previous year. Although the decrease of fruit production was more moderate (2%) than in case of the former groups, it deserves attention that the volume

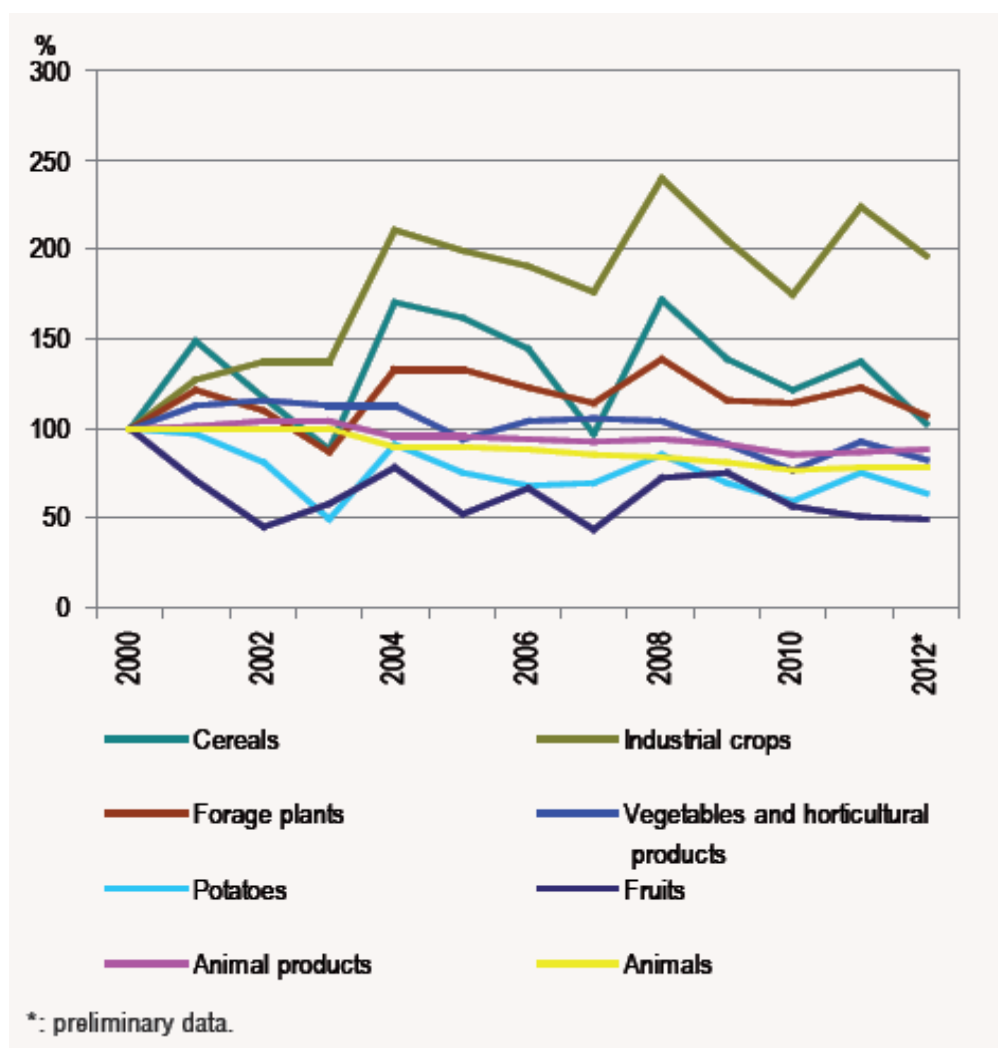
of this product group reached the level of the previous year in 2009 for the last time, and it has decreased continuously since then.

The output of animal husbandry was some 1% higher in 2012 than in the previous year. The volume of production of live animals was unchanged, while that of animal products was up by 2%. According to preliminary data the volume of cattle and pigs was on the decrease among animals, while that of poultry grew; out of products the volume of milk rose, while that of fresh eggs fell, which was consistent with the entering into effect of stricter regulations on keeping chickens.

The output volume in the different groups of crop production and animal husbandry has followed different paths since 2000. The increasing and steady demand for industrial crops – in an unparalleled manner – allowed for the doubling of the output. The output of cereals and forage plants was higher in the past few years than in the base year, however, the increase measured was not substantial enough to be considered as a trend, moreover, the weather causes significant fluctuations year by year.

Concerning vegetables and horticultural products, potatoes and fruits a decreasing trend was recorded for the past few years. In case of the latter, annual fluctuation is striking as well as the continuous decline of the volume after 2009, which reached in 2012 hardly half the base of 2000 according to preliminary data. The output of animals and animal products was similar: the fall was moderate but followed a trend until 2010, since when essentially stagnation has been observed.

Change of output volume of major product groups (2000=100%)



Source: HUNGARIAN CENTRAL STATISTICAL OFFICE, 2012

## **7.4. THE FOOD INDUSTRY OF HUNGARY**

### **7.4.1. THE STRATEGIC IMPORTANCE OF FOOD PRODUCTION**

**The food industry is traditionally one of the most important sectors of Hungary's national economy.** Including the food, soft drinks and tobacco sub-sectors, this industry is the 2<sup>nd</sup> largest employer and the 3<sup>rd</sup> largest producer of the processing industry in Hungary. Being one of the most modern food sectors in the CEE, its export revenues are vital to Hungary's overall trade balance. Hungary is the only net exporter of agricultural and food products in the region. The industry provides 5.31% of the country's exports.

**70% of Hungarian agricultural production is utilized by Hungarian food producers.**

**The security of food supplies is becoming an increasingly important social-political issue** following the last few decades of food overproduction. Dependence on import may become a problem once again for certain countries, a process that can be aggravated radically by the crisis. Because of the growing food safety risks arising of the global free movement of goods, the consumers appreciate local food producers more, since they are considered to be more likely to guarantee the safety of food.

In this situation, countries with comparative advantages regarding food production, such as Hungary, should do everything they can to capitalize on this advantage. It is the interest of both the country and the national economy to utilize the outstanding capabilities of the food industry to regain and increase its competitiveness in order to meet domestic food needs, and to contribute to the growth of the economy as a whole, once the domestic supply is secured.

### **7.4.2. THE ROLE AND THE POSITION OF THE HUNGARIAN FOOD INDUSTRY WITHIN THE HUNGARIAN ECONOMY**

In Hungary, the share of the food industry is decreasing within the performance of the processing industry comprising 14 sectors – despite its strategic importance. While it was ranked second in 2002 among the sectors with a share of 14,9%, its share dropped to 8,6% by 2011 (gross production value was 2002 billion Forints). This still meant a third rank within the sectors, showing the prominent importance of the industry.



. Distribution of industrial production and  
sales,\* 2011 (%)

Branch, branch group	Major branch groups, share from industrial <sup>1)</sup>		
	production	export	domestic
		sales	
Machinery branches	46.5	63.2	7.7
Chemical industry	20.5	15.4	20.1
Manufacture of food products, beverages and tobacco	10.1	5.1	13.3
Electricity, gas and water supply	6.8	3.0	44.9
Manufacture of basic metals	7.0	6.2	5.3
Other	9.1	7.2	8.6
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

\* Excluding water and waste management.

<sup>1)</sup> At current prices, the group of businesses with at least 5 employees = 100.0.

Source: HUNGARIAN CENTRAL STATISTICAL OFFICE, 2012

### 7.3.3. THE MARKET SITUATION

**The most important market outlet of agricultural products, Hungarian food producers the being crowded out of from the Hungarian market.** At the same time domestic products are also being displaced from the shelves of the retail chains. **In this year based on the government initiation the retail chains have a campaign to recover the Hungarian foods to the hyper- and supermarkets.**

Hungary is the second most significant exporter in the region. There is a constant surplus in the food industry foreign trade balance. The country is a large producer of wheat, sunflower, and corn. The most important export products are fruit and vegetables, meat, poultry, confectionery and dairy products. All exotic fruits and vegetables are imported.

Domestic sales dropped by almost 30% from 2002 to 2009, while we rely partially on import regarding specific staple foods. The 25% (now even 27%) VAT on the majority of food products is the highest within the EU. The competitive disadvantage arising from this is significant – especially considering the 4-7% VAT for Polish and German products. This difference imposes a great strain on domestic agriculture and the food industry. The former policies in Hungary were focused on increasing the production of raw materials, providing no support to the food industry. The producers could not supply the food industry continuously with good quality raw materials, capital investments remained low, there was no technological advancement, no development, which left markets open for import goods.

**Employment within the food industry decreased by 25% between 2002 and 2009.**

During this period, the share of the sector decreased by 0,6 percentage points within the national economy regarding employment, by 1 percentage point regarding GDP production and by 0,6 percentage points regarding investments.

The annual production value of the Hungarian food industry in 2012 was 2300 billion Forints. The production of the Hungarian food industry decreased by 20% between 2000 and 2010, meanwhile domestic sales dropped by 36%. However, production increased by 2,3 % and export increased by 8,2 percent in 2011. Domestic sales dropped by 3,3% and export increased by 6,4% in 2012, in correlation to the previous year.

Despite growing import, the balance of trade regarding agricultural products is positive – partly because of processing imported raw materials. At the same time, the added value of exported agricultural and food products is becoming lower and lower. There is a tendency to export mainly agricultural raw materials or agricultural and food products following primary processing. In 2010 the following shares in revenues were reported by the AKI agricultural report within the food industry: raw materials 42%, primary processing 19% and highly processed products 39%. Raw materials had a share of 74% while finished products had a share of 19% in the positive balance of agricultural trade.

**7.3.4. THE MAJOR PRODUCERS OF THE HUNGARIAN FOOD INDUSTRY****The main figures:**

- **90% of production in Hungary is realized in large and middle-sized companies.**
- **96% of companies active in the food sector are small or micro enterprises.**
  - Most food industry companies (more than 96%) are micro-enterprises that employ fewer than 10 persons.
  - About half of the food industry businesses operate as private entrepreneurs
- **The sector is dominated by multinational companies**, especially in vegetable oil processing, confectionary and snacks.
  - There are about 200 large food producers altogether, 2/3 of which are in foreign hands. The share of foreign capital in the industry is 48%.
  - About 70% of the total production is provided by major companies
  - Large producers primarily use Hungarian raw materials.

- The meat and poultry, fish and game, vegetable and fruit processing, mills and baking industry is mostly in Hungarian ownership.
- **Among the 500 largest Hungarian companies, 37 are from the food industry.** The majority of these firms are active in milk processing, meat and poultry, soft and alcoholic drinks, confectionary, tea and coffee, canning, and vegetable oil sub sectors.

### Some foreign investments and reinvestments from recent years

- 2012: Swiss **Givaudan** starts operations
- 2011: Swiss **Nestlé** finishes expansion at its pet food plant
- 2011: US based **POPZ** starts investment for new microwave popcorn packaging plant
- 2010: Austrian **PEZ** builds new sweets factory
- 2009: Turkish **Duna Döner** builds its new kebab plant. Started in 2010
- 2008: Swiss **Glencore** starts building new facility for a vegetable oil pressing plant

### Key factors to investing in the Hungarian food industry

- Food processing sector is among the most modern in CEE with significant foreign investment stock
- Physical infrastructure is considered one of the best in the region, considerably facilitating distribution
- The only net exporter in the CEE with a 7.3% export ratio
- Long traditions in the industry and abundant raw material supply
- Strong market: per capita consumption levels are among the highest in the region

## 7.5 AGRICULTURAL AND FOOD EDUCATION IN HUNGARY

There are several universities which deal with both agricultural education and research. The most important institutions for the agro-food sector are as follows:

Budapest Corvinus University [www.uni-corvinus.hu](http://www.uni-corvinus.hu)

Szent István University [www.szie.hu](http://www.szie.hu)

Debrecen University [www.unideb.hu](http://www.unideb.hu)

Pannon University [www.georgikon.hu](http://www.georgikon.hu)

Kaposvár University <http://english.ke.hu/menu/36/26>

University of West Hungary [www.uniwest.hu](http://www.uniwest.hu)

Some figures about the tertiary education, focusing to the agriculture qualification, the vocational trainings.

**Students in tertiary undergraduate (Bachelor) and postgraduate (Master) trainings by fields of training\* (%)**

Denomination	2001/2002	2011/2012 <sup>+</sup>
Teacher training and education science	14.1	4.7
Arts	2.2	2.9
Humanities	10.4	8.5
Social sciences	11.0	10.2
Business and administration	13.9	17.8
Law	5.0	4.0
Natural sciences	2.9	5.3
Computing	3.9	3.5
Engineering, manufacturing and construction	15.6	20.2
Agriculture	3.6	2.4
Health and welfare	9.1	11.5
Services	8.3	8.6
Not classified by fields of training	—	0.3
<b>Total</b>	<b>100.0</b>	<b>100.0</b>

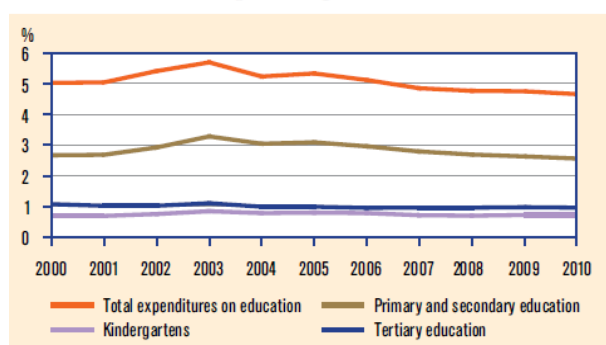
\* Including students in university and college level education and in undivided training.

Compare to the significant role of agriculture in Hungary, the students in tertiary undergraduate (Bachelor) and postgraduate (Master) trainings (according to the Bologna system) is very low, only 2,4 %, and the proportion of the agriculture denomination is decreasing.

In the last more than ten years the government expenditures on education, in the percentage of the GDP decreased, as the GDP of Hungary, too. (see below)

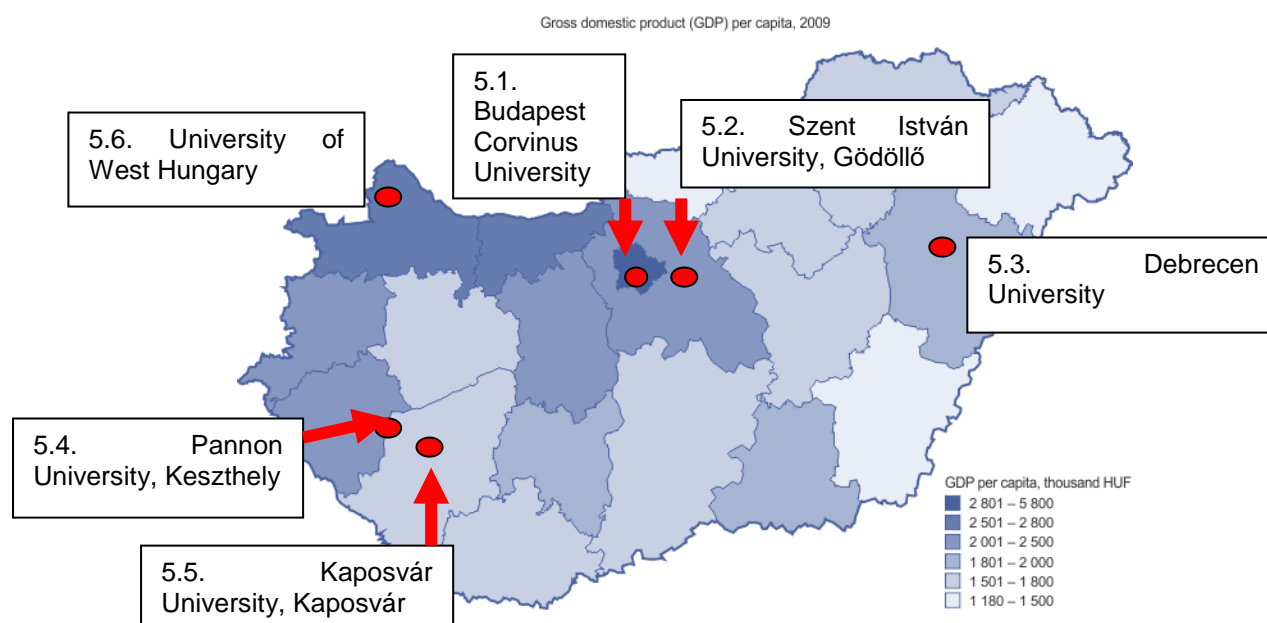
Nowadays one has to pay for tertiary education an educational fee: due the families income decreased in these years, and the reachable future income of the agrobusiness for an educated young people is the lowest among the others denomination, the interest for this education would be decreased in the next years.

Government expenditures on education as a percentage of GDP



HUNGARIAN CENTRAL STATISTICAL OFFICE, 2012

The main Universities holding special and well qualified agriculture education are the follows:



## 7.5.1 BUDAPEST CORVINUS UNIVERSITY

### 7.5.1.1. Faculty of Food Science

As the consequence of rapid and large-scale development of food science and technology, new areas have opened up for food engineers to deal with. As a result the Faculty had to elaborate or improve the curricula of new specialisations in graduate and post-graduate education, e.g. food quality and safety assurance, food biotechnology, management and marketing. Besides the general and special knowledge of the several sectors in food industry, the education of new requirements for foodstuffs and the ever-changing European food quality control are emphasized in the Faculty's curricula.

Programs in Hungarian

#### Undergraduate Program

BSc in Food Engineering;  
BS in Oenology;  
BSc in Bio Engineering;  
Specialised Graduate Program (based on the traditional educational system)  
Food Engineering

#### Graduate Programs (MSc Programs)

MSc in Food Biotechnology

MSc in Food Engineering  
MSc in Food Quality and Safety  
MSc in Viticulture and Oenology

#### **PhD Programs**

Food chemistry and biochemistry of the nutrition chain  
Food quality assessment and food quality control  
Food biotechnology  
Process engineering, measurement and control systems for food technology  
Economics of sustainable food engineering

#### **7.5.1.2. Research and development activities**

The Faculty has successfully participated in food science innovations and in the research and development activities regarding food technologies. One of the latest projects is the establishment of the Innovation and Knowledge Center of Food Science at Corvinus University of Budapest by three faculties (Faculty of Food Science, Faculty of Horticultural Science and Faculty of Economics) as of October 1, 2006 as a result of having succeeded at the application entitled 'Research and development in the food chain' announced by the Office of National Research and Technology in the frame of the Pázmány Péter Program. During this three-year project, a regional center will be developed. Its goal is to set out new products, technologies and so-called decision support systems and spin-off establishments for the food producers and distributors using the financial support provided by the Office and the partners.

The mission of the Innovation and Knowledge Center is to become an independent long term institution, in order to create an international cluster for the Hungarian food producers and distributors in the field of development and innovation in food research focusing on food processing, preservation, safety and food quality. The goal of the Center is to help economical and social development to the region, to increase the competitiveness of the food economy and the life quality of the population.

#### **The other main R&D topics at the Faculty are the following:**

- Research on the physical, chemical, microbiological, physiological, technological and environmental factors that influence the quality of food products and raw materials and development of methodology and complex systems of food quality control and assurance.

- Research on healthy nutrition and production of healthy and functional food.
- Risk analysis of genetically modified foodstuff and raw materials.
- Development of non-thermal food preservation techniques.
- Application of computer-aided image analysis for determination of physical and quality characters of foodstuff and raw materials.
- Development of membrane separation techniques for food technological and environmental applications.

### **7.5.2. SZENT ISTVÁN UNIVERSITY**

The Szent István University has seven faculties. Two of them have a direct relation with the agriculture and food industry. The Faculty of Agriculture and Environmental Management offers different study programs on BSc and MSc level in the fields of plant production, animal husbandry, horticultural production and environmental management. The Faculty of Agricultural Engineering offers BSc and MSc programs in the fields of agricultural and food industrial engineering and mechanisation.

### **7.5.3. DEBRECEN UNIVERSITY – CENTRE FOR AGRICULTURAL AND APPLIED ECONOMIC SCIENCES**

Within the structural framework of the integrated University of Debrecen, the Centre of Agricultural Sciences was established on 1st January, 2000. An addition to the Faculty of Agriculture, the Faculty of Agricultural Economics and Rural Development came into being on 1st September, 2002 (from July 1st, 2009 it is called the Faculty of Applied Economics and Rural Development). Owing to the accumulation of intellectual capital and the advantages of integration, our potential has been considerably increased. The Faculty of Engineering belonged to the Centre between July 1st, 2006 and June 30th, 2009. The institution has expanded with the Balásházy János Secondary School of Agriculture and Economics on July 1st, 2009. The Centre for Agricultural Sciences and Engineering maintains wide-ranging educational and research relationships with other faculties and institutions of the University, which are mutually beneficial in all areas of training and research.

#### ***7.5.4. PANNON UNIVERSITY OF AGRICULTURAL SCIENCES GEORGIKON FACULTY OF AGRICULTURE - KESZTHELY***

The educational profile of the Georgikon Faculty is by tradition versatile. The Faculty's courses in animal husbandry, economics and rural development, environmental management, horticulture, agricultural engineering, agronomy, environmental protection and tourism and hospitality attest to the recognition that beyond the strictly defined field of agricultural sciences, The Faculty must acquaint students with modern ecological considerations in order to maintain the high standard of education is provided. The Georgikon Faculty offers a number of BSc and higher vocational training programs in the above mentioned disciplines. BSc graduates may continue their studies to Master's level in agriculture, animal husbandry and plant protection (only to name the flagship programs) and may then enter the Doctoral School of Animal and Agro-environmental Sciences or the Doctoral School of Plant Production and Horticultural Sciences.

#### ***7.5.5. KAPOSVÁR UNIVERSITY FACULTY OF ANIMAL SCIENCE, KAPOSVÁR***

Kaposvár University's Animal Science educational infrastructure meets the highest standards. The faculty has always believed that modern training can be performed only with the perfect cooperation of theoretical and practical training. The campus boasts well-equipped lecture and seminar rooms, excellent laboratories, a Study Farm of 1129 hectares and raising all major farm animal species, a Game Farming Center (deer and wild boar), an Equestrian Academy, and a fully equipped and staffed Health Center. Students have the University Library at their disposal, which contains more than 250,000 books and documents and 30 computers with access to electronic databases.

The faculty maintains good cooperative relationships with universities and institutes of 12 countries. This list is continuously growing in order to ensure useful possibilities for both teachers and students.

#### ***7.5.6. UNIVERSITY OF WEST HUNGARY - FACULTY OF AGRICULTURAL AND FOOD SCIENCES***

Prince Albert Casimir of Saxony, Duke of Teschen established the Agricultural Higher Educational Private Institution of Magyaróvár, the legal predecessor of the Faculty of

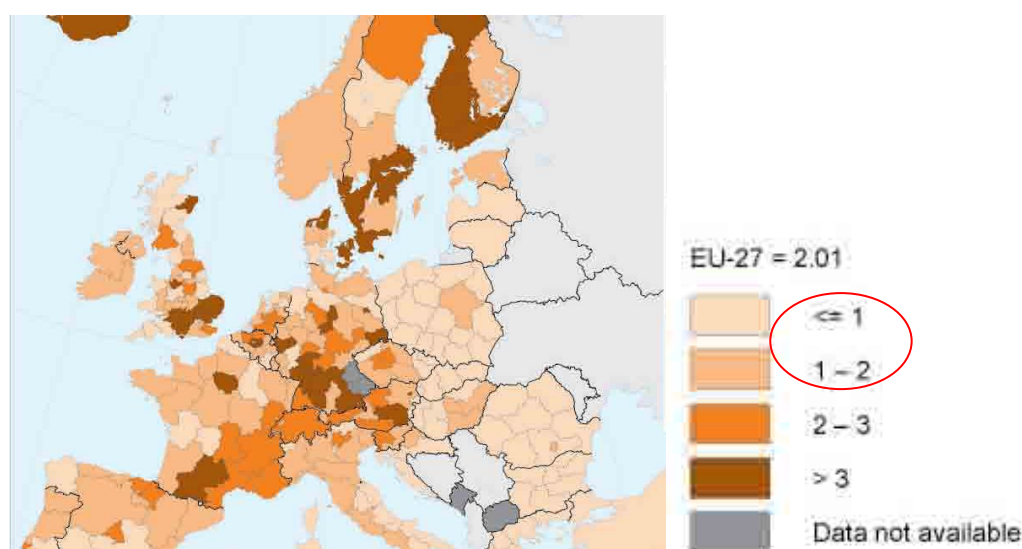


Agricultural and Food Sciences of Mosonmagyaróvár in 1818. Legally and practically it is the longest-established institution of agricultural higher education in the world. The language of education was Latin in the beginning, and later German and Hungarian. In 1872 some teachers seceding from the parent institution established the Agricultural University of Vienna. In 1874 it functioned as a highest level educational institution under the name 'Hungarian Royal Academy of Farming'. Successfully combining higher education with research, the professorial staff of the end of the 19th century founded ten experimental stations in Magyaróvár, thus establishing the whole Hungarian professional research system.

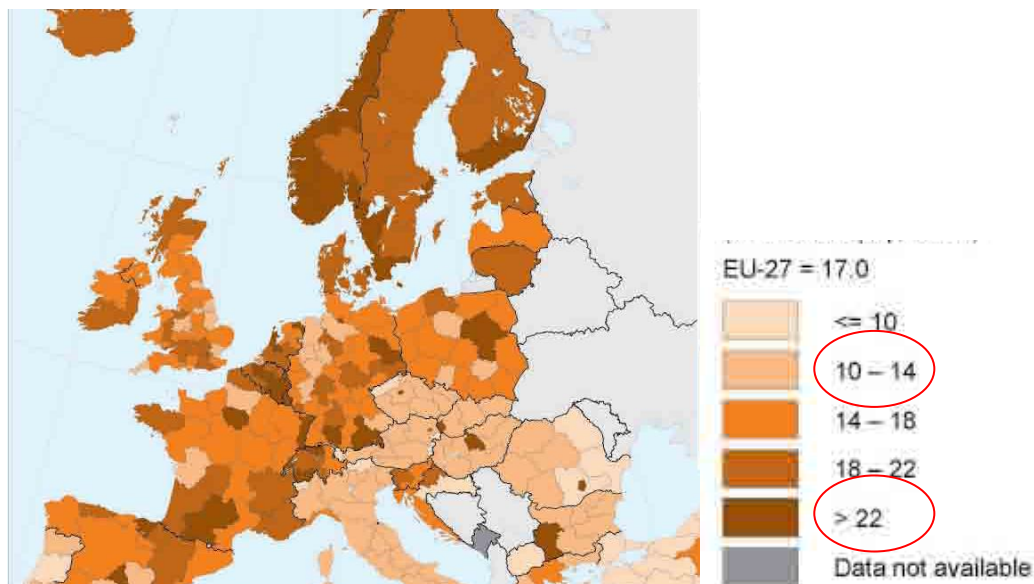
## 7.6. *KNOWLEDGE CENTRES RELATED TO AGRICULTURE*

The R&D activity in Hungary is shown in the a) and b) tables below. The origin of the data is the EU.

- a) R & D intensity, by NUTS 2 regions, 2009 (R & D expenditure as a % share of GDP) is different, but very low: the biggest part of Hungary is under 1 %, but in the other parts is about 1-2 %. In 2012 his rate was overall 1,2 %.



b) Human resources in science and technology core (HRSTC), by NUTS 2 regions, 2010 (% of active population)



Among the R&D activities the human resource working in the field of agriculture is the lowest:

Distribution of researchers\* by field of science, 2011

Field of science	Distribution, %
Natural sciences	24.3
Engineering and technology	31.5
Medical sciences	12.2
Agricultural sciences	5.4
Social sciences	15.3
Humanities	11.3
<b>Total</b>	<b>100.0</b>

\* Calculated based on headcount of researchers

These figures shows the unacknowledgment of the agriculture business in Hungary and the unknown necessity of the wide range of possible development in this field.

### **7.6.1. CORVINUS UNIVERSITY OF BUDAPEST**

The mission of R&D centre is to become an independent institution for long-term, which is to create international cluster for the Hungarian food producers and distributors in field of development and the innovation of food-research focusing on food-processing, -preservation, -safety and food quality as well.

The goal of the R&D centre is to add economical and social development to the region, to increase the competitiveness of the food-economy and life-quality of the population. Furthermore, it would also ameliorate the enterprise of the industrial and the business spheres and develop the culture of establishment and increase the ability of the association of students.

Topics considered to be materialized in the frame of the project:

- Development of special selection methods for the improvement of fruit genotypes for fast disinterment.
- Development of integrated technology for the growing of apricot and sour cherry.
- Production of modern food-supplements based on local officinal herbs.
- Analysis, detection, inhibition of the spoiling processes of raw food materials.
- Development of food products using different combinations of raw materials.  
Production of selenium and chromium-supplemented food products.
- Development of modified atmosphere storage technologies and packaging methods.
- Improvement and application of the sensor-system of product classifying appliances.
- Development, optimization and application of 'Sous – vide' technology.
- Elaboration of temperature monitoring system of chilled food products.
- Working-out of food industrial risk assessment- and decision-support systems.
- Development and operation of minor enterprises and incubation centre, consultative assistance of minor enterprise.

### **7.6.2. EGERFOOD**

To summarize the objectives of the project, its main aim is to establish such a Knowledge Centre, which can elaborate and maintain traceability requirement and criteria model systems improving and guaranteeing food safety. The above model will be established by a research and development activity relevant to all significant aspects of the field of food safety. The established systems and models will be accompanied with a consumer and end-user centred infocommunication base in addition to hardware and software innovations facilitating and promoting the continuous control and development of technological

procedures. The development of new food safety parameters and the analytical instruments will result in the elaboration of new Hungarian products and patents relevant to the business sphere. This market and profit oriented activity carried out by four research teams is scheduled to display the following characteristics:

- The traceability model systems are built on comprehensive research and development based parameters relevant to the full product range.
- The above-mentioned systems are capable of processing or handling more food safety and quality control concerns, either presently existing or to be developed later as a result of innovation,
- The models also entail the application of state of the art newly developed instruments,
- As a result of the system the uniform, integrated system-based traceability of significantly differing product ranges can be facilitated
- The system will be able to handle the demands of unlimited number of additional product ranges without conversion or restructuring
- The system should positively impact a broad range of domestic agricultural producers In order to make the model attractive for small business, its application should require minimal investment and maintenance costs
- Since traceability systems relevant to food production are only being formed in the established countries of the European Union, Hungarian agro-business firms are provided a significant competitive advantage the design and implementation of a mobile data transmission and processing system the relevant info-communicational innovations transmitted via appropriate communication channels will facilitate consumer access to easily comprehensible scientifically proven food safety information.
- Consequently, the increasing consumer confidence will lead to the improvement of the market position of the given product
- Due to the production of reasonable priced foods whose safety is guaranteed by a traceability system the project will contribute to the improvement of the quality of life both in Hungary and in other countries of the European Union.

### **7.6.3.        *DEBRECEN UNIVERSITY REGION***

The **University of Debrecen** is, of course, the founder and maintainer of the knowledge centre to be developed using direct and indirect means.

The research teams of the University of Debrecen are represented in the project in different forms.

- The first category includes working groups that have significant experience in development, have direct industrial contacts and are involved in joint development projects with existing partners.
- A new group of teachers-researchers of entrepreneurial spirit has appeared that tend to take part in establishing spin-off and start-up companies in the near future, and they are willing to utilize their own ideas as well as the intellectual products developed within the university.
- Several basic research projects are related to the knowledge centre that, at present, only potentially bear the possibilities of further development and industrial application, however, it is worth taking the promising topics into account and strengthening them.

#### ***7.6.4. THE SITUATION OF THE HUNGARIAN AGRICULTURAL HIGHER EDUCATION-SUMMARIZING***

The knowledge-based, competitive economy places a great emphasis on the education system. The responsibility of higher education is to impart knowledge of high standard which is in harmony with the continuously changing environment. Higher education has a special role in the knowledge-based economy since it does not only have to fulfil educational but also research and innovation tasks.

The decreases in the traditional role of agriculture as well as international tendencies facilitate diversification, i.e. the emergence of new roles and the relevant activities. Due to the diversification of agriculture fields like environmental protection, bioenergetics, and rural development have become more emphatic.

The growing importance of these new fields is also significant from the point of view of education. Well trained professionals are of vital importance for the agriculture.

A significant number of fresh graduates are not employed in their profession; they find a job in other areas or continue their education in a different field of interest.

#### ***7.7. REGIONAL INNOVATION AGENCIES AND COUNCILS***

Every region has an Regional Innovation Agency and a Council. They are working together and support the SMEs and RDI entrepreneurs in their innovation activity.

### **7.7.1 THE ROLE OF THE AGENCIES**

The Agencies have an active role in establishing and operating professional relationships within and outside of the Region, in economic development and in fostering local initiatives. One of the most important tasks of the Agencies is the implementation of the comprehensive territorial development programme of the Region through involving the most possible stakeholders in the joint planning and work.

The establishment of regional level innovation agencies has resulted a milieu that facilitates the creation, reception and usage of innovation at local companies and other actors. Sustainable development, quality life, competitiveness, better knowledge acquisition and dissemination accompany this milieu.

The Agencies' mission to become a professional centre of regional development in the Region and a focal point of the partnering network, while it wishes to take a central role in the development of the region. All these ends are intended to be accomplished with reliance on an extensive professional knowledge base and cooperative teamwork.

The Agencies

- have a significant role in the management of the EU funds related to economic development, development of tourism, development of transport, as well as urban and regional development, and in addition has certain tasks connected to the management of decentralized national resources that are available for local governments, businesses and non-governmental organizations of the region.
- have an important duty to attend activities in planning, analysis and project generation in connection with regional development and in line with the national, county and micro-regional development concepts.
- endeavour to keep international partnering contacts with the partner regions, as well as several other regions of the European Union;

### **7.7.2 THE TOOLS OF REGIONAL INNOVATION AGENCIES**

The activities of Regional Innovation Agencies (RIAs) fill a gap in the Hungarian economy. RIAs explore innovation opportunities in the regional economy, disseminate knowledge, create a ground for entrepreneurial networks, support innovative companies, award prize and

set up and operate information system. They aim to be a sound coordinator and service provider that helps to

- implement the regional innovation plan,
- mediate between the R&D&I actors and the industry,
- support SMEs,
- capitalize technology transfer and intellectual property,
- promote the international competitiveness of the region,
- raise the attractiveness of rural areas.

RIAs are important partners of the National Innovation Agency since 2005. The 7 Hungarian regions have one-one RIA. The profile of the agency network consists the followings:

- consultancy in cluster management, technology transfer and market deployment
- development of networks
- setting up and operation of regional innovation database and information system
- training (e.g. innovation brokers), organising events, workshops
- strategic planning and programme monitoring
- developing an expert database
- intellectual and industrial property
- project management, project generation and consultancy in project financing
- supporting supplier connections and cooperation on the equity market and R&D
- helping to find business angels for small companies
- elaborating regional innovation strategies
- measuring innovation activities
- start-up firm management
- organising European cross-border cooperation on the field of research and development, supporting these networks with offering new partners and the services mentioned above.

In summary, the aim of the Agencies is to facilitate the efficient use of regional resources, create partnerships between the public and private sphere, as well as to establish and develop national and international relations for a developing and prospering of the region.

## **7.8 RESEARCH AND TECHNOLOGICAL INNOVATION FUND**

### **7.8.1. LEGAL BACKGROUND**

Act XC of 2003, approved by the Hungarian Parliament on November 10, 2003, established the Research and Technological Innovation Fund, which provides stable and reliable financing for RTDI activities. The independent government Fund is envisioned to promote demand driven innovation and the knowledge based competitiveness of companies. The Fund is financed by mandatory contributions of all companies registered in Hungary, matched yearly by the government budget.

The so-called innovation contribution, based on the (adjusted) net turnover, for medium size and large companies grows from 0.2% in 2004 to 0.3% by 2006. Micro-enterprises and small-size enterprises are exempt from paying a contribution. Direct R&D expenditures, both intramural and ordered from public R&D units, can be deducted from the contribution thus stimulating innovation activities. The company payments into the transparent, dedicated RTDI Fund shall be used for the direct or indirect benefit of the private sector, as stipulated in the legislation creating the Fund. It is also a legal requirement that resources of the Fund be spent through competitive calls, and at least 25% should go for regional innovation purposes.

### **7.8.2. USE OF THE FINANCIAL RESOURCES OF THE FUND**

Strategic issues relevant to the Fund shall be addressed by the Research and Technological Innovation Council. The majority of the members of the Council shall comprise of nongovernmental representatives of the economic and scientific communities. The Council shall have a right of approval concerning the establishment of the utilisation plan and the strategy for the calls for proposals for the Fund, including determination of the means and tools of funding and decision making relevant to the provision of financial assistance.

#### **Competitive schemes financed from the Fund**

The various competitive schemes include:

- Regional University Knowledge Centres
- Regional Innovation Agencies
- National Research and Development Programs



## **7.9. KEY INFORMATION FROM THE PROFILING OF THE REGIONAL RESEARCH ENTITIES**

The profiling analysis was conducted by addressing **50 RTDs**, whereas **12** entities were finally profiled (24%). The low number of RTDs profiled compared to the project's target number follows a merging process of many entities, were ceased, others changed their activity.

The RTDs **staff dimension** on average shows **10,9 permanent researchers** per entity but in a wide range 0-60; and **35,08** is the value of **temporary personnel**.. There is an outlier but a more even distribution.

**Technical** staff average number is **11** units per RTD, whereas same data for **Administrative** staff is **4,4**.

The **Research Areas** 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.
- Animal health
- Livestock breeding

One TRD has production activity. (Cereal Research Non-profit Ltd.)

The data shows **75,0%** of profiled RTDs offering **knowledge- based services** to third parties, while the **83,3%** of them reported **international projects** in the past 5 years, **100,0 %** of Entities profiled have **international journal publications** in the same period and **100%** of RTDs reported **international collaborations** with other foreign RTD .

The key information from the profiling of the regional RTD entities are presented in the next pages, in a tabular format.

## The key information from the profiling of the regional RTD entities

Full official name of entity and website link	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)international cooperation, collaboration
<b><u>Veterinary Medical Research Institute</u></b>	Academic Department	The main aim of the institute is to investigate the bacterial, viral and parasitic diseases of farm animals and to conduct molecular biology research in these areas. The overwhelming part of the work is basic research. In particular, molecular and genetic aspects are increasingly emphasized. Most of the research is concentrated on studying genetic material and proteins and glycoproteins of various pathogens. Among the viruses, primarily the herpes-, adeno-, paramyxo-, and avian tumour-viruses are investigated. Among the bacteria: <i>E. coli</i> , Pasteurella, Salmonella, Bordetella as well as Mycoplasma are studied for information of their so far less well known virulence characteristics.	NO	-National: 11	Research staff permanent :12 Research staff – temporary: 53 Technical staff: 2 Administrative staff: 1		<b>International: 119</b> <b>National: 41 yes</b>
<b>Research Institute of Organic Agriculture</b>	Research Institute	crop production, horticulture, Sustainable food systems	landscape potential and agro ecological landscape evaluation, Organisation of e-farm experiments, Organic gardening advices, education and awareness raising activities in connection with	1 international, 1 national (from	Research staff permanent : 5	-	<b>1 +5 yes</b>

			organic farming, Visit to controlled organic farms and consulting, organisation of professional events and conferences	04.2012 continuous		
<b>Szent István University Faculty of Economic and Social sciences Marketing Institute</b>	Institute of university	Theoretical, methodical research of food consumers behaviour, and the marketing behaviour of organizational actors in the food economy	No	International: 6 National: 9	Research staff permanent : Research staff – temporary: 11 Technical staff:1 Administrative staff: 1	Spine off: 1 <b>National: 80</b> <b>International: 10</b> <b>yes</b>
<b>Research Institute for Animal Breeding and Nutrition (ÁTK), Herceghalom</b>	Background institution of the Ministry	The research activity is conducted in two organizational units: at the Institute for Animal Breeding which includes departments specialized in genetics, cattle breeding, swine breeding, sheep and goat breeding, biology of reproduction, cell biology and horse breeding; and at the Institute for Animal Nutrition, which has departments for ruminant nutrition, swine nutrition, feed analysis and evaluation, physiology of nutrition, microbiology and feed preservation and biochemistry. An experimental farm is available for the execution of model and semi-field scale experiments. The Research Institute for Animal Breeding and Nutrition conducts many of its research and training programs in cooperation with several Hungarian, European and overseas research institutions.	Its further duties comprise national and regional consulting and information services in animal breeding and nutrition.	- International: 1 -National: 3	Research staff permanent :13 Research staff – temporary: 10 Technical staff:9 Administrative staff: 2	Patents: 2 Spin off: 1 <b>International: 6</b> <b>National: 32</b> <b>yes</b>

<b>University of Pannonia „Georgikon” Faculty of Agricultural Sciences Wine and Grape Research Institute Badacsony</b>	Institute of university	<ul style="list-style-type: none"> <li>- Maintain and develop of biological resources concentrated for the Balaton Region</li> <li>- Special wines (e.g. Kéknyelű) program</li> <li>- Clone selective breeding, value test of clones and their dissemination</li> <li>- Integrated grape growing and wine methods research</li> <li>I- Analysis of Wine Marketing Strategies</li> </ul>	Laboratory investigations, professional consultancy	<ul style="list-style-type: none"> <li>- International: 6</li> <li>-National: 6</li> </ul>	Research staff permanent : - Research staff – temporary: 6 Technical staff:6 Administrative staff: 1	Patents: 7 Spin off <b>International: 20</b> <b>National: 218</b> <b>yes</b>
<b>Centre for Agricultural Research, Hungarian Academy</b>	Academic Department	The profile of the Agricultural Institute, Centre for Agricultural Research, Hungarian Academy of Sciences involves complex, interdependent, basic, methodological and applied research projects culminating in practical applications. The basic aim is to use the internationally renowned germplasm accumulated in Martonvásár over the past fifty years, combined with up-to-date methods from the fields of genetics, physiology, cell and reproduction biology, functional genomics, biotechnology, plant breeding and crop production, in order to develop new, generic plant		<ul style="list-style-type: none"> <li>- International: 7</li> <li>-National: 4</li> </ul>	Research staff permanent :14 Research staff – temporary: 24 Technical staff:13 Administrative staff: 7	Patents- 6 Spine-off- 4 <b>National: 25</b> <b>International: 30</b> <b>yes</b>

		genotypes satisfying the future demands of society, and to carry out research on production technologies and the environment. Ongoing projects include an analysis of the agroecological equilibrium, the preservation and expansion of genetic variability, the production of raw materials for healthy nutrition, the development of durable stress resistance, and improvements in seed safety in order to meet the requirements of sustainable development.				
<b>Hungarian Dairy Research Institute</b>	Research Institute	Development of Advanced Products and Material as well as Energy-Saving and Environment-Friendly Production Procedures Quality and Food Security Development	Research and Developments: The task-specific technology teams provide the foundation for the Institute's R&D activities. The teams' work is facilitated by a state-of-the-art, well-equipped pilot plant and the physical-chemical properties and microbiology testing laboratories. The Institute's R&D activity is practice-oriented and predominantly aims to produce results that are marketable and the have benefits which can be shared with the users. -Laboratory Services Adherence to the effective Hungarian and EU requirements concerning the manufacturing of foodstuffs and medicinal products and the regulation of their quality control, as well as to the relevant pharmacopoeia rules is mandatory. This entails day-to-day tasks for foodstuff and drug manufacturers and distributors, who our Institute's Research, Food Inspection and Raw Milk Rating Laboratory is ready to help so that they can meet these requirements.,	International: 2 National: 9	Research staff permanent :9 Research staff – temporary: 12 Technical staff:7 Administrative staff:1	Patents: 10 Spin off: 48 <b>National: 5 International: 30 yes</b>

<b>Cereal Research Non-Profit Ltd.</b>	Research Institute	The current profile of the company has been formed after several restructuring and involves the following areas: breeding and commercialisation of field crops; improvement of production technology; and production and sale of seeds representing high genetic value.	Propagation and sale of bred varieties refined by the Cereal Research Non-profit Ltd. for seed producing large plants as well as the public growing. Providing technical support in the field of agro-technical works.	- National: 9 International: 1	Research staff permanent :9 Research staff – temporary: 42 Technical staff:16 Administrative staff: 3	Patents: 2  - <b>International: 13</b> - <b>National: 19 yes</b>
<b>Biological Research Centre, Szeged</b>	Academic Department	The Biological Research Centre is the largest research facility of the Hungarian Academy of Sciences. Its activity covers all areas of modern biology. It is organized into four institutes, corresponding to the diversity of the investigated fields: biophysics, biochemistry, genetics, plant biology. The activities of the Center involve primarily basic science, but practical application of the results also represents a high priority.	To support scientific research, the BRC has organized several laboratories that offer different kinds of services.	- National: 10 - International: 3	Research staff permanent :60 Research staff – temporary: 200 Technical staff: 42 Administrative staff: 12	- Patents: 1 - Spin off: 10 - <b>International: 55</b> - <b>National: 12 yes</b>
<b>Research Institute for Fisheries, Aquaculture and Irrigation (HAKI), Szarvas</b>	Background institution of the Ministry	The task of the Institute to ensure the biological resources and knowledge to the development of the sustainable fishing and fish farming, water resources management, aqua culture systems and irrigating management. The three pillars of its	Professional consultancy in the field of fishing, aqua culture and irrigation, sale of breeding stock	- National: 4 International: 1	Research staff permanent :12 Research staff – temporary: 26 Technical staff:5 Administrative staff: 4	Patents: 1 - <b>International: 22</b> - <b>National: 4 yes</b>

		<p>activity:</p> <ol style="list-style-type: none"> <li>1. Multidisciplinary research in favour of the development of sustainable production systems in frame of international cooperation</li> <li>2. Dissemination of the research results in the practice, change of information between the experience and the research</li> <li>3. Participation in international project to improve the living conditions in the developing countries</li> </ol> <p>The company's motto: "Research, development, education and consultancy responsible utilization and protection of our water resources, on favour of development of healthy nutrition.</p>				
<b>Agricultural Biotechnology Center</b>	- Background institution of the Ministry	<p>ABC represents the largest and most important group of scientists in the plant and animal biotechnology field in Hungary.</p> <p>ABC's mission is to perform high quality research (basic and applied) on plant and animal, developments, breeding and modern environmental technologies.</p> <p>The scope is to obtain knowledge, products and services to meet the needs of sustainable development, quality and consumer-oriented food production.</p>	<p>Fragment analysis Metabolite composition examination by GCMS Geno-typing</p>	<p>National: 12 International: 2</p>	<p>Research staff permanent : 6 Research staff – temporary: 17 Technical staff:10 Administrative staff: 10</p>	<p>- Patents: 1 - Spin off: 3</p> <p><b>-International: 211</b> <b>-National: 30 yes</b></p>

		<p>Both the needs of local communities and the developments of international research are considered of major importance.</p> <p>The most important aim of the research carried out in ABC is enhancing the competitiveness of Hungarian agriculture.</p>				
<b>Central Food Research Institute (KÉKI)</b>	Background institution of the Ministry	<p>Detection and of biological and chemical risk factors as well as traceability of them in whole food chain; and research of biological and bio-analytical methods to avoid the possible negative effects.. Development of new analytical methods fit for food control and food safety requirements.</p> <p>Research of relationship of food ingredients in relation to modern and healthy nutrition</p> <p>Research and development of advanced sound technologies in favour of production of high quality, higher value added and more competitive products.</p> <p>Socio-economic assays for foundation of food safety strategy, risk management and communication</p>	NO	National: 5	<p>Research staff permanent :-</p> <p>Research staff – temporary: 47</p> <p>Technical staff:13</p> <p>Administrative staff: 3</p>	<p>Patents-Spin off-</p> <p><b>International :2</b></p> <p><b>National: 32</b></p> <p><b>yes</b></p>



<b>Hungarian Forest Research Institute (ERTI)</b>	Background institution of the Ministry	<p>Definition of the economic conditions for natural forest management</p> <p>Activities in connection with the establishment and utilization of energy plantations</p> <p>Improvement of varieties suitable for planting high-yield energy crops, for safe cultivation among home site conditions, and resistant to disease.</p> <p>Development of growing technology for energy plantations, clarification of ecological (nutrient exchange) problems and those of plant protection in relation to sustainability</p> <p>Solid biomass product line optimization.</p> <p>Cost-benefit analysis, economical preparation of investment decisions</p>	- Water, soil and biomass analysis performed in the ecological laboratory have marketable capacity in the field of soil analysis and soil consultancy. Besides breeding and genetic conservation, we produce seedlings and cuttings. Visitors can choose from the varieties of domestic poplars and willows that can be utilized at plantations. They can as well order a complete plan of planting. We share our knowledge with foresters about growing techniques, economic evaluation, and forest protection in professional meetings and exhibitions.	International: 2 National:35	Research staff permanent :3 Research staff – temporary: 26 Technical staff:10 Administrative staff: 8	Patent 1 Spin off	<b>International: 20</b> <b>National: 330</b> <b>yes</b>

## 7.10 CONCLUDING REMARKS - THE SITUATION OF THE R&D&I ACTIVITY

In 2011 research and development activities in Hungary increased further, quicker than in the previous year.

### 7.10.1. MAIN INDICATORS OF R&D&I

The indicator most widely used for the evaluation and international comparison of R&D activities is

- **R&D expenditure as a percentage of GDP,**

but beyond that other indicators also well describe the role of R&D activities in a certain economy. The increasing importance of R&D is indicated by the

- **number of research units**
- **proportion of R&D personnel** to the total number of persons employed,
- **R&D capital expenditure as a percentage of total.**

**Main indicators of research and development**

(%)

Year	Research and development units <sup>1</sup>			
	staff number <sup>1</sup> as a percentage of total employment	of which: researchers	capital expenditure as a percentage of total investments in Hungary	expenditure as a percentage of gross domestic product (GDP)
2005	0.60	0.41	0.73	0.94
2006	0.66	0.45	0.90	1.01
2007	0.66	0.44	0.60	0.98
2008	0.71	0.48	0.62	1.00
2009	0.79	0.53	0.75	1.17
2010	0.83	0.56	0.82	1.16
2011	0.89	0.60	0.88	1.20

<sup>1</sup>Full-time equivalent staff number.

a) **R&D expenditures** rose by 8.5%, thus they exceeded HUF 336 billion, which reached **1.2% of GDP** compared with 1.16% last year. R&D expenditure at current prices was 62% higher, so the expenditure per research unit rose from HUF 82.6 million to HUF 112.2 million.

a) **R&D capital expenditure as a percentage of total investments** also rose perceptibly, from 0.7% to 0.9%.

b) The **number of research units** remained essentially unchanged, only an increase of 0.6% could be observed.

- c) **R&D personnel** grew by 2.6%, so nearly 37 thousand researchers and close to 18,500 technicians and other personnel participated in R&D activities. The **proportion of R&D personnel** to the total number of persons employed, which has constantly grown since 2005. In 2005 only 0.6%, while in 2011 almost 0.9% of the total number of persons employed was engaged in R&D activities

A larger increase can be seen in the number of R&D personnel in full-time equivalents (FTE), its value increasing by 7.9% to reach 34 thousand people, among whom the share of researchers was over two-thirds. To ensure a high level of professionalism some one-fourth of the total R&D staff possesses PhD, while their proportion exceeds one-third among researchers, having a tertiary degree almost without exception.

Since 2005 R&D personnel in headcount has grown by 11.4%, while R&D staff number in FTE by 46.1%, which shows that the larger part, more than 60% of their working hours was dedicated to R&D activities in average, which proportion was less than 50% earlier on.

#### 7.10.2. DISTRIBUTION OF TYPICAL INDICATORS BY SECTOR

Distribution of typical indicators of R&D activities by sectors

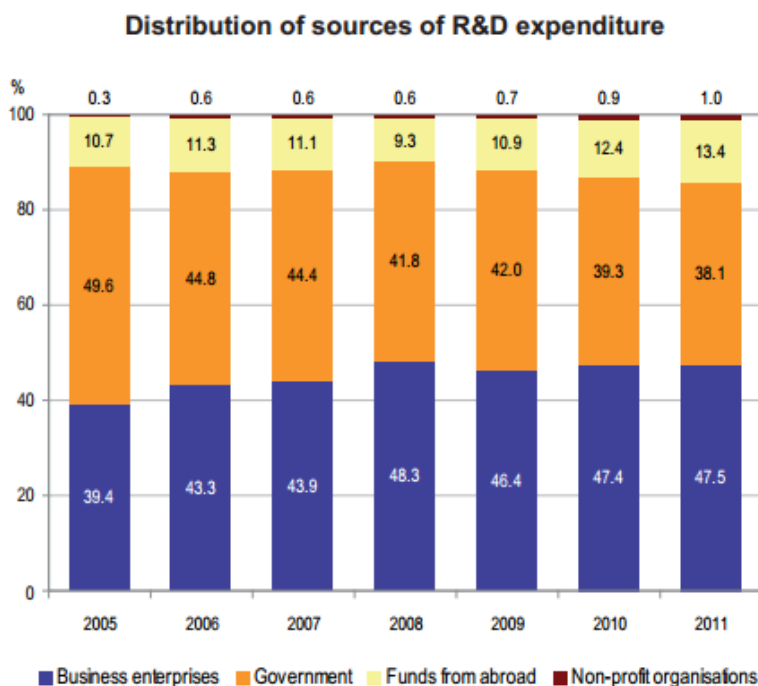
Denomination	(%)					
	Government		Higher education		Business enterprise	
	2005	2011	2005	2011	2005	2011
Number of research units	8.0	6.3	62.2	46.0	29.8	47.7
R&D personnel in headcount	23.4	18.3	57.7	44.1	18.9	37.6
R&D personnel in FTE	32.9	25.0	35.3	24.3	31.8	50.7
Of which: researchers	31.2	22.9	37.2	26.0	31.5	51.1
R&D expenditure	29.1	16.0	26.1	20.5	44.8	63.5

Source: HUNGARIAN CENTRAL STATISTICAL OFFICE, 2012

The change in the composition of **R&D expenditure** by sources followed the former tendency.

- The role of **business enterprises** strengthened further in financing, though at a slowing pace (from 47.4% to 47.5%), while that of the government sector diminished (from 39.3% to 38.1%) despite the amount from this source growing by 5.1% following a decrease last year.
- **The share of government funds is still high in Hungary** compared to the EU-27 average (which was 34.9% in 2010), and that of the business enterprise sector is relatively low (the EU average was 54.1% in 2010). Funds from abroad spent on R&D have an increasing share year by year, reaching already 13.4% in 2011, which is one

percentage point more than in the previous year. Looking back till 2005 the change in the activity of the different segments financing R&D activities is even more apparent.

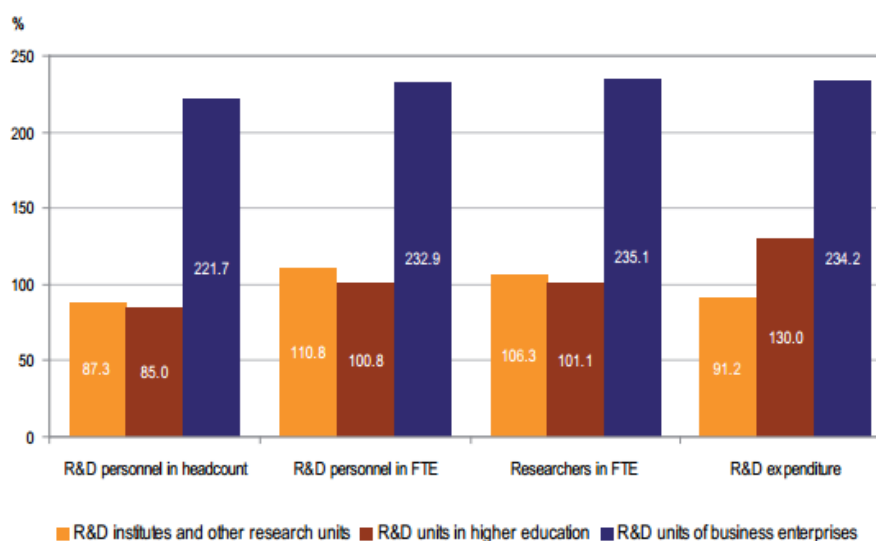


Source: HUNGARIAN CENTRAL STATISTICAL OFFICE, 2012

The total **number of research units** increased by nearly 20% from 2005 to 2011, while it rose by more than 90% in the business enterprise sector in the same period, so almost one in two belonged there in 2011. The disparities in the change of conditions determining R&D capacity are even larger. R&D personnel in headcount grew by 11% in the national economy as a whole, while it more than doubled in the business enterprise sector, and decreased by over 10% in case of research institutes and in the higher education sector. The order of magnitude of the change was similar in case of the full-time equivalent R&D personnel as well as R&D expenditure.

Research units working in the different sectors (business enterprise, higher education and government sectors) have differing features in the field of R&D too. Their basic tasks, aims and conditions of operation differ significantly, thus their role in R&D activities in the Hungarian economy may be totally different. The significance of business enterprises has continuously grown in the last few years, and this phenomenon can be observed in all the aspects of R&D.

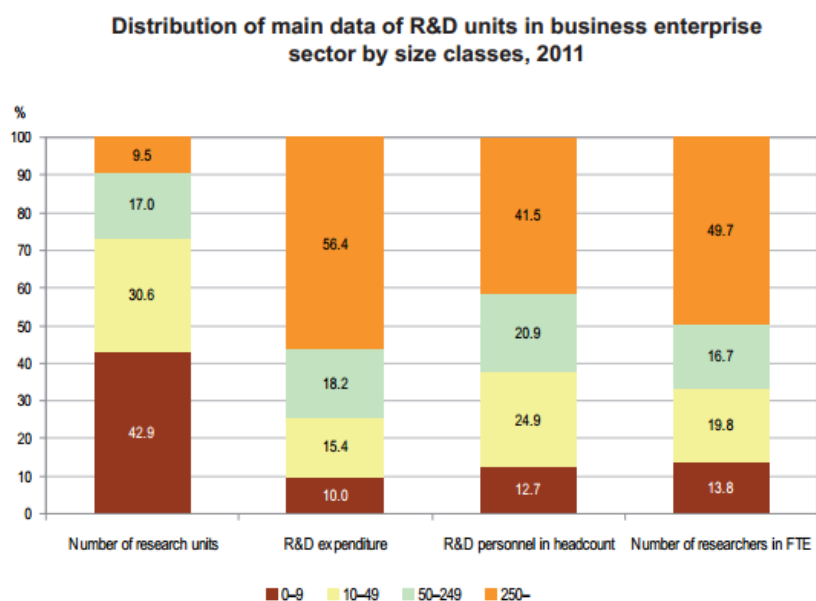
R&amp;D data of year 2011 as a percentage of year 2005



Source: HUNGARIAN CENTRAL STATISTICAL OFFICE, 2012

**The characteristics of R&D show a heterogeneous picture not only by sectors but also within them. In the business enterprise sector a strong concentration can be observed by both proprietors of enterprises and employment size classes.**

In 2011 only 9.5% of research units of business enterprises were operated by enterprises with at least 250 employees, but nearly the half of R&D personnel worked there and 56.4% of R&D expenditure was incurred there. Wholly or partly foreign-owned enterprises accounted for 14.4% of research units, while their share in the number of researchers and in R&D expenditure was around 60%.



Source: HUNGARIAN CENTRAL STATISTICAL OFFICE, 2012

### 7.10.3. DIFFERENCES BETWEEN THE REGIONS

Due to the significant differences in the number of R&D centres, R&D human resources and R&D expenditure between the country's regions, the innovation-related development of the regions is a challenge for innovation policy because, although the RTDI gap is being narrowed, economic performances have not improved substantially.

The inequality in the distribution of R&D activities by regions remained unchanged. Although only the half of research units were situated in Central Hungary, this region continued to have an excess weight of almost two-thirds in all other respects, while Northern Hungary and Southern Transdanubia remained at the end of the rankings.

### 7.10.4. DIFFERENCES BETWEEN THE SECTORS

Only the 7,2% of the total R&D expenditure present the Agriculture sector – it is very low comparing to the industrial production and technology.

Distribution of R&amp;D expenditure by socio-economic objective, 2011

Socio-economic objective	(%)			
	R&D institutes and other research units	R&D units in higher education	R&D units of business enterprises	Total
Exploration and exploitation of the Earth	8.8	1.5	0.4	1.9
Environment	4.8	6.1	1.9	3.3
Exploration and exploitation of space	0.8	0.3	0.1	0.2
Transport, telecommunications and other infrastructure	7.8	6.3	13.8	11.3
Energy	1.1	2.3	1.5	1.6
Industrial production and technology	8.6	11.9	55.3	38.9
Health	12.3	20.7	19.9	18.8
Agriculture	16.6	8.5	4.4	7.2
Education	1.8	17.4	0.2	4.0
Culture, recreation, religion and mass media	2.9	2.0	0.4	1.1
Political and social systems, structures and processes	12.9	4.1	0.6	3.3
General advancement of knowledge	21.3	18.6	1.5	8.1
Defence	0.3	0.4	0.2	0.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Source: HUNGARIAN CENTRAL STATISTICAL OFFICE, 2012

## 7.11 SUMMARIZING

Nowadays, emphasizing the importance of innovation is a cliché. There is no such segment in the economy, where the importance of innovation is not known and adapted.

In 2011, the seventh innovation survey (CIS2010), similarly to the previous ones based on the Eurostat methodological guidance, was conducted by HUNGARIAN CENTRAL STATISTICAL OFFICE. Concerning the proportion of innovative enterprises there are great differences not only by size, but also by activity. The proportion of businesses with new products and services averaged 19.2% in industry and 17.5% in the services sector; however, there is a major dispersion behind these averages. The manufacture of pharmaceuticals continued to be the driver of industrial innovation, where 56.8% of all enterprises and all firms with 250 or more employees marketed new products or processes.

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**On average, two thirds of innovative enterprises introduced a new good or service into the market and nearly half of them applied some new procedures.**

If we analyze how the revenues of product innovator enterprises are distributed, we can unambiguously state that the proportion of revenues from new-to-market products is three-times higher among large enterprises than among medium and small enterprises. Usually, larger businesses have such resources, human capacities, which are required to develop new-to-market products.



## 8. REGION OF ODESSA, UKRAINE

### 8.1 SHORT PROFILE OF THE REGION, THE AGRICULTURAL PRODUCTION AND THE FOOD INDUSTRY

#### 8.1.1 INTRODUCTION

The region of Odessa is located in the far south-west of Ukraine. It borders on Romania in the south, Moldova in the west, Vinnitsa and Kirovograd regions in the north, and Nikolayev region in the east. Odessa region is the largest in Ukraine by its area (33.3000 sq. km) that constitutes approximately 5.5% of total Ukraine's territory and is comparable with the territory of such Western European countries as Belgium and the Netherlands. Odessa Region is administratively subdivided into 26 districts, as well as 7 cities (municipalities) which are

directly subordinate to the oblast government: Bilhorod-Dnistrovskiy, Illichivsk, Izmail, Kotovsk, Tepلودar, Yuzhne, and the administrative center of the region, Odessa.

The main peculiarity of economic and geographical status of the region consists in its coastal and boundary location. Free access to Black Sea - Azov basin and to large river routs of the Danube and the Dniester gives good advantages to Odessa region in the development of transport infrastructure. Sea ports of the region are located at the crossroads of existing international transport corridors. Thus, the region appears to be the main sea gate of



Ukraine. Economically and geographically Odessa region is a zone of intensive steppe farming with advanced irrigation. Its coastal part is also included into the recreational zone of north-western Black Sea coast.

The AgroFood sector is an extremely important part of the economy of Odessa region. Agriculture accounts for over 8% of GDP and 5.5% of employment in Ukraine. The food industry contribution to GDP is about 9% and about 4% of total employment in Ukraine.

### **8.1.2 AGRICULTURE**

Land fund of the region is 3.3 million hectares, including 2.6 million hectares of agricultural lands. Natural conditions are favourable for growing cereals, corn, barley, sunflowers, grapes and affect on regional specialization and organization of agricultural production. The share of the region in total gross output in Ukraine exceeds 4.1%, grains - 6.2%, sunflower - 3.6%, grapes - 44%, meat - 2.4%, milk - 3.6 %, eggs - 3.7%. Nowadays Odessa region includes 983 enterprises and more than 6,000 farms. Production of gross agricultural output in 2010 amounted to more than 440,3 mln Euros. For agricultural market functioning there were created 50 trading houses, 44 agricultural service cooperatives, 13 credit unions, 47 wholesale food markets, 314 proprietary trading shops, 261 points harvesting agricultural products. The volume of foreign investments involved into agriculture is about 172,88 million Euro what is equal to 12.4% of total foreign direct investments into the economy of Odessa region. Nowadays in Ukraine there is a regime of the most-favoured status for the producers of the agricultural products, they are given advantages and benefits as for the taxes. The state implements stimulating programmes, carries out compensations as for the percent to the credits for agricultural producers and others. The programmes that support the agricultural business will be active during the next 5-10 years.

### **8.1.3 FOOD INDUSTRY**

The most investment-attractive industries in the region due to favourable climatic conditions, availability of raw materials and consumer potential are food and processing industries. Food industry covers almost a quarter of region total output. Core businesses are concentrated in the fat-and-oil, dairy and meat, canning, wine industry. Odessa region is a traditional winegrowing and winemaking region. The region has grown 55% of all Ukrainian grapes that gave an impulse to the powerful wineries development. Food industry in Odessa region is of great importance to the Ukrainian economy development as a whole. Thus, the processing enterprises of the region produces almost 21% of all fruit and vegetable juices, 25% of wine, 8,5-9,0% of unrefined sunflower oil, 4,5-6,0% of flour, about 5,0% of bakery products. As a part of food industry the production of fat, sugar, bread, cereals and flour, cocoa, chocolate, chocolate and sugar confectionery, fish, industrial processing of fruits and vegetables, meat and dairy industry, watered spirits, wines, beer, mineral water and soft drinks is dominated

## **8.2 SHORT DESCRIPTION OF THE REGIONAL RESEARCH AND INNOVATION FRAMEWORK**

### **8.2.1 Innovation Governance and Funding at a Regional Level**

There is no specific R&D governance system in the regions of Ukraine. There is also no singular body at the regional level that is responsible for R&D development. Some regional administrations have created special departments, responsible for S&T and innovation policies. At the same time, according to existing legislation, regional authorities:

- are responsible for formulation of the regional R&D and innovation programmes;
- could provide financing for R&D and innovation program within the limits of regional budgets;
- could create regional financial organisations, which could provide loans for R&D and innovation projects;
- control and evaluate R&D and innovation activities, which are undertaken, sing money from regional budgets.

In reality, local authorities have no special funds to support R&D. The share of the regions in the total funding of R&D was about 1% in recent years. In 2009 expenditures on R&D funded by local budgets was lower than 0.4% of total expenditure on R&D in the country. The research budget for the Kiev region,

However, was larger than the combined budget for all other regions, although its amount was still less than €1m, according to official exchange rate in 2009 currency.

Aggregated data on R&D expenses for all regions, from all sources are not published by the State Committee of Statistics of Ukraine. As to the budget expenses, funding on R&D from both central and local budgets is distributed unevenly. Kiev receives almost 41% of all R&D expenditures, while Kharkiv gets 16.7% and Dnepropetrovsk, 10%. Other regions lag behind these three leaders.

### **8.2.2 Key Players of the Regional Research and Innovation System focusing on Food**

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.

### 8.3 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 table 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)
1. Institute of Market Problems and Economic and Environmental Research of the National Academy of Sciences of Ukraine	Academic Department	<ul style="list-style-type: none"> <li>- Increasing economic efficiency and competitiveness (Manufacture of food products, beverages and tobacco)</li> <li>- Water Supply(Manufacture of food products, beverages and tobacco)</li> </ul>	<ul style="list-style-type: none"> <li>-Environmental audit</li> <li>-Eco-consulting</li> <li>-Organization of wholesale agricultural markets</li> <li>-Economic and ecological expertise</li> </ul>	International:2 National: 0	Research staff permanent : 86 Research staff – temporary: - Technical staff:5 Administrative staff:11	-	7
2. Kharkiv State University of Food Technology and Trade	Academic Department	<ul style="list-style-type: none"> <li>-General research on protection and improvement of human health</li> <li>-Nutrition and food hygiene</li> <li>-General research on agriculture production and technology</li> <li>-Animal products</li> <li>-Increasing economic efficiency and competitiveness</li> <li>-Manufacture of food products and beverages</li> </ul>	<ul style="list-style-type: none"> <li>- Development of technologies for food products, related documents and food equipment</li> <li>- Sale of licenses to use patents and regulatory documentation</li> <li>- Design of food industry enterprises, individual shops, lines, etc.</li> <li>- Various educational services (higher education, re-training (second degree) courses)</li> </ul>	International:2 National: 3	Research staff permanent : 445 Research staff – temporary: 52 Technical staff:70 Administrative staff:15	Patents:7	15
3. Odessa National Academy of Food Technologies	Academic Department	<ul style="list-style-type: none"> <li>-Nutrition and food hygiene</li> <li>-General research on agriculture production and technology</li> <li>- General research on industrial production and technology</li> <li>-Manufacture of food products and beverages</li> </ul>	<ul style="list-style-type: none"> <li>- Sterilization modes</li> <li>- Food safety analysis</li> <li>- Normative documentation</li> <li>- Development of food compounding</li> <li>- Development of perspective plans for food industry development</li> </ul>	International:3 National: 0	Research staff permanent : 520 Research staff – temporary: 30 Technical staff:190 Administrative staff:460	Patents:16	16

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)
4. Odessa State Agrarian University	Academic Department	-General research on agriculture production and technology (Production, processing and preserving of meat and meat products)	<ul style="list-style-type: none"> <li>- Scientific support of technologies in agriculture</li> <li>- Consultations on selection, breeding, feeding and keeping of farm animals</li> <li>- Preparation of business plans for the livestock raising effective conducting</li> <li>- Perspective plans preparation for selective and breeding works for different species of farm animals and poultry</li> </ul>	International:1 National: 1	Research staff permanent : 302 Research staff – temporary: 22 Technical staff:36 Administrative staff:14	Patents:15	18
5, Separated subdivision of the National University of Life and Environmental Sciences of Ukraine "Research and Design Institute of Standards and Technology ecosafety and organic products"	Academic Department	<ul style="list-style-type: none"> <li>- Food Technology</li> <li>- Nutrition and food hygiene (Manufacture of food products, beverages and tobacco)</li> </ul>	<ul style="list-style-type: none"> <li>- Regulatory and technical documentation (State Standards of Ukraine, technical conditions and so on) for food products including baby food, functional and dietary purposes food</li> <li>-Technological modes of food production, including sterilization, pasteurization</li> <li>- New resource saving technologies of fruits, vegetables, meat, fish and cereals processing and preserving</li> <li>- Institute has a Branch of Ukrainian Laboratory of Agricultural Products Quality and Safety with functions of quality and safety independent examination of agricultural raw materials, semi-finished products, certification and quality management system. The Institute provides scientific and technical consultations and provides copyright support of technical and technological solutions.</li> <li>-Institute operates a Technical Committee TC 24 "Vegetable and fruit products and equipment for their processing" of a State Service of Technical Regulation of Ukraine. This TC provides standardization in accordance with the legislation of Ukraine, international and European standardization.</li> </ul>	International: 0 National: 4	-	Patents:1	2
6. Southern Institute of Vegetable and	Research Institute	<ul style="list-style-type: none"> <li>- General research on agriculture production and technology</li> <li>-Other research on agriculture production</li> </ul>	<ul style="list-style-type: none"> <li>- Development of new sorts and hybrids, and development of new technologies for vegetable and melon crops that will</li> </ul>	-	Research staff permanent : 46 Research staff –	-	-

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)
Melon Growing of National Academy of Agrarian Sciences of Ukraine		and technology -General research on industrial production and technology (Manufacture of food products and beverages)	provide competitiveness resource - and energy saving, increasing overall productivity. - Development of technologies for growing gourd plantation in the open and closed ground with minimal energy consumption - Hygienic requirements for safe, biologically valuable watermelon and pumpkin products in order to use a rational and dietary nutrition		temporary: - Technical staff:- Administrative staff:6		
7. National Scientific Centre "Institute of viticulture and winemaking named after Tairov"	Research Institute	-Crops -Manufacture of food products and beverages	- Development of technological methods and technologies in viticulture - Development of new varieties of grapes with the given parameters - Growing grape planting stock high breeding categories - Quality control of vegetable and food raw materials on possible presence of viral diseases and GMOs		Research staff permanent : 94 Research staff – temporary: - Technical staff:13 Administrative staff:13	-	-
				<b>Total International : 8</b> <b>Total National:8</b>	<b>Total numbers Res. Perm. 1493</b> <b>Res temp. 104</b> <b>Tech. 314</b> <b>Admin: 519</b>	<b>- Total Patents: 39</b> <b>- Total Spin off companies: 0</b>	<b>- Total:58</b>

Code	Question	Value	Percentage (unless otherwise indicated) %
-	How many research entities were initially contacted for profiling, i.e. how many questionnaires were sent out?		12
-	How many research entities were finally profiled?	7	58%
-	How many research entities were regional?	5	72%
-	How many research entities were from outside the region?	2	28%
A9, A10	What is the average research staff of the entities (permanent and temporary)?	228	
A11, A12	What is the average of the entities technical and administrative staff?	119	
B2	Which are the Top 5 Research areas that the research entities reported they were active at?	<i>-Nutrition and food hygiene -General research on agriculture production and technology -General research on industrial production and technology -Increasing economic efficiency and competitiveness -Manufacture of food products and beverages</i>	
B2	Which are the Top 5 Sectors that the productive sectors reported they were active at?	<i>-Manufacture of food products, beverages and tobacco -Manufacture of food products and beverages -Production, processing and preserving of meat and meat products -Manufacture of wines</i>	
B3	How many research entities have reported that they offer knowledge- based services to third parties?	7	100%
C1	How many research entities have reported international projects in the past 5 years?	4	57%
D1	How many research entities have reported international journal publications in the past 5 years?	5	72%
D2	How many research entities have reported the existence of patents?	4	57%
D2	If so, how many patents were reported?	39	
D3	How many research entities have reported the existence of spin- off companies?		0%
D3	If so, how many spin- off companies were reported?		0
E1	How many research entities have reported international collaborations in general?	6	86%
F1	Shortly describe the existing and possible future services offered to food companies	<i>Technology, equipment, and normative documentation in the field of food production. Selling licenses for using patents and regulatory documentation. Development of new food recipes. Quality control. Technological modes of food production, including sterilization, pasteurization.</i>	

## 8.4 PRELIMINARY SWOT RESULTS

<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>1. Open exchange of experience in research and technology development (5 responses)</li> <li>2. Strong research base (5 responses)</li> <li>3. Highly skilled personnel (4 responses)</li> <li>4. Increasing number of collaboration with firms (2 responses)</li> <li>5. Public-private cooperation (1 response)</li> </ul>	<ul style="list-style-type: none"> <li>1. Low size of budget for R&amp;D (7 responses)</li> <li>2. Poor linkage between firms and research entities (4 responses)</li> <li>3. Not enough start ups (3 responses)</li> <li>4. Lack of formal collaboration between actors (1 response)</li> <li>5. Poor research base (1 response)</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>1. New R&amp;D European and regional programmes (5 responses)</li> <li>2. Availability of EU R&amp;D funds for research (4 responses)</li> <li>3. Increasing demand for more/better varieties (4 responses)</li> <li>4. Surplus of well educated researchers (4 responses)</li> <li>5. Networking (1 response)</li> </ul>	<ul style="list-style-type: none"> <li>1. Few incentives for university researchers to engage in collaboration with the industry (4 responses)</li> <li>2. Other (4 responses)</li> <li>3. Need of adaption to the new tools, rules and priorities (3 responses)</li> <li>4. Failure to attract international researchers (3 responses)</li> <li>5. Funding programmes to support research with content far from current research interests (1 response)</li> </ul>



## 9. REPUBLIC OF MOLDOVA

### 9.1 SHORT PROFILE OF THE REGION, THE AGRICULTURAL PRODUCTION AND THE FOOD INDUSTRY

#### 9.1.1 INTRODUCTION

Moldova is situated in South Eastern Europe, north of the Balkan Peninsula. With an area of 33,846 square kilometers (about 12,600 square miles), it is the second smallest member of the Commonwealth of Independent States. It stretches 350 km from North to South and 150 km from East to West. In the North and East Moldova borders Ukraine and in the West it borders Romania.

The Republic of Moldova has been an independent State since August 27, 1991 following the collapse of the Soviet Union. It joined the United Nations on March 2, 1992. Despite a sometimes turbulent history, it has emerged as a stable democratic state based on the rule of law.



#### 9.1.2 AGRICULTURE

Agriculture and the rural sector play a central role in the national economy. Throughout the 1990s, the macroeconomic environment was quite poor. Between 1991 and 1999, GDP fell

almost 70 percent. It began rising again in 2000 through 2004.<sup>7</sup> In fact, per capita GDP in constant dollars rose by more than a quarter in 1999-2003, evidencing rapid economic growth. Land reform, combined with macroeconomic stabilization and increased domestic demand from remittances, were all factors contributing to the agricultural sector's recovery. Despite GDP growth in 2004 (more than 7 percent), Moldovan GDP per capita, expressed in 2000 prices, was still under US\$400, a sixth of the average for the Eastern Europe and Central Asia Region (ECA), and below the average for Sub-Saharan Africa.<sup>8</sup>

While GDP has continued to grow vigorously since 2002, there has been little progress in reducing poverty, particularly in rural areas. Indeed, farmers suffered a significant rise in poverty in 2004 and the first three quarters of 2005. In 2005, rural poverty accounted for 42.5 percent of the total, while rural households derived 73 percent of their income from agriculture. Evidence suggests that this increase in rural poverty was caused by a fall in farm incomes due to an increase of input prices and flat or falling prices of final products.<sup>9</sup>

A competitive market structure is not yet fully established, and government policies have not supported private agriculture. The government often intervenes in domestic and export markets of agricultural commodities such as bread and flour products in a way that appears non-transparent and distorted. Export of agricultural products was liberalized in 1997, but several non-tariff barriers for agricultural products remain.

The result of agricultural and macroeconomic policies caused a drastic drop in agricultural input use and low and unstable returns on agricultural commodities in the late 1990s. Yields and agricultural productivity started increasing after 2000 in parallel with a lessening of government interventions in grain markets. In 2003, though, a severe drought interrupted the positive trend and brought renewed government interventions in the agricultural sector.

### **9.1.3 FOOD INDUSTRY**

The food industry of the Republic of Moldova is one of the main industrial branches of the national economy. The different sectors of the food industry process over 80% of the local agricultural raw material. About 60% of the exports of the Republic of Moldova are the products of agri-food industry. The regional specialization branches include: wine industry, tobacco industry, sugar industry, canning industry, natural juices, essential oils, etc.

## **9.2 SHORT DESCRIPTION OF THE REGIONAL RESEARCH AND INNOVATION FRAMEWORK**

Several reports and studies were published recently, which address among other issues also the Moldovan innovation policy. The OECD (2011) Report on SME Development states that

the government should consider changing its top-down approach to innovation policy in order to strengthen the links between academia and the private sector and to develop a more inclusive innovation agenda. Establishing intermediary institutions such as the AITT provides a good practice example of efforts to more effectively include the private sector in the innovation process. Science and technology parks and innovation incubators, which are already operational, are examples of initiatives aimed at improving the innovative capacities of companies.

However, the scope of these initiatives is limited and their results are still uncertain. Moreover, the current orientation of the AITT does not seem to focus on developing the R&D activities of the private sector. It relies instead on a separation of tasks where public institutions perform research, the results of which shall then be transferred to and marketed by private companies. The current institutional setting seems to be geared towards basic research. The authors of the OECD report consider that it is important that the government reviews the results of initiatives already existing in the area of innovation policy, in close dialogue with donors and the enterprise community, to make successful programs sustainable and to extend coverage and accessibility even after donor support is finished.

The Report of the Expert Group (2011) on the RDI sector of Moldova evaluates the state policy in R&D and Innovation in terms of good governance. The study suggests that the current state policy is not adequate to achieve the expected results. Strategic goals for RDI are not set and the sector has practically no role in the national development objectives identified in strategic planning documents. The study recommends a new organisation model of the RDI sector in Moldova.

The Report of the Court of Accounts (2010) on allocating and monitoring research funds<sup>11</sup> includes an audit of policies and procedures developed by the ASM for allocation and monitoring of utilisation of public funds for research and innovation.

Some assessment of the effectiveness of innovation policy is included also in the annual Report of the Agency for Innovation and Technological for 2010. The report lets deduct that direct financial instruments were not very stimulating and it is considered that the systems of higher education and of lifelong learning do not ensure the necessary competences for the proper implementation of research results. The main future challenges for innovation policy for the period 2012-13 remain improving the innovation governance model (through e.g. involving more actors in policy formulation, spreading of policy formulation, implementation and evaluation over different actors), increasing business R&D and linkages between education, research and business, development of an efficient evaluation and monitoring system of implemented policies.

### 9.3 KEY INFORMATION FROM THE PROFILING OF THE REGIONAL RESEARCH ENTITIES

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)
<i>Institute of Soil and Agro-chemistry "Nicolae Dimo"</i>	<i>Research Institute</i>	<ul style="list-style-type: none"> <li>-General research on agriculture production and technology</li> <li>-Food technology</li> <li>-Other research on agricultural production and technology</li> <li>-Manufacture of food products and beverages</li> </ul>	<ul style="list-style-type: none"> <li>-Manufacture of food products, beverages and tobacco</li> <li>-Production, processing and preserving of meat and meat products</li> <li>-Processing and preserving of fruit and vegetables</li> <li>-Manufacture of vegetables and animal oils fats</li> <li>-Manufacture of other products</li> </ul>	<ul style="list-style-type: none"> <li>-International:</li> <li>-National:</li> </ul>	Research staff permanent : Research staff – temporary: Technical staff: Administrative staff:		-International : - National :
<i>Practical Scientific Institute of Horticulture and Food Technology</i>	<i>Research Institute</i>	<ul style="list-style-type: none"> <li>- Animal products</li> <li>-Crops</li> <li>- Forestry and timber production</li> <li>-Food technology</li> <li>- Other research on agricultural production and technology</li> <li>- General research on industrial production and technology</li> <li>- Manufacturing and processing techniques</li> <li>-General research on agriculture production and technology</li> </ul>	<ul style="list-style-type: none"> <li>-Manufacture of food products and beverages</li> <li>- Production and preserving of poultry meat</li> <li>- Processing and preserving of fish and fish products</li> <li>- Processing and preserving of fruit and vegetables</li> <li>- Manufacture of fruit and vegetable juice</li> <li>-Manufacture of prepared animal feeds</li> <li>-Manufacture of vegetables and animal oils fats</li> <li>-Production, processing and preserving of meat and meat products</li> <li>- Manufacture of dairy products</li> <li>-Manufacture of other food products</li> <li>-Manufacture of bread; manufacture of fresh pastry goods and cakes</li> <li>- Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes</li> <li>- Manufacture of condiments and seasonings</li> </ul>	<ul style="list-style-type: none"> <li>-</li> <li>-International:1</li> <li>-National:5</li> </ul>	Research staff permanent :42 Research staff – temporary: - Technical staff:12 Administrative staff: 2	Patents:26	-International :27 - National : 22
<i>State Station for Machine Testing</i>	<i>Research Institute</i>	<ul style="list-style-type: none"> <li>-General research on industrial production and technology</li> <li>-Manufacture of motor vehicles and parts</li> <li>-Other research on agricultural production and technology</li> <li>-Food technology</li> <li>-Increasing economic efficiency and competitiveness</li> </ul>	<ul style="list-style-type: none"> <li>-Production, processing and preserving of meat and meat products</li> <li>-Manufacture of food products and beverages</li> <li>-Processing and preserving of fruit and vegetables</li> <li>- Manufacture of prepared animal feeds</li> <li>-Manufacture of vegetables and animal oils fats</li> </ul>	<ul style="list-style-type: none"> <li>-International:</li> <li>-National:</li> </ul>	Research staff permanent : Research staff – temporary: Technical staff: Administrative staff:		-International : - National :

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)
<i>National Institute for Viticulture and Vinification</i>	<i>Research Institute</i>	<ul style="list-style-type: none"> <li>-Crops</li> <li>-General research on agriculture production and technology</li> <li>-Food technology</li> <li>-Nutrition and food hygiene</li> <li>-Other research on agricultural production and technology</li> </ul>	<ul style="list-style-type: none"> <li>-Manufacture of food products, beverages and tobacco</li> <li>-Production, processing and preserving of meat and meat products</li> <li>-Processing and preserving of fruit and vegetables</li> <li>-Manufacture of vegetables and animal oils fats</li> <li>-Manufacture of dairy products</li> </ul>	<i>-International:</i> <i>-National:</i>	Research staff permanent : Research staff – temporary: Technical staff: Administrative staff:		<i>-International :</i> <i>- National :</i>
<i>Research Institute for Field Crops "Selectia"</i>	<i>Research Institute</i>	<ul style="list-style-type: none"> <li>-Other research on agricultural production and technology</li> <li>-Crops</li> <li>-General research on agriculture production and technology</li> <li>-Food technology</li> <li>-Nutrition and food hygiene</li> </ul>	<ul style="list-style-type: none"> <li>-Production, processing and preserving of meat and meat products</li> <li>-Manufacture of beverages</li> <li>-Processing and preserving of fruit and vegetables</li> <li>-Manufacture of other food products</li> <li>-Manufacture of vegetables and animal oils fats</li> </ul>	<i>-International:</i> <i>-National:</i>	Research staff permanent : Research staff – temporary: Technical staff: Administrative staff:		<i>-International :</i> <i>- National :</i>
<i>Institute for Animal Husbandry and Veterinary Medicine</i>	<i>Research Institute</i>	<ul style="list-style-type: none"> <li>-Animal products</li> <li>-Veterinary medicine</li> <li>-Pharmaceutical products</li> <li>-Food technology</li> <li>-General research on agriculture production and technology</li> </ul>	<ul style="list-style-type: none"> <li>-Manufacture of vegetables and animal oils fats</li> <li>-Manufacture of food products and beverages</li> <li>-Processing and preserving of fruit and vegetables</li> <li>- Processing and preserving of fish and fish products</li> <li>-Production, processing and preserving of meat and meat products</li> </ul>	<i>-International:</i> <i>-National:</i>	Research staff permanent : Research staff – temporary: Technical staff: Administrative staff:		<i>-International :</i> <i>- National :</i>
<i>The Institute of Agricultural Technics "Mecagro"</i>	<i>Research Institute</i>	<ul style="list-style-type: none"> <li>-General research on agriculture production and technology</li> <li>-Food technology</li> <li>-Water supply</li> <li>-Nutrition and food hygiene</li> <li>-Manufacture of food products and beverages</li> </ul>	<ul style="list-style-type: none"> <li>-Manufacture of food products, beverages and tobacco</li> <li>-Production, processing and preserving of meat and meat products</li> <li>-Processing and preserving of fruit and vegetables</li> <li>-Manufacture of vegetables and animal oils fats</li> <li>-Manufacture of other food products</li> </ul>	<i>-International:</i> <i>-National:</i>	Research staff permanent : Research staff – temporary: Technical staff: Administrative staff:		<i>-International :</i> <i>- National :</i>
<i>State Agricultural University of Moldova (UASM)</i>	<i>Academic Department</i>	<ul style="list-style-type: none"> <li>- Other research on agricultural production and technology</li> <li>- Agricultural sciences</li> <li>- Increasing economic efficiency and competitiveness</li> <li>- Crops</li> </ul>	<ul style="list-style-type: none"> <li>- Manufacture of food products, beverages and tobacco</li> <li>- Manufacture of food products and beverages</li> <li>- Manufacture of crude oils and fats</li> <li>- Manufacture of starches and starch products</li> <li>- Manufacture of prepared animal feeds</li> <li>- Manufacture of bread; manufacture of fresh pastry goods</li> </ul>	- <i>International:2</i> <i>-National:3</i>	Research staff permanent :122 Research staff – temporary: - Technical staff:-	Patents: 2	<i>-International :8</i> <i>- National : 15</i>

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)
		<ul style="list-style-type: none"> <li>- General research on agriculture production and technology</li> <li>- General research on protection and improvement of human health</li> <li>- Protection of soil and groundwater</li> </ul>	<ul style="list-style-type: none"> <li>and cakes</li> <li>- Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes</li> <li>- Manufacture of sugar</li> <li>- Manufacture of macaroni, noodles, couscous and similar farinaceous products</li> <li>- Manufacture of homogenized food preparations and dietetic food</li> </ul>		Administrative staff: -		

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## **10. REGION OF VOJVODINA, SERBIA**

### **10.1 SHORT PROFILE OF THE REGION, THE AGRICULTURAL PRODUCTION AND THE FOOD INDUSTRY**

Vojvodina is an autonomous province of the Republic of Serbia, located in the northern part of the country. Vojvodina borders Romania in the east, Hungary in the north, Croatia in the west, Bosnia& Herzegovina in the southwest and central Serbia in the south. It covers an area of 21,506 km<sup>2</sup>, which represents approximately one quarter of the territory of the Republic of Serbia.

Vojvodina's economy is dominated by the food processing industry and agriculture, yet some other sectors are also significant such as processing of oil derivatives, chemical products, banking and financial services, information and communication technologies, trade and distribution services.

The share of region Vojvodina in the national output of agriculture is approximately 70%. Cereals, industrial crops, fruits and animal products are of particular importance for the regional economy and compared to the national averages.

Vojvodina has excellent natural conditions for agricultural production. It is located in the Pannonian plain, making the land configuration predominantly flat with a high quality of soil. There are also two mountains: Vrsacke in the southeast and Fruska Gora in the central area.

As mentioned earlier, the agricultural population, based on 2002 census, accounts for 215,147 inhabitants or 10.59% of the total population of Vojvodina. The figure significantly decreased from the previous census in 1991, in which the number of the agricultural population in Vojvodina was 269,438. Agricultural land in Vojvodina in 2009 covers 1.747 million ha, which is 35% of the total agricultural land in Serbia. Arable fields and gardens cover 1.578 million ha (39% of total arable land in Serbia), 18,000 ha are under orchards and almost 10,000 ha are under vineyards. Meadows cover 41,000 ha and pastures 101,000 ha (Statistical Office 2010). The quality of land is very good with 52% is made up of black soil.

Cultivation of arable land is dominated by cereal grains, planted on 66% of all land. Cereals are followed by oilseed crops (22%), vegetables (5%) and fodder crops (5%). In the last few years there has been a trend of increasing areas under oilseed crops (soya, in particular) at the expense of cereal grains, though the trend is falling in the areas under vegetables and fodder crops, mostly due to negative trends in the cattle-farming segment. Vojvodina covers 53.24% of the total area under cereal grains in Serbia, 91.81% under oilseed crops, 25.36% under vegetables and 16.26% under fodder crops (Statistical Office 2010).



Fruit production is much less significant than cereal grains. Fruit is mostly grown in the northern part of Vojvodina, as well as the Fruska Gora and Vrsac mountains. The total number of productive fruit trees in 2009 was about 12.8 million. The most widely grown fruits were apples (42.13%) with production at 105,000 tons, followed by plums (20.65%) with 57,000 tons and sour cherries (12.28%) with 26,100 tons.

Sugar production is stable at around 430,000 tons. Domestic consumption of sugar amounts to 240,000 tons (25-30 kg per capita), exports to 180,000 tons (mostly to the EU within the customs-free export quota is 180,000 tons).

Confectionary and snacks is a sub-sector with an overall production of 130,000 tons per year and increasing importance in the food production in Serbia. The sub-sector achieves annual revenues of over 400 million EUR and an export value of 150 million EUR.

Total wine production in Serbia amounts to ~ 170 million litres. Local consumption is dominated by imported wine (third quarters of wine consumed is imported). The low prices paid for grapes have resulted in declining production and limited investment in grape production and processing.

Serbia is the world leader in raspberry production. Other key fruits are apples, plums, blackberries and sour cherries (in total around 20 types of fruit). Premium quality of berry fruits due to optimal climate and soil conditions (results in a higher dry content). More than 300 companies are active in the fruit sub-sector in Serbia.

## **10.2 SHORT DESCRIPTION OF THE REGIONAL RESEARCH AND INNOVATION FRAMEWORK**

AP Vojvodina is the member of the Assembly of European Regions of the Parliament of the EU, as the first, and so far the only region that became a member whose country was not at that time member of the EU or the Council of Europe. Furthermore, Vojvodina is the co-founder of the regional council of the DKMT (Danube-Kris-Mures-Tisa) Euro-region, besides Vojvodina, also encompasses several counties from Hungary and Romania, and whose task is cooperation in regional economic, cultural and ecological development. The Autonomous Province of Vojvodina is the only in Serbia that has a middle-term development plan "Integrated Regional Development Plan of AP Vojvodina" which defines strategic and priority objectives as well as measures for their achievement. The defined priorities and measures manifest the new role of the provincial government, imminent to the concept of modern regional policy and to the concept of endogenous development. Every development priority is dealt with to the level of a concrete strategy and measures are suggested towards the achievement of every strategy.



One of those institutions is the Centre for Strategic Economic Studies “Vojvodina CESS”. CESS was founded in 2004., by Executive Council of AP Vojvodina and University of Novi Sad as a think-tank organization that stimulates regional development on scientific bases. In order to create economic policies in a proper way, a clear understanding of economic effects must exist, thereby expertise concerning regional development is a key precondition for a successful realization of development goals. CESS is an institution that deals with research, project and educational activities. In accordance with the main aim, goals and mission, Centre for Strategic Economic Studies Vojvodina-CESS has defined the following objectives:

- analysis of socio-economic situation in the Autonomous province of Vojvodina and enhancement of regional development
- realization of empirical research in the field of socio-economic development of the Autonomous Province of Vojvodina
- cooperation with institutions that practice similar activities in neighboring countries and EU member countries with the aim to put forward interregional cooperation
- development of applicative and absorption capacities of the region by giving support to potential applicants who are competing for resources from the pre-accession EU funds

In AP Vojvodina, there is a Fund for Capital investment which was founded by the Assembly of the Autonomous Province of Vojvodina in December 2006. The fund was founded in order to finance programmes and projects that are of importance for development of Vojvodina, local self-governments, republic of Serbia and wider region. Fund finances projects within priority areas: architecture, urbanism and construction, energz, technological development, agriculture and forestry, water managment and environment protection, helath and social security, education, science and inovation, transport (exclusively local ground, railway and river networks on the territory of AP Vojvodina) and telecommunication.

### 10.3 KEY INFORMATION FROM THE PROFILING OF THE REGIONAL RESEARCH ENTITIES

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 of food technology	Research Institute	-technology of plant based food products	None <ul style="list-style-type: none"> <li>– Technology and wheat flour (quality testing of raw materials, storage, milling, baking, pasta production);</li> <li>– Technology of fruits and vegetables, sugar technology, technology of confectionery products, physical properties of products of plant origin, methods of storage and preservation;</li> <li>– Microbiology of food, food technology - microbiology, hygiene; Safety and quality of food of plant origin;</li> </ul>	<i>International: 5</i> <i>National: 5</i>	Research staff permanent :35 Research staff – temporary: 5 Technical staff:4 Administrative staff: 4	Patents: 2	-International: 61 - National : 105
Institute of food technology	Research Institute	-feed technology and animal products -quality and safety	<ul style="list-style-type: none"> <li>– technology of raw materials</li> <li>– technology of mixes and premixes</li> <li>– technological microbiology</li> <li>– production and technological properties of feed (physical, chemical, biochemical, hygienic, functional, etc.)</li> <li>– nutritional characteristics of feed</li> <li>– valorization of by-products of agriculture and food industry for use as feed</li> <li>– methods of storage and preservation of feed</li> <li>– sustainability of the food chain</li> <li>– quality and safety of feed and food products</li> <li>– environmental protection</li> <li>– meat technology</li> <li>– technology of meat industry by-products</li> <li>– technology of functional products</li> <li>– physical properties of products of animal origin</li> <li>– methods of preservation</li> <li>– technology of traditional products</li> </ul>	<i>International: 8</i> <i>National: 2</i>	Research staff permanent :14 Research staff – temporary: 0 Technical staff:1 Administrative staff: 4	Patents: 1	-International :52 National : 68

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)
			<ul style="list-style-type: none"> <li>– technological microbiology</li> <li>– protection of geographical indications</li> <li>– quality and safety of animal product</li> </ul>				
Institute of Field and Vegetable Crops/Laboratory for Seed Testing	Research Institute	<ul style="list-style-type: none"> <li>- Viability and dormancy of seed</li> <li>- Antioxidants in seed under stress conditions</li> <li>- Seed pathogens – viruses/bacteria detection and identification</li> <li>- GMO detection</li> <li>- Genetic purity of seed</li> </ul>	<ul style="list-style-type: none"> <li>– physiological seed testing</li> <li>– biotechnological seed testing</li> <li>– seed health testing</li> </ul>	International: 1 National: 3	Research staff permanent :5 Research staff – temporary: 0 Technical staff:13 Administrative staff: 1		International: 15 National: 10
Faculty of technology	Academic department	<ul style="list-style-type: none"> <li>- Technology of milk production and processing</li> <li>- quality of milk</li> </ul>	<ul style="list-style-type: none"> <li>– Controls on milk production</li> <li>– visits to experimental farms</li> <li>– consulting on milk processing</li> </ul>	International: 2 National: 3	Research staff permanent :3 Research staff – temporary: 1 Technical staff:1 Administrative staff: 1		International: 8 National: 20
Faculty of technology	Academic department	General research on cereal based products (bread and pasta)	<ul style="list-style-type: none"> <li>– technological testing of bread, pasta and other cereal products</li> <li>– chemical and reological analyses</li> </ul>	International: National: 2	Research staff permanent :4 Research staff – temporary: Technical staff:1 Administrative staff:		International: 9 National: 18
Faculty of technology	Academic department	General research on carbohydrate products (confectionery products)	<ul style="list-style-type: none"> <li>– reological analyses</li> <li>– chemical analyses</li> </ul>	International: 1 National: 2	Research staff permanent :4 Research staff – temporary: Technical staff:1 Administrative staff:		International: 12 National: 20
Faculty of technology	Academic department	Research on oil and fats	<ul style="list-style-type: none"> <li>– chemical and technological analyses of oils and fats</li> <li>– consulting</li> </ul>	International: National: 2	Research staff permanent :3 Research staff – temporary: 2 Technical staff:1		International: 6 National: 18

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)
					Administrative staff: 1		
Faculty of technology	Academic department	Research on fruits and vegetables	<ul style="list-style-type: none"> <li>chemical and technological analyses of fruits and vegetables</li> <li>technological consulting</li> </ul>	International: 2 National: 2	Research staff permanent :3 Research staff – temporary: Technical staff:1 Administrative staff: 1		International: 4 National: 13
Faculty of technology	Academic department	Research on wine, alcoholic and nonalcoholic drinks	<ul style="list-style-type: none"> <li>chemical and technological analyses of wines, alcoholic and nonalcoholic drinks</li> </ul>	International: 1 National: 1	Research staff permanent :2 Research staff – temporary: Technical staff:1 Administrative staff:		International: 3 National: 9
Scientific Veterinary Institute "Novi Sad"	Research Institute	Feed quality and safety, raw material quality Food of animal origin, dairy and meat products, quality and safety of food	<ul style="list-style-type: none"> <li>Chemical and microbiological analyses of feed</li> <li>Chemical and microbiological analyses of food of animal origin</li> <li>Consulting, visiting farms</li> </ul>	International: 5 National: 20	Research staff permanent :34 Research staff – temporary: 2 Technical staff:12 Administrative staff: 5		International: 11 National: 28
Faculty of Agriculture	Academic department	technology for fruit production, variety selection, preserving and storage of fruit technology for grape production, variety selection, preserving and processing of vine	<ul style="list-style-type: none"> <li>consulting</li> <li>laboratory analyses</li> <li>visit to experimental vineyard and orchard</li> </ul>	International: 2 National: 5	Research staff permanent :10 Research staff – temporary: Technical staff: 4 Administrative staff: 1		International: 9 National: 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)
Faculty of Agriculture, Novi Sad	Academic department	<ul style="list-style-type: none"> <li>General research on protection and improvement of animal husbandry</li> <li>Animal nutrition and feed hygiene</li> <li>General research on agriculture production and technology</li> </ul>	<ul style="list-style-type: none"> <li>Chemical and microbiological analyses of feed</li> <li>Consulting, visiting farms</li> </ul>	International: 1 National: 19	Research staff permanent :39 Research staff – temporary: 1 Technical staff:6 Administrative staff: 6		International: 21 National: 63
Institute for Vegetable Crops	Research institute	<ul style="list-style-type: none"> <li>Breeding of vegetable seed and its production and marketing. Also, plant protection and production of ecological and environmental friendly vegetables.</li> </ul>	<ul style="list-style-type: none"> <li>Plant breeding</li> <li>Plant protection</li> <li>Seed testing in accredited laboratory</li> <li>Ecological production of vegetables</li> </ul>	International: 1 National: 1	Research staff permanent :16 Research staff – temporary: Technical staff: 22 Administrative staff: 4	Patents: 4	International: 8 National: 6
Faculty of agriculture, Belgrade	Academic department	<ul style="list-style-type: none"> <li>general research on food technology and biochemistry</li> </ul>	<ul style="list-style-type: none"> <li>Food Chemistry and Biochemistry</li> <li>Conservation and fermentation technology</li> <li>Technology of crop products</li> <li>Animal Products Technology</li> <li>Technological microbiology</li> <li>Managing safety and quality of food</li> </ul>	International: 17 National: 10	Research staff permanent :73 Research staff – temporary: 2 Technical staff: 14 Administrative staff: 1		
				<b>Total International: 43</b> <b>Total National: 77</b>	<b>Total numbers</b> <b>Res. Perm. 245</b> <b>Res temp. 13</b> <b>Tech. 82</b> <b>Admin: 29</b>	<b>Total Patents: 7</b>	<b>Total International: 219</b> <b>Total National: 395</b>

Code	Question	Value	Percentage % (unless otherwise indicated)
-	How many research entities were initially contacted for profiling, i.e. how many questionnaires were sent out?	15	
-	How many research entities were finally profiled?	14	93% (profiled/ contacted)
A9, A10	What is the average research staff of the entities (permanent and temporary)?	18.5	-
A11, A12	What is the average of the entities technical and administrative staff?	7.9	-
B2	Which are the Top 5 Research areas that the research entities reported they were active at?	-Food technology -Nutrition and food hygiene -Animal products -Other research on agricultural production and technology -General research on industrial production and technology	
B2	Which are the Top 5 Sectors that the productive sectors reported they were active at?	-Production, processing and preserving of meat and meat products - Processing and preserving of fruit and vegetables -Manufacture of dairy products -Manufacture of grain mill products, starches and starch products	
B3	How many research entities have reported that they offer knowledge- based services to third parties?	6	43%
C1	How many research entities have reported international projects in the past 5 years?	10	71%
D1	How many research entities have reported international journal publications in the past 5 years?	14	100%
D2	How many research entities have reported the existence of patents?	3	20%
D2	If so, how many patents were reported?	7	n/a
D3	How many research entities have reported the existence of spin- off companies?	0	0%
D3	If so, how many spin- off companies were reported?	-	-
E1	How many research entities have reported international collaborations in general?	14	100%

The profiling analysis was conducted by addressing 15 RTDs, but 14 entities were finally profiled (93.3%). The reason of lower number of RTDs profiled is centralized research in a few faculties in region of Vojvodina.

The RTDs staff dimension on average shows 17, 5 permanent researchers units per entity and 1 is the value of temporary personnel.

Technical staff average number is 5.9 units per RTD, whereas same data for Administrative staff is 2.

The Research Areas where the RTDs show more activity, according the NABS classification, are:

- Food technology
- Nutrition and food hygiene
- Animal products
- Other research on agricultural production and technology
- General research on industrial production and technology

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 FINS).

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

The data shows 42,8% of profiled RTDs offering knowledge- based services to third parties, while the 71,4% of them reported international projects in the past 5 years, All Entities profiled have international journal publications in the same period but number of publications is not so high. 100, 0% of RTDs reported international collaborations with other foreign RTD.

The number of registered patents in the past 5 years is very low (7 patents). Only 20% of profiled Entities have reported patent.

There is no spin-off companies created in last 5 years in the RTD agro-food sector. In this moment, research and academic institutions in the field of technical sciences are more focused and productive in establishment of spin-off companies.

## 10.4 PRELIMINARY SWOT RESULTS

<b>Strengths</b>	<b>Weaknesses</b>
1. Highly skilled personnel (10 responses) 2. Open exchange of experience in research and technology development (8 responses) 3. Strong research base (4 responses) 4. Public-private cooperation (3 responses) 5. Increasing number of collaboration with firms (2 responses)	1. Low size of budget for R&D (12 responses) 2. Poor linkage between firms and research entities (6 responses) 3. Not enough start ups (4 responses) 4. Lack of formal collaboration between actors (2 responses) 5. Weak understanding between researchers and industry complicates joint projects (2 responses)
<b>Opportunities</b>	<b>Threats</b>
1. Availability of EU R&D funds for research (11 responses) 2. New R&D European and regional programmes (10 responses) 3. Networking (7 responses) 4. Surplus of well educated researchers (3 responses) 5. Increasing demand for more/better varieties (2 responses)	1. Bureaucracy barriers (13 responses) 2. Brain drain (9 responses) 3. Failure to attract international researchers (4 responses) 4. Few incentives for university researchers to engage in collaboration with the industry (4 responses) 5. Funding programmes to support research with content far from current research interests (3 responses)

Low size of budget for R&D and poor linkage between researchers and industry as well as bureaucracy barriers and brain drain are mentioned as mainly weaknesses and treats. It resulted in low number of patents and lack of spin-off companies in agri-food sector. As main strengths are mentioned presence of highly skilled personnel and availability of Regional and EU R&D funds and new R&D programmes funded by EU.



## **10.5 CONCLUDING REMARKS**

The agro-food research system in region of Vojvodina as well as in Serbia is mainly made of public entities. Private entities are mostly focused in laboratory work connected to quality control of food products and commercially oriented.

In recent years there is considerable breakthrough in promotion of innovation as a main driven factor of the economy and society with intention to Serbia become a knowledge based society. The policy frame is set by the Serbian Law on Innovation Activity, last amended in March 2010<sup>1</sup> and implemented by Ministry of education, science and technological development. The Law on Innovation Activity regulates basic principles, goals and organization of application of scientific knowledge and inventiveness, for the purpose of creation and realization of new and improved products, processes and services to serve as a driving force for the development of the Republic of Serbia.

Between the other, the Improved SME Competitiveness and Innovation Project (ICIP), financed by the EU aims at improving the competitiveness of Serbian SMEs and increasing levels of innovation in SMEs. The project also envisages related needs to strengthen the institutional capacity and support framework for increased level of innovation in enterprises, upgrade of innovation support services, build of capacities of innovation stakeholders and strengthen links between education, research institutes and business.

Although there is a connection between the industrial sector and research institutions, only few companies have need to use the research results because most of companies are privatized and have their own research sectors. For this reason, a small number of patents were realized over the last 5 years, while the number of spin-off companies in the food sector is very low.

The number of patents registered by R&D organizations in the period from 2003-2009 was just 54; while in the period 2003-2009 over 3,400 technical solutions were implemented in the field of technological development in Serbia. The relevant figures in the corporate sector were not remarkably better, with about 20 patents registered per year, while individuals registered more than 300 patents in the same period. In the year 2010 in total 579 patent applications were filled in the Intellectual Property Office out of which 290 were resident and 289 non-resident patent applications. In view of such results, Serbia was at the bottom of the list in Europe <sup>5</sup>.

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<sup>5</sup> Erawatch: Country Reports 2011: Serbia

Investments in R&D and innovation in Serbia from public sources are prioritised and budgeted in the framework of multi-annual plans to ensure predictability and long term impact. Project financing based on open competition for R&D and Innovation projects is decade's long practice in Serbia. There is no institutional, or block funding for R&D activities in Serbia. Programmes for the support of R&D and innovation activities (co)financed by the MES, the Ministry of Economy and Regional Development (MoERD).

Innovation Fund was established by the Innovation Law in order to provide funding for innovations, particularly through cooperation with international financial institutions, organizations, donors and the private sector. The objective of the Fund is to promote innovation in priority areas of science and technology and to support commercialization of technology transfer thus enabling new technologies to reach the market. It was done through Innovation Serbia Project which is funded by the EU Instrument for Pre-accession Assistance (IPA) and administered by the World Bank, in 2011. This project is aimed to provide technical assistance to selected research and development institutes (RDIs) and among them is Institute of Food Technology (FINS).

The Institute of Food Technology (FINS) has leading position in region in the agro-food sector and permanently improves and strengthening links between research and industry. The Institute has several pilot plants to develop new technologies and products, for testing of raw materials, training and demonstrations. One of good example is cooperation with big soybean processing factory "Sojaprotein" in developing and testing soy concentrates in animal feeding.

As conclusion, it should be emphasized that in the region of Vojvodina there is the ongoing work to achieve sustainable economic growth, especially innovation and the promotion of SMEs. It must draw attention to the need for close co-operation between academic and scientific knowledge, commercial operators and authorities (Triple Helix). The role of University of Novi Sad and other research entities are very important since future programmes of EU (HORIZON 2020) will promote strengthening the EU's position in science as well as strengthening industrial leadership in innovation.

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## **10. ANNEX- MODEL QUESTIONNAIRE FOR THE PROFILING OF AGROFOOD RTD ENTITIES**

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### **SECTION A - GENERAL INFORMATION**

A1. Organization/Department

A2. Acronym

A3. Affiliation (e.g. University of...or  
Research Institute of...)

A4. Address

A5. Website

A6. Director

A7. Email

A8. Telephone

A9. Research staff – permanent <sup>(1)</sup>

A10. Research staff – temporary <sup>(1)</sup>

A11. Technical staff <sup>(1)</sup>

A12. Administrative staff <sup>(1)</sup>

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<sup>(1)</sup> Indicate the number of personnel.

**SECTION B- SKILLS***Add rows, if necessary.***B1. Keywords (max 10)**

--	--	--	--	--	--	--	--

**B2. Research topic(s)**

	Research (1)	area(s)	Sector(s) <sup>(2)</sup>	Description <sup>(3)</sup>
1				
2				
3				
.....				

<sup>(1)</sup> See Annex 1.<sup>(2)</sup> See Annex 2.<sup>(3)</sup> Brief description (max. 200 characters) of the research topic.**B3. Knowledge based services offered by the Organization/Department to third parties<sup>(1)</sup>**

1	
2	
3	
4	
.....	

<sup>(1)</sup> Examples: Controls on milk production; visits to experimental farms, etc.

## SECTION C - RESEARCH ACTIVITIES

Add new Tables, if necessary.

### C1. INTERNATIONAL projects (last five years) (1)

Title

Website

Abstract

NABS code/description (2)

Sector/description (3)

Topic(s) (4)

Duration (from month/year  
– to month/year)

Funding Organisation

Total Project Value (€)

Role (5)

Activities (6)

Main results achieved (7)

(1) Indicate projects where the Organization/Department has been or is involved in the last five years.

(2) See Annex 1.

(3) See Annex 2.

(4) Brief description (max. 500 characters) of the research project topic(s).

(5) Coordinator - partner - sub-contractor .....

(6) Brief description (max. 500 characters) of research activities carried out by the Organization/Department within the project.

(7) Only results strictly related to the described project.

Add new Tables, if necessary.

### C2. NATIONAL projects (last five years) (1)

Title

Website

Abstract

NABS code/description (2)

Sector/description (3)

Topic(s) (4)

Duration (from  
month/year – to  
month/year)

Funding Organisation

Total Project Value (€)

Role (5)

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**Activities <sup>(6)</sup>**

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**Main results achieved <sup>(7)</sup>**

---

<sup>(1)</sup> Indicate projects where the Organization/Department has been or is involved in the last five years.

<sup>(2)</sup> See Annex 1.

<sup>(3)</sup> See Annex 2.

<sup>(4)</sup> Brief description (max. 500 characters) of the research project topic(s).

<sup>(5)</sup> Coordinator - partner - sub-contractor .....

<sup>(6)</sup> Brief description (max. 500 characters) of research activities carried out by the Organization/Department within the project.

<sup>(7)</sup> Only results strictly related to the described project.

**SECTION D - RESEARCH RESULTS*****Total international journals publications in the last five years:*****D1. Peer-reviewed International Journals Publications (last five years) <sup>(1)</sup>**

Author(s)	Title	Journal	Year/Vol./Pages

<sup>(1)</sup> Provide details about at maximum 30 international journal publications.**D2. Patents**

Author(s)	Title	Brief description (max 500 characters)

**D3. Spin-off companies <sup>(1)</sup>**

Organization name	Brief description (max 500 characters)

<sup>(1)</sup> Indicate “spin-offs” start up by the Organization/Department

**SECTION E - COLLABORATIONS****E1. INTERNATIONAL (current)**

Name	Country	Research area(s) <sup>(1)</sup>	Description <sup>(2)</sup>	Public/Private

<sup>(1)</sup> See Annex 1.<sup>(2)</sup> Brief description (max. 200 characters) of the collaboration topic.**SECTION F- EXISTING AND POSSIBLE FUTURE SERVICES OFFERED TO FOOD COMPANIES**

Productive sector <sup>(1)</sup>	Services offered	Type of collaboration <sup>(2)</sup>

<sup>(1)</sup> See Annex 2<sup>(2)</sup> Please indicate one or more of the options below i) Commercial basis, ii) Collaborative funded project



## SECTION G - STRATEGIC POSITIONING

Double click on the boxes and select Default value

G1. Focusing on your own resources (personnel, organizational aspects, financial aspects, etc.), what do you think are your Organization/Department's STRENGTHS, i.e., capabilities to provide comparative advantages in the AgroFood research sector in your Region?

- |                                                                                                |                                                      |
|------------------------------------------------------------------------------------------------|------------------------------------------------------|
| <input type="checkbox"/> Public-private cooperation<br>collaboration with firms                | <input type="checkbox"/> Increasing number of        |
| <input type="checkbox"/> Open exchange of experience in research<br>and technology development | <input type="checkbox"/> Strong research base        |
| <input type="checkbox"/> Highly skilled personnel                                              | <input type="checkbox"/> Other, please specify ..... |

G2. Focusing on your own resources (personnel, organizational aspects, financial aspects, etc.), what do you think are your Organization/Department's WEAKNESSES, i.e., absent resources, activities you do not carry out in the proper way?

- |                                                                                                                     |                                                       |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| <input type="checkbox"/> Not enough start ups                                                                       | <input type="checkbox"/> Low size of budget for R&D   |
| <input type="checkbox"/> Poor linkage between firms and research entities                                           |                                                       |
| <input type="checkbox"/> Poor research base<br>between actors                                                       | <input type="checkbox"/> Lack of formal collaboration |
| <input type="checkbox"/> Weak understanding between researchers<br>.....<br>and industry complicates joint projects | <input type="checkbox"/> Other, please specify        |

G3. Now, focusing on aspects outside your control, where do you see OPPORTUNITIES for your Organization/Department, i.e., open up possibilities to capitalise?

- |                                                                               |                                                       |
|-------------------------------------------------------------------------------|-------------------------------------------------------|
| <input type="checkbox"/> Surplus of well educated researchers<br>for research | <input type="checkbox"/> Availability of EU R&D funds |
| <input type="checkbox"/> Networking<br>more/better varieties                  | <input type="checkbox"/> Increasing demand for        |
| <input type="checkbox"/> New R&D European and regional programmes<br>.....    | <input type="checkbox"/> Other, please specify        |

G4. Focusing on aspects outside your control, where do you see THREATS for your Organization/Department, i.e., close off future possibilities?

- |                                                                                                                                          |                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Failure to attract international researchers<br>research                                                        | <input type="checkbox"/> Low awareness or regional                                              |
| <input type="checkbox"/> Brain drain                                                                                                     | capacity                                                                                        |
| <input type="checkbox"/> Funding programmes to support research with<br>new tools, rules,<br>content far from current research interests | <input type="checkbox"/> Need of adaptation to the<br>and priorities                            |
| <input type="checkbox"/> Few incentives for university researchers to<br>engage in collaboration with the industry<br>.....              | <input type="checkbox"/> Bureaucracy barriers<br><input type="checkbox"/> Other, please specify |

## Questionnaire - Annex 1

### Nomenclature for the analysis and comparison of scientific programmes and budgets (NABS)

Code	Description
0206	Water Supply
0304	Protection of ambient water
0305	Protection of soil and groundwater
0400	General research on protection and improvement of human health
0405	Nutrition and food hygiene
0600	General research on agriculture production and technology
0601	Animal products
0602	Fishing and fish-farming
0603	Veterinary medicine
0604	Crops
0605	Forestry and timber production
0606	Food technology
0609	Other research on agricultural production and technology
0700	General research on industrial production and technology
0701	Increasing economic efficiency and competitiveness
0702	Manufacturing and processing techniques
07042	Pharmaceutical products
07052	Manufacture of motor vehicles and parts (including agricultural tractors)
0710	Manufacture of food products and beverages
07063	Software development
1107	Agricultural sciences <i>(to be chosen when more than one option is possible)</i>

For reference: [http://europa.eu.int/estatref/info/sdds/en/gba/gba\\_nabs\\_classification.pdf](http://europa.eu.int/estatref/info/sdds/en/gba/gba_nabs_classification.pdf)

## Questionnaire - Annex 2

### Description of productive sectors - Statistical classification of economic activities in the European Community (NACE)

**0.00 - Manufacture of food products, beverages and tobacco** *(to be chosen when more than one code is relevant)*

**15.00 - Manufacture of food products and beverages**

**15.10 - Production, processing and preserving of meat and meat products**

15.11 - Production and preserving of meat

15.12 - Production and preserving of poultry meat

15.13 - Production of meat and poultry meat products

**15.20 - Processing and preserving of fish and fish products**

**15.30 - Processing and preserving of fruit and vegetables**

15.31 - Processing and preserving of potatoes

15.32 - Manufacture of fruit and vegetable juice

15.33 - Processing and preserving of fruit and vegetables

**15.40 - Manufacture of vegetable and animal oils and fats**

15.41 - Manufacture of crude oils and fats

15.42 - Manufacture of refined oils and fats

15.43 - Manufacture of margarine and similar edible fats

**15.50 - Manufacture of dairy products**

15.51 - Operation of dairies and cheese making

15.52 - Manufacture of ice cream

**15.60 - Manufacture of grain mill products, starches and starch products**

15.61 - Manufacture of grain mill products

15.62 - Manufacture of starches and starch products

**15.70 - Manufacture of prepared animal feeds**

15.71 - Manufacture of prepared feeds for farm animals

15.72 - Manufacture of prepared pet foods

**15.80 - Manufacture of other food products**

15.81 - Manufacture of bread; manufacture of fresh pastry goods and cakes

15.82 - Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes

15.83 - Manufacture of sugar

15.84 - Manufacture of cocoa; chocolate and sugar confectionery

15.85 - Manufacture of macaroni, noodles, couscous and similar farinaceous products

15.86 - Processing of tea and coffee

15.87 - Manufacture of condiments and seasonings

15.88 - Manufacture of homogenized food preparations and dietetic food

15.89 - Manufacture of other food products

**15.90 - Manufacture of beverages**

15.91 - Manufacture of distilled potable alcoholic beverages

15.92 - Production of ethyl alcohol from fermented materials

15.93 - Manufacture of wines

15.94 - Manufacture of cider and other fruit wines

15.95 - Manufacture of other non-distilled fermented beverages

15.96 - Manufacture of beer

15.97 - Manufacture of malt

15.98 - Production of mineral waters and soft drinks

For reference: [http://ec.europa.eu/comm/competition/mergers/cases/index/nace\\_all.html](http://ec.europa.eu/comm/competition/mergers/cases/index/nace_all.html)