



Balkan Agro Food Network

Support the opening of the European Research Area by developing
a sustainable network in agricultural and food sector in the Western Balkan

Agri-food research in the Western Balkan Countries: Current Landscape

FINAL CONSOLIDATED MAPPING REPORT

This publication is part of a project called “Setting up of an agricultural & food research network in the Western Balkan countries”, which has been awarded financial support by the European Commission through Contract no. 026361 under the Sixth Framework Programme for Research, Technological Development and Demonstration Activities (2002 to 2006), and its specific programme ‘Integrating and Strengthening the European Research Area – Specific measures in support of international co-operation’.

Foreword

This ‘mapping report’ is a country-specific synthesis of the statistical information and the survey results available to describe agrifood research in the Western Balkan countries. The main source of information was the web-assisted survey conducted in the BAFN project frame in 2006 and 2007 (www.bafn.eu/research). When relevant, available complementary statistics were also used. The report covers Albania, Bosnia and Herzegovina, the Former Yugoslav Republic of Macedonia (FYROM) and Serbia (including Kosovo), but for comparison, some statistical and survey data of Croatia (from the AgriMapping project report available at www.agrifoodresearch.net) was also provided.

Data collection was not straightforward. The BAFN partners first established a so-called master list (i.e. list of the agrifood research institutions broken down to research groups / organisations in their country). Then questionnaires were translated into the 4 national languages and sent several times to the organisations on the master list. The agrifood research groups were also contacted directly by telephone and direct meetings were organised to help them to complete the questionnaire. Then National Mapping Reports were drafted based on the questionnaires results (www.bafn.eu/mapping_reports). These reports were presented, discussed, modified and approved by national experts at local expert panel meetings during the Summer 2007. Based on the national reports, this document could be written up.

In the case of Serbia the response rate to the BAFN survey surpassed 50% of the more than 190 research groups registered as ‘agrifood research organisation’ by the BAFN project. Altogether, a total of 73 FYROM agrifood research units were identified of which 34 have answered the survey questionnaire. Bosnia and Herzegovina and Albania have only few agrifood research capacities (34 and 26 units). In both countries one third of them answered the survey questionnaire. The response rates provide an acceptable base for most of the statements in this report, which means that no major deviations would be expected if the response rate increased, however, for Albania and Bosnia and Herzegovina the survey results should be considered more as orientating and not as exact figures.

In providing a more general context to the mapping, GKI Economic Research Co. has relied upon the statements in the *Review Documents* prepared by our BAFN project partners (www.bafn.eu/foresight_reports). The editor work done by Rozanna Ploumidou is greatly acknowledged.

Additionally, the editors, Balázs Borsi, Attila Udvardi and Mária Vanicsek would like to express their sincere thanks to Marie Fauchadour, the BAFN project co-ordinator, for her availability to discuss the issues that emerged during the compilation of this report. We are grateful to Boris Angelkov, Olivier Chartier, Zeljka Dukic, Xhulieta Hamiti, Pellumb Harizaj, Jasmina Čakar, Ivan Minkov, Valentina Toneva, Milica Mojasevic, Genc Myftiu, Igor Pandzic, Gordana Popsimonova, Ljubinka Ristic and Miroslav Sekuloski without whom the extensive international survey of agrifood research entities could not have been a reality. We deeply acknowledge the high quality bibliometric analytical work delivered by András Schubert, which provided a European-level insight into the diversity of agrifood research. Last, but not least, Anna Munkácsy and Tamás Tompa must be mentioned for their invaluable technical assistance in processing the data.

CONTENT

Foreword	2
1. Agriculture and agrifood industry	4
1.1. Introducing the BAFN countries	4
1.2. The agrifood industry	5
2. Agrifood research capacities	10
2.1. Institutional structure	10
2.2. Financing agrifood R&D	12
2.3. Human resources	15
2.4. Research infrastructure.....	19
3. Agrifood research performance.....	21
3.1. Innovative and scientific output	21
3.2. Research competence	24
4. Concluding remarks	26
References	28
Annex 1: Agrifood research groups – the BAFN master list by countries	29
Albania	29
Bosnia and Herzegovina	30
Former Yugoslav Republic of Macedonia (FYROM)	31
Serbia.....	33
Annex 2: The BAFN survey questionnaires	35
Questionnaire for registration on www.bafn.eu	35
Questionnaire for the mapping survey	36
Annex 3: Agrifood research activity by research areas	39
Annex 4: Basic BAFN survey results – summary statistics by countries	41

1. Agriculture and agrifood industry

1.1. Introducing the BAFN countries

In the late 1980s, at the beginning of the process of economic transition, **Serbia**, as a federal state of Yugoslavia, was in favourable position. However, after two decades of wars, economic sanctions and mismanaged economic policy, Serbia was given the opportunity to reintegrate into the international community only at the turn of the millennium. Most importantly, the country has started preparing for membership in the European Union.

Bosnia and Herzegovina declared independence of Yugoslavia in 1992. Subsequently a three-year long war followed, which had a dramatic impact on the country's physical infrastructure and economy. Since the Dayton Peace Agreement in late 1995 the production capacity has been mostly restored. Despite existing political, legal and economic problems, Bosnia and Herzegovina is rather slowly but steadily going on the bumpy road to be an EU member country. This is a rational orientation as the EU is Bosnia and Herzegovina's main trading partner, accounting for around 40% of exports and 45% of imports (*Review Document for Bosnia and Herzegovina* [2007]).¹

At independence in September 1991 **FYROM** was the least developed of the Yugoslav republics. Sovereignty also meant the end of transfer payments from the central government and eliminated advantages from inclusion in a de facto free trade area. An absence of infrastructure, UN sanctions on the downsized Yugoslavia, and Greek economic embargo hindered economic growth until the mid-1990s. FYROM has maintained macroeconomic stability with low inflation, but it has lagged the region in attracting foreign investment, and job growth has been anaemic. FYROM has an extensive grey market, estimated to be more than 20 percent of GDP (for more details see the *CIA World Factbook*).

Albania is one of the poorest European countries. Between 1990 and 1992 Albania ended 46 years of a closed communist regime and established a multiparty democracy. Overall, the transition period is considered to be a success, but Albanian governments still have to deal with the underground economy. The government has drafted a new anti-corruption strategy for 2007-2013. A strategy covering an extended period shows a positive change in approach from short-term solutions to more effective and sustainable measures. Albania has made good progress in implementing the GRECO (Council of Europe Group of States against Corruption) 2002 recommendations. Although it has been improving considerably, but energy shortages and inadequate infrastructure contribute to Albania's poor business environment, which make it difficult to attract and sustain foreign investment. On the positive side, growth was strong in 2003-06 and inflation is low and stable. In the long term, Albania would like to become an EU member country (for more details see the *CIA World Factbook and the European Commission, Progress Report* [2007]).

The **per capita GDP** amongst the BAFN countries reaches the highest level in Serbia (today about 3000 euros), while lower in FYROM (2300), Bosnia and Herzegovina (2200) and in Albania (2100). The **unemployment is above 30% in Macedonia**, slightly below 30% in Bosnia and Herzegovina, 22% in Serbia, while 14% in Albania.

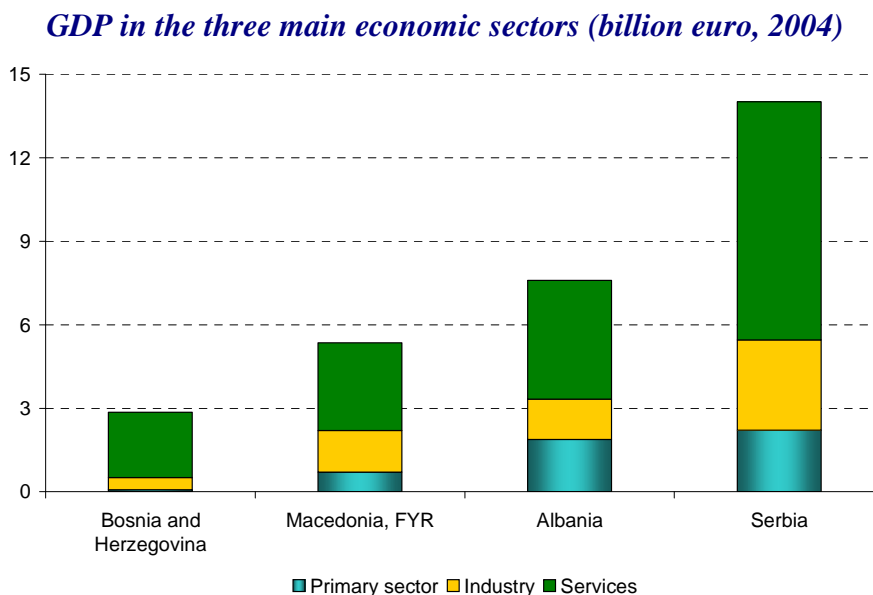
¹ The Review Documents are also the results of the BAFN project.

In Serbia the foreign **trade deficit** is deeply in the red, except for the agrifood sector. Namely, in 2007 the export/import trade balance thanks to agricultural commodities has been in favour of the agrifood sector (<http://poljoprivreda.info>). The public debt is substantial (53% of GDP). At the same time, economic reforms are tedious, substantially lagging behind due to political instability in the country. In Albania external debt is about 16% of GDP. The economy is bolstered by annual remittances from abroad of US\$ 600-800 million, mostly from Albanians residing in Greece and Italy; this helps offset the towering trade deficit (*CIA World Factbook*). Bosnia and Herzegovina has high foreign deficit, causing most of the current account deficit. Economic prospects are not necessarily great as the substantial international aid to the country is likely to decrease in the future and re-vitalising the overstuffed and outdated industrial structure is quite a challenge. In FYROM the **public debt** is substantial (42% of GDP).

1.2. The agrifood industry

The service-sector accounts for 42-60%, industry for 24-47% and **agriculture for 11-21%** (highest in Albania) **of the GDP** in the BAFN countries. **In Serbia**, within the manufacturing industry, the food industry gives one-fifth of value added. More than 700 thousand people work in agriculture, and about 100 thousand in the food industry. **Albania** has a traditionally agricultural society. Agriculture is the principal income source for rural households (54% of the population) accounting for 60% of the employment. The food industry has high significance (for more details see also the *Review Document for Albania [2007]*²). For **Bosnia and Herzegovina**, no data on employment in agriculture was available. The food industry seems to have low significance. Nevertheless, as the *Review Document for Bosnia and Herzegovina [2007]*³ notes, development of the manufacturing industry (equipment or machine parts for primary agriculture production and agrifood industry) is one of the strategic goals, but it requires reorientation of manufacture in existing companies or investments in new factories. In FYROM within the manufacturing industry, the food industry gives 32% of value added. More than 180 thousand people work in agriculture (22% of the employment).

Fig.1



Source: WDI 2006 Database

In Serbia investments in agriculture are low. The export of agricultural products is about 100 million Euro and that of food industry is about 550 million Euro per annum, substantially lower

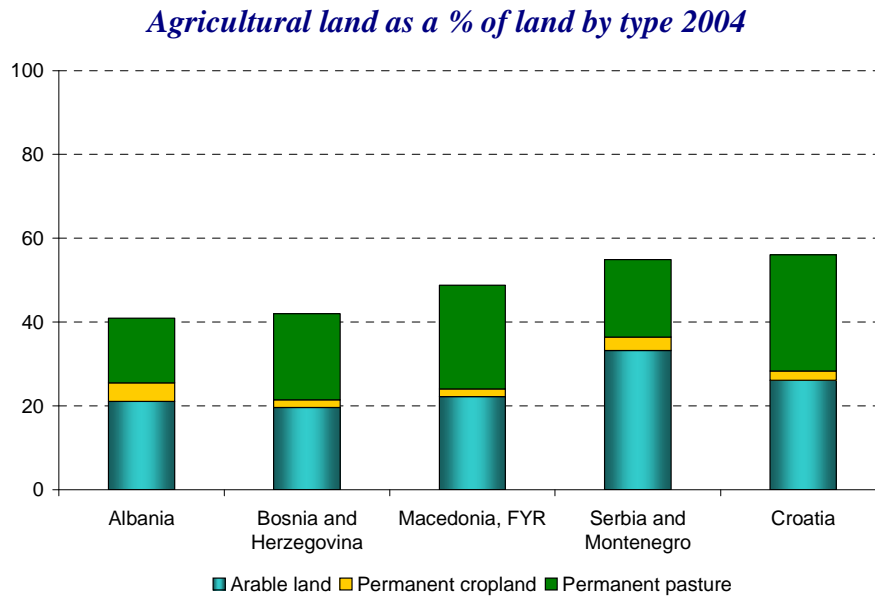
² Available at www.bafn.eu/foresight_reports.

³ Availbale at www.bafn.eu/foresight_reports.

than the country's potential. There are many (more than 700 thousand) smallholders of agricultural households.⁴

The natural conditions are favourable for agriculture. On two thirds of the agricultural land the growing period lasts over 200 days and precipitation is mostly adequate. **About 55% of the land is used as agricultural land.** Most of the agricultural land is arable land (60,6 %), about one third is permanent pasture, the rest (5,8 %) is permanent cropland (in 2003, see the WDI 2006 database for Serbia and Montenegro).

Fig.2



Migration over the last 50 years has been extensive from mountains towards lowlands and cities, which has caused a **reduction of livestock numbers**. There has been a dramatic decrease in cattle and sheep numbers, especially in zones where grasslands are dominant. Today there are vast areas without people or livestock, and grasslands, which are completely neglected. Despite rural depopulation the number of agricultural landowners is increasing because of the law of inheritance.

The technology in agriculture is rather poor. Much produce, especially vegetables, is sold on green markets in small quantities, and livestock individually. On new farms the number of dairy cows is now 10-50 (in contrast with the 1-3 average not long ago), but the number of such farms is low.

The size of agricultural holdings is not increasing, but producers with better equipment are renting uncultivated land. In Vojvodina, where land is cheap compared to Central Serbia and Kosovo, farms are considerably larger - several hundred hectares and more.

In 2005, export of agricultural products was 1020 million US\$ mainly to Germany, Italy and Switzerland, and import was 892 million US\$ mostly from Germany, Italy and the Netherlands.

Prior to the introduction of sanctions in 1992 Serbia was a **traditional exporter of fat cattle and beef meat** to many countries, especially Germany, Italy and Greece. Cattle numbers in Serbia are

⁴ According to the census of 2002, agricultural household is defined as a holding with at least 0.1 hectare of cultivable land being used at the time of census, or an household with up to 0.1 hectare of cultivable land being used at the time of census, and in minimum possession of: a) a cow and calf or a cow and heifer, or b) a cow and two fully grown heads of small livestock, or c) 5 fully grown sheep, or d) 3 fully grown pigs, or e) 4 fully grown heads of sheep and pigs together, or f) 50 heads of fully grown poultry, or g) 20 beehives

decreasing, as in most of countries, but with increasing productivity per head. Currently sheep rearing in Serbia is unsatisfactory; transition in agriculture also affected the sheep industry. Total numbers are falling, especially in the public sector; but the number of private sheep farms and the size of their flocks are increasing.

Although **Albanian agriculture lacks modern equipment**, as a result of land privatisation the sector has experienced high growth rates in the last years. The total number of farms is decreasing, yet the prevalence of **small, inefficient plots of land** is an obstacle in the long run. The *Review Document for Albania* [2007] also emphasises that poverty is higher in rural areas, and **migration towards urban areas** have given birth to new problems. Additionally, animal husbandry suffers from the shortage of fodder.

Agricultural production is predominantly for family consumption. Though Albania is a typical agricultural country, since the change of the regime it has become a **net importer of agrifood products**. The export of agricultural products is about US\$ 67 million of which food products account for 38 million Euro per annum, the import is about seven times higher (WTO statistics for 2005).

The natural conditions are not bad for agriculture, although the general landscape is mountainous. The area surrounding Albania has relatively abundant fresh water resources. Seven main rivers run from East to West and there are substantial water storage capacities as well as potential to develop the fisheries sector. **About 41% of the land is used as agricultural land**. More than half (51%) of the agricultural land is arable land, about 38% is permanent pasture, the rest (11%) is permanent cropland (in 2003, see the WDI 2006 database for Albania). The *Review Document for Albania* [2007] notes that **the average agricultural land per capita is the smallest in Europe**.

In addition to what was mentioned above, the *Review Document for Albania* [2007] identifies a **number of problem areas** that affect agricultural development in Albania. The most important ones are:

- uncertainties regarding land ownership;
- partial rehabilitation of the irrigation system;
- high prices of inputs and disorganized and inefficient systems of production and delivery;
- low level of crediting activities in the agricultural and food sector;
- poor transport infrastructure;
- high cost of agricultural machinery;
- electricity and the other uncertain energy sources (although the electricity situation is improving rapidly);
- underdeveloped, but improving marketing and market information;
- underdeveloped, but improving agro-processing industry.

We can state that Albania has serious problems to cope with in its agriculture and agrifood industry **before attention can be paid to agrifood or any scientific research** as understood generally in the developed world. This is also evident by the number of policy documents developed with international aid. “Albanian agriculture is at a stage when growing and qualitative changes are occurring, but it needs to be oriented and supported in harmony with the whole social and economic development process.” (quoted from the *Review Document for Albania* [2007]).

Bosnia and Herzegovina is traditionally a net importer of agrifood products although the EU allows more than 95% of its imports (including agricultural produce) to enter the EU duty-and-quota free. Exported goods are base metals, wood and wood products, mineral products and chemicals, while imports mainly include machinery, mineral products, foodstuffs and chemicals (see the *Review Document for Bosnia and Herzegovina* [2007]). The export of agricultural products is about US\$ 370 million and that of food industry is about US\$ 140 million per annum

(WTO statistics for 2005). Although agriculture is almost all in private hands, farms are small and not very efficient.

The natural conditions are not favourable for agriculture, the general landscape is mountainous and relatively dry. In Bosnia and Herzegovina **about 42% of the land is used as agricultural land**. Most of the agricultural land is permanent pasture (49%), about 47% is arable land, the rest (4%) is permanent cropland (in 2003, see the WDI 2006 database for Bosnia and Herzegovina).

During the disintegration of Yugoslavia, civil fighting in the major agricultural areas **often interrupted harvests** and caused considerable loss of field crops. The 2005 harvest showed already the signs of recovery. The livestock population also fell significantly during the 1990s. Production of meat fell from 158,000 tons in 1990 to about 100,000 tons in 1993 to 24,000 tons in 1999.

FYROM is a **net food importer** (especially wheat is imported), but the country has the potential to be self-sufficient from agrifood products. The urban population relies heavily on imported food products, while the rural population covers the majority of its food needs from its own production. **Tobacco** is the most important agricultural product (mostly for export).

With the mountainous landscape the natural conditions greatly vary within the country and are not always favourable for agriculture. The **availability of water is a problem** for about 40% of the arable land. At the same time unexpected rainfalls cause erosion and local floods. **About 48% of the land is used as agricultural land**. Most of the agricultural land is permanent pasture (51%), and arable land (45%) the rest (4%) is permanent cropland (in 2003, see the WDI 2006 database for FYROM).

Table 1

Agrifood industry performance indicators

<i>Serbia and Montenegro</i> ⁵	1990	1995	2004
Agriculture value added per workers in agriculture (constant 2000 US\$)	n.a.	1 695*	1 424**
Agriculture value added per sq. km of agricultural land (current US\$)	n.a.	35 272***	64 090
Export of agricultural products (% share of world trade)	0,1	0,1	0,1
Export of food products (% share of world trade)	0,1	0,1	0,1
Food export per agricultural worker (current 1000 US\$)	n.a.	1,9	5,7
Food import per population (current US\$)	n.a.	33	90
<i>Albania</i>	1990	1995	2004
Agriculture value added per workers in agriculture (constant 2000 US\$)	823	1 167	1 492*
Agriculture value added per sq. km of agricultural land (current US\$)	67 306	119 948	144 797
Export of agricultural products (% share of world trade)	n.a.	0,01	0,01
Export of food products (% share of world trade)	n.a.	0,01	0,01
Food export per agricultural worker (current 1000 US\$)	n.a.	0	0,5
Food import per population (current US\$)	n.a.	88	148
<i>Bosnia and Herzegovina</i>	1990	1995	2004
Agriculture value added per workers in agriculture (constant 2000 US\$)	2 951*	2 751	5 671**
Agriculture value added per sq. km of agricultural land (current US\$)	20 466	17 765	37 508
Export of agricultural products (% share of world trade)	n.a.	n.a.	0,04
Export of food products (% share of world trade)	n.a.	n.a.	0,02
Food export per agricultural worker (current 1000 US\$)	n.a.	1,1	1,1
Food import per population (current US\$)	n.a.	358	314
<i>FYROM</i>	1990	1995	2004
Agriculture value added per workers in agriculture (constant 2000 US\$)	2 257*	2 280	3 177**
Agriculture value added per sq. km of agricultural land (current US\$)	25 752	38 586	48 318
Export of agricultural products (% share of world trade)	n.a.	0,05	0,04
Export of food products (% share of world trade)	n.a.	0,05	0,05

⁵ In the BAFN project only the case of Serbia is presented (and Montenegro is excluded). However the independence of Montenegro is too recent to be able to find data/statistics only for Serbia.

Food export per agricultural worker (current 1000 US\$)	n.a.	1,2	1,8
Food import per population (current US\$)	n.a.	152	202

Source: WDI 2006 database, *1992, WTO statistics, **2003

Agricultural land is fragmented and there are many smallholders of agricultural households. **Investments and the technological levels in agriculture are low**, the statistical information system for agriculture is largely missing for the moment and being built with foreign assistance. Individual farmers own or rent approximately 80% of all arable land, most of the pastureland is owned by the state and managed by public enterprises (for more details see the *Review Document for FYROM* [2007]⁶).

Livestock numbers have stabilised and are growing steadily. Cattle numbers have increased slightly since 1992. About 50% of cattle are for the dairy sector. There are about 30 state farms with 250–1200 cows in the Skopje and Bitola areas. Over 90% of cattle, however, are in private hands, with most farmers rarely having more than three cows because of limited land. The goat sector is rapidly growing (the raising of goats was prohibited during the socialist era in order to protect forestry resources).

Table 2

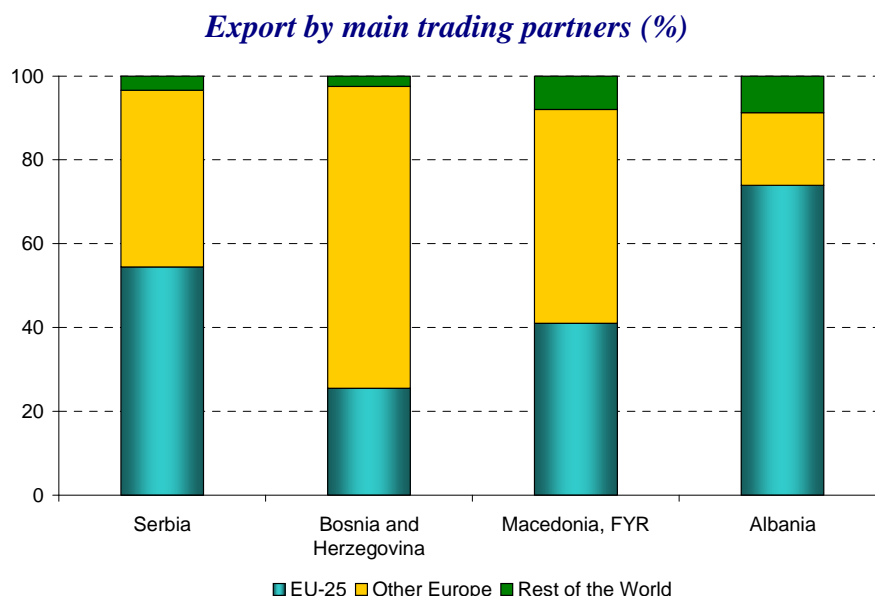
The most important agrifood export products

<i>Serbia</i>	<i>Albania</i>	<i>Bosnia and Herzegovina</i>	<i>FYROM</i>
berry fruit (packed under Western European labels – Serbia grows about one-third of the world's raspberries and is a leading frozen fruit exporter); cereals; meat products; edible oils; processed food.	tinned fish; medicinal plants; mineral water; unprocessed tobacco; raw leather; fish; tinned vegetables	meat and meat preparations; fresh river fish, smoked and dried fish meat; milk and dairy products (UHT milk, cheese, spread cream) fruit and vegetable; sugar and products (highly laevulose syrup, honey); fruit tea; dried tobacco.	tobacco (raw and processed); wine; fruit and vegetables; tomato; potato; freshwater fish; sheep and goat meat; milk and dairy products.

Source: the *Review Documents* [2007]

In case of Serbia and FYROM the Former Yugoslav Republics are the largest export markets. Agricultural commodities account for a significant proportion (16-17 %) of total Serbian exports. Much of Serbia's recent trade with Russia and Romania has involved the exchange (barter trade) of wheat and maize for energy and fertilizer. A wide range of food and agricultural products is imported, with the EU as the largest source of imports (for further details see also the *Review Document for Serbia* [2007]). In the case of **Albania** the most important agrifood export markets are in **high correlation with the number of ethnic Albanians**, and in **Bosnia and Herzegovina** it is **in correlation with the number of emigrants** from the country.

⁶ Available at www.bafn.eu/foresight_reports.



Source: *Review documents* [2007]

2. Agrifood research capacities

2.1. Institutional structure

In Serbia, FYROM, Albania and Bosnia and Herzegovina **no private business was identified** as an organisation that conducts agrifood research. In the BAFN countries probably there are some companies, which undertake such research activities, but the fact that they are presumably few in number as compared with state-owned institutions (including higher education units) contrasts global agrifood research trends in the developed countries.

Albania's first university was set up in 1957 and the other universities were established in 1992-1993 (*Review Document for Albania* [2007]). This implies that the institutional system for R&D is not a mature one and it is the case for agrifood research as well.

Today the Ministry of Agriculture, Food and Consumer Protection has under its authority seven Institutes and four Experimental Stations. These organizations are fairly small; institutes mostly employ 6-15 graduate research staff, 3-6 administrative staff, and 10-20 support staff (excluding staff engaged in production of goods or services). Experimental Stations have fewer employees. The Institutes are: Fruit-Trees Institute; Vegetable Institute; Arable Crops Institute; Livestock Institute; Plant Protection Institute; Maize Institute; Soil Research Institute; Institute of Food Security and Veterinary. The Institute of Plant Protection and the Gene Bank are under the authority of Agricultural University of Tirana. Nevertheless, a reorganization process is also going on. The idea is to have fundamental research under the authority of the Agricultural Universities and to develop a network of five Agricultural Technology Transfer Centres, each covering a major agricultural region (Fushe-Kruja, Lushnja, Vlora, Korca and Shkodra). Each centre should take national responsibility for applied research in certain commodities or topics, as appropriate, and contain a limited number of qualified researchers plus support staff. For more details, please consult the *Review Document for Albania* [2007].

In FYROM there are five higher education institutions in the country in the area of agriculture: the Faculty of Agricultural Science and Food, the Faculty of Veterinary Health, the Faculty of Medicine, the Faculty of Biotechnological Sciences and the Faculty of Forestry. In addition, there are five public research institutions: the Institute of Agriculture, the Institute of Livestock Breeding, the Institute of Tobacco in Prilep, the Institute of Southern Crops in Strumica and the Veterinary Institute, the Institute of Hydrobiological Sciences. The Institute of Agriculture carries out its research in the field of plant production on about 360 hectares of arable land. The largest portion of its work is seeds and seedlings production and sale. The Institute of Tobacco is one of the best equipped and the most powerful research institutions (for more details see the *Review Document for FYROM* [2007]).

In Serbia the BAFN Survey questionnaire was responded by 44% of the university and higher education research groups and **75% of the research groups from public research institutes**. In FYROM the response rate was 35% for universities and higher education research units, and **88% for the public research organisations**. One of the not classified institutions have also answered the questionnaire. In Albania and Bosnia and Herzegovina the response rate was poorer and covered mostly the higher education units. In Croatia the questionnaire was responded by half of the universities and public research institutes.⁷

Table 3

Number of agrifood research groups* identified and response rate to the BAFN survey in March 2008

	University / higher education research groups	Research groups in public research institutes	Private non-profit research groups	Business enterprise research	Other	Total
Albania	14 (64%)	12 (0%)	0	0	0	26 (35%)
FYROM	52 (35%)	17 (88%)	1 (0%)	0	3 (33%)	73 (47%)
Bosnia-Herzegovina	26 (46%)	8 (13%)	0	0	0	34 (38%)
Serbia**	118 (44%)	73 (75%)	1 (100%)	0	0	192 (56%)
Croatia	75 (52%)	54 (50%)	0	1 (100%)	1 (100%)	131 (52%)
Total	282 (46%)	160 (58%)	2 (50%)	1 (100%)	4 (43%)	456 (47%)

* The smallest possible and meaningful unit was used, based on the so-called master list compiled by the BAFN partners

** Figures include Kosovo. When the BAFN project started, Kosovo did not declare its independence.

Source: BAFN Survey, March 2008

As the table above indicates the agri-food research community is small: in the four Western Balkan Countries covered by the study, it is estimated that there are 47 research entities (mother organisations, see the Annex) involved in agri-food research including 17 universities. These are scattered into 325 research groups.

Scientific Research in Albania is regulated by two laws, respectively the law Nr.7893 of year 1994 about "Science and technological development" and the recently approved law on "The Higher Education" Nr.9741 of the year 2007. Additionally there are several bylaws and governmental normative acts controlling the field. The principle trend of the scientific research reform consists in the creation of a unique and integral education and research system in Albania. This implies the revision of the status of the existing research institutes under the administration of several ministries and the Academy of Science, as well as their transformation and integration within the University of Tirana, the Polytechnic University of Tirana and the University of Agriculture of Tirana. In the field of the Agricultural Research this implies that several public research institutes such as the Institute of Fisheries, the Institute of Plant Protection, the Institute of Arboriculture are now part of the University of Agriculture of Tirana and can not be considered as public research institutes, but as university research institutes instead.

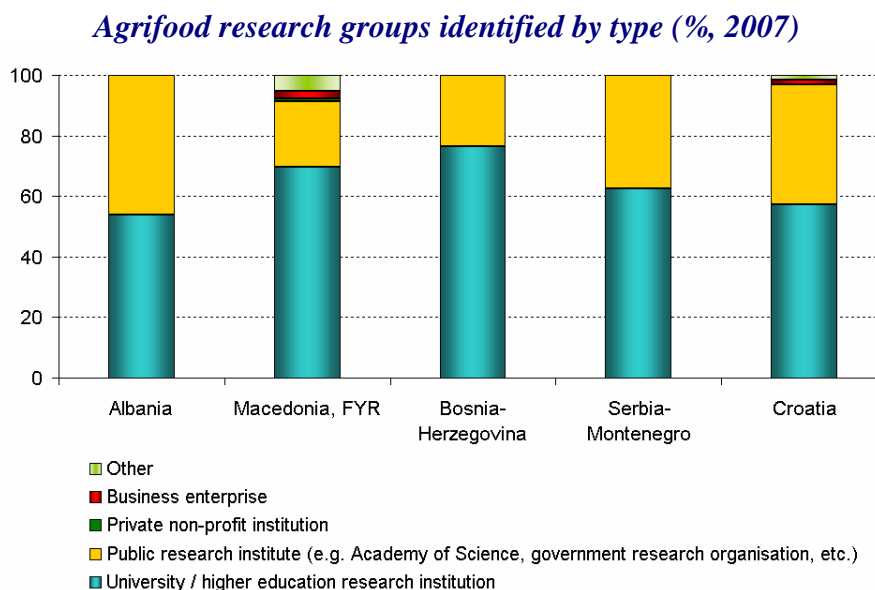
Some former institutions have been dissolved and have given rise to several technology transfer centres which do still reside under the administrative control of the Ministry of Food, Agriculture and the Consumer Protection. These centres can no longer benefit from state funds for research and development which are allocated annually under a competitive basis to Universities upon application. Although the technology transfer centres pertaining to the Ministry of Agriculture can not be funded by the state budget on science and research, they are financed by funds allocated for agricultural services and extensions. According to some provisions of the law Nr.7893 of year 1994 technology transfer can be considered as part of the applied research and therefore although as not treated as such, those centers might be considered as involved in the agricultural research activities of the country.

The null response rate, reported in the questionnaires distributed to the public research institutions of Agriculture in Albania might be related to their not yet well defined status in the research area following the reform. (This short overview of the situation as of March 2008 was written by *Edmond Panariti*).

⁷ For Croatia the survey was carried out in the frame of the AgriMapping project (www.agrifoodresearch.net).

The majority of agrifood research groups in the BAFN countries is found in a higher education research unit, many of them are small (1-3 employees). The detailed lists of organisations by countries can be seen in the Annex .

Fig.4



Source: BAFN Survey, March 2008

In Serbia the number of agrifood research groups / units totals to 192, of which 61% (118) is part of a university or a higher education institution, 38% is of a public research institute (e.g. Academy of Science, government research organisation, etc.), while there is one private non-profit research group. FYROM has the second largest agrifood research capacity (if Croatia, where there are 131 agrifood research units, is not taken into account). Of the 73 FYROM units 71% (52) is a university or a higher education institution, 23% (17) is a public research institute. In Bosnia and Herzegovina the number of agrifood research groups totals 34, of which 76% (26) is a university or a higher education institution and the remaining 24% is public research institute. Albania has 26 agrifood research groups, of which 54% (14) is a university or a higher education institution and the remaining 46% (12) is public institute.

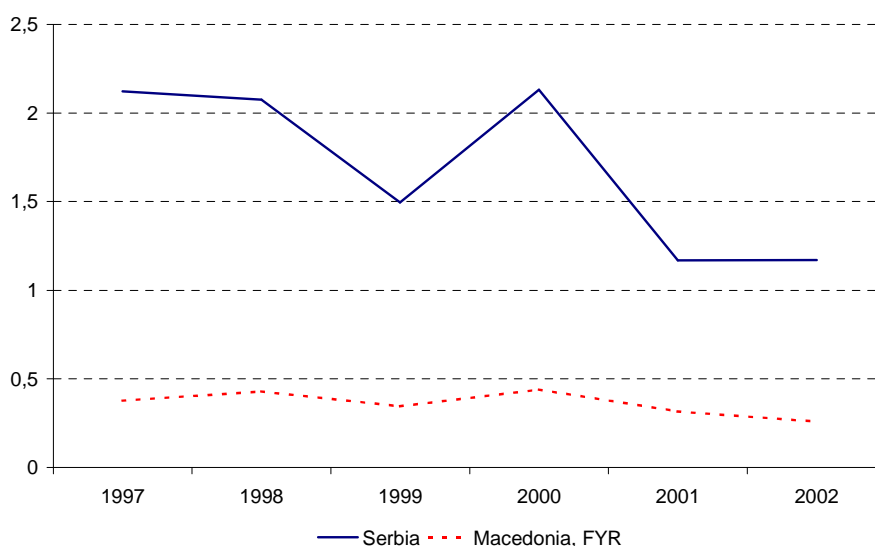
2.2. Financing agrifood R&D

Due to the economic difficulties, the expenditure on research and development as a per cent in GDP has fallen significantly since 1997, to its half in Serbia and by 30% in FYROM. The *Review Document for Serbia* [2007] notes that public expenditure on R&D rose from 0,1% of GDP (2000), to 0,32% (2003) in Serbia, and remained at the same level in 2004.⁸

In FYROM the budget allocated to agricultural research in 2005 amounted to about 0,4 percent of the GDP of agriculture, which means that **agrifood research is in a relatively better position** than other S&T areas. Nevertheless, the expenditure on agricultural research and education has reduced over the period from 2003 to 2005.

⁸ For the other BAFN countries (Albania and Bosnia and Herzegovina) no data was available.

Gross Domestic Expenditure on R&D as a % of GDP



Source: UNESCO

The *Review Documents* [2007] identified the following key S&T policy trends:

Serbia

Following political changes in late 2000, steps have been taken to increase R&D spending.

The Ministry for Science, Technology and Development was changed into the Ministry of Science in 2007. The Law on Scientific Research was adopted in 2005.

The much contested 1998 Law on University abolished university autonomy, and a new Law was prepared in 2002, which has been revised several times. Eventually, the Law on High Education of the Serbian Universities was adopted in 2005.

Albania

Agrifood research policy is part of the national agriculture policy (has small weight and lacks financial resources, though).

Increase of the productivity and competitiveness of the agrifood sector and integration into EU and regional markets are medium-term policy goals.

The Albanian Academy of Sciences focuses on 6 priority areas, these are: Albanology; natural resources; ICT systems; biotechnology and biodiversity; agriculture and food; and geology, mineral extraction and elaboration.

There is a debate about funding the Agricultural University on a programme / project basis.

Bosnia and Herzegovina

At government level, only the Republic of Srpska could tell to have allocated direct funding for agrifood R&D.

Indirect policies could be the investment tax credits, business awards, access to infrastructures, encouragement for participation in brokerage events or trade fairs etc.

Gradual integration into the European Research Area (ERA), and inclusion into the European Investment Bank's Innovation 2000 Initiative ought to prove useful.

The Instrument for Pre-Accession Assistance (IPA) during the period 2007-2013 shall partly support S&T infrastructure and related activities.

FYROM

There is still a sharp need for a unified research and education policy, which does not exist in FYROM.

Government research spending has shifted towards clients' needs.

Establishing better market economy conditions also for R&D should be more targeted.

The trends above show that **R&D spending is in a transition phase** in the surveyed countries. According to the agrifood research groups, which took part in the BAFN survey, **government spending is the most important source of financing agrifood R&D in the BAFN countries**. In Bosnia and Herzegovina and also in Albania funds from abroad are important sources.

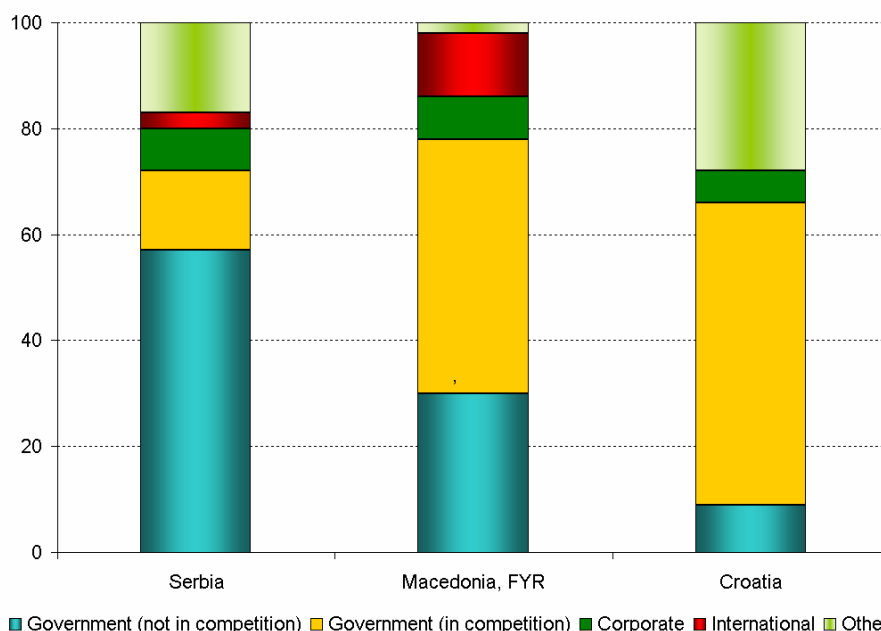
In **Serbia and FYROM** only 8% of the agrifood research groups reported that industry (corporate) financing is decisive in their annual research budgets. Since half of the Serbian GDP is still produced by the public sector, we can state that the agrifood research is very much government-influenced in the country.

In FYROM the government agrifood research is funded mostly by the Ministry of Education and Science and to a smaller extent by the Ministry of Agriculture, Forestry and Water Economy. Between the ministries there is some coordination of the agrifood research spending. Most of the publicly funded institutions have to compete for funding and foreign resources are observable.

The *Review Document for FYROM* [2007] provides some explanation for the interesting funding structure. For **public higher education units**, the government provides funding only for the salaries (20%), the rest comes from project funding often organised on a competitive bidding procedure. Since such funding is hectic, the research staff has started to offer fee-based services such as seeds sale, agriculture information services and advice to farmers on fertilizer regimes. For **public research institutions**, most of the funding is part of the annual government budget, but they can also compete for additional international and government funding.

Fig.6

Distribution of agrifood research groups by main financing source of the annual research budget 2003-2005



Remarks:

1. Government financing: projects won after competitive bidding procedures – so that the organisation can actually lose the funding targeted at the end of the procedure – count as source on a competitive basis. If the organisation participates in a money-allocation mechanism so that the money cannot be lost (but e.g. 'only' reduced), it counts as source on a non-competitive basis of research funding even if the procedure itself is called 'competitive bidding'.
2. Other sources: foundations, non-profit organisations, etc.

Source: BAFN Survey, March 2008

In **Albania** the main institution responsible for R&D is the Ministry of Education and Science, but a **reorganisation is under way** with the creation of a unique National Centre for R&D and the introduction of standards on research indicators following OECD guidelines, together with well-defined procedures for financing and accreditation of Universities (Science, Technology and Economic Development in South Eastern Europe, UNESCO, quoted by the *Review Document for Albania* [2007]). Not surprisingly, at the time of this report writing, **there are no official R&D statistics available**.

The state of economic development assumes low research spending in general and **very low agrifood R&D** spending in particular. The *Review Document for Albania* [2007] mentions that the main national funding opportunity is the state budget. The program “Agriculture and Food” has a 2 million euro annual budget. Its main beneficiaries are farmers and agro-businesses; policy makers; the NGO-sector and students of Agricultural University. The target areas of the program are plant breeding, technology improvement, environmental protection, food safety, sustainable resource management and organic agriculture.

The *Review Document for Albania* [2007] identified a number of international initiatives and programmes that could help Albanian agrifood research. However, they mean only potential and **thus far no account of significant assistance** to Albanian agrifood research can be given. Bilateral cooperation is more successful and Albania is or was collaborating with Belgium, Croatia, France, Germany, Greece, Italy and Spain.

The *Review Document for Albania* [2007] notes that investments for laboratory equipments and staff training with foreign and own government support could take place. The private sector does not provide funds to the Research/Technological Institutions and/or Universities for research. There is a traditional lack of university-industry relationships, so some measures have been taken by the Albanian government in 1997 to stimulate cooperation with the private sector. Albanian **institutions can keep 90% of the income from work for third parties**, of which 60% can be used as a salary supplement for their employees (Science, Technology and Economic Development in South Eastern Europe, UNESCO, quoted by the *Review Document* [2007]).

In **Bosnia and Herzegovina** specific **S&T and related institutions have not been set up** or are still not functional. The Federation of Bosnia and Herzegovina, the Republic of Srpska and the self-governing district of Brčko have their own governments, and the cantons within the Federation also have powerful local governments with a strong influence on the S&T sector (Science and Technology Country Report – Bosnia and Herzegovina, see-science.eu, 2007 quoted by the *Review Document for Bosnia and Herzegovina* [2007]).

There are no official R&D statistics in Bosnia and Herzegovina either. The government dominates R&D spending, which is estimated to be very low: around 0.05-0.15% of the GDP (2001 data, quoted by the *Review Document for Bosnia and Herzegovina* [2007]). Due to limited R&D funds, it is reported that universities have become purely educational institutions. We should note that most of the agrifood research units are universities.

2.3. Human resources

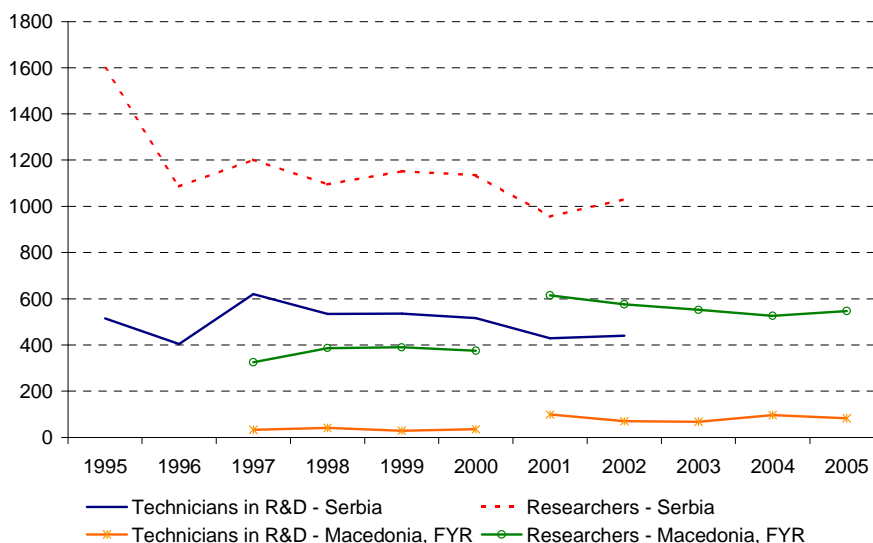
Over the last fifteen years, there have been two processes directly affecting the R&D sector: the massive and continuous ‘**brain-drain**’, frequently of top experts who emigrated to seek employment opportunities abroad; and the so-called ‘**brain-waste**’, where specialists leave their professions for better paid jobs in the private and/or informal sector of the economy. Both phenomena have had profound implications for the human capital of BAFN countries’. (Uvalic, UNESCO quoted by the *Review Documents* [2007])

According to the national statistics of **Serbia**, the total number of researchers after 1994 has been more or less constant, in 2000 giving a total of 12611 researchers, a slight increase with respect to 1994. The numbers do not coincide with international sources that refer a more substantial increase in the number of scientists and engineers in R&D in FR Yugoslavia (possibly a subcategory of the above) during the 1995-2000 period: from 1598,1 (per million people) in 1995, to 2389,3 in 2000. (Uvalic, UNESCO quoted by the *Review Document for Serbia* [2007]).

By March 2008, 108 agrifood research groups (59% of the total) have answered the BAFN questionnaire, reporting 1413 researchers on a Full Time Equivalent (FTE) basis. Therefore, **the number of researchers in the Serbian agrifood sector is estimated at 2300-2400.**

Fig.7

Researchers and technicians per million people



Source: WDI 2006 database

Over the last ten years, the University of Tirana lost some 40% of its academic staff, of which 90% were under 40 years old (see Popa, Eftimi and Fuga, 2002, quoted by the Review Document for Albania [2007]). Currently, Albanian universities and research institutes are in a critical situation because of lack of human resources. By March 2008, the 9 respondent agrifood research groups (35% of the total) reported 103 researchers on a Full Time Equivalent (FTE) basis. Therefore, the number of researchers in the Albanian agrifood sector is estimated at around 300. This estimate almost the same as the numbers in the Review Document for Albania [2007]:

Table 4

Total number of researchers in the Albanian agrifood sector as estimated for 2006

	Research Institutes & Ministry of Agriculture	Agricultural University	Total
Agriculture and Veterinary Science	77	85	162
Food Science & Technology	10	19	29
Natural Resources Management & Agricultural Engineering	28	15	43
Rural Economics & Development	10	50	60
TOTAL	125	169	294

Source: Review Document for Albania [2007]

In Bosnia and Herzegovina the four-year war destroyed the country's productive and technological base and led to significant brain drain, especially of young people.⁹ By March 2008, the 13 respondent agrifood research groups (38% of the total) reported 143 researchers on a Full Time Equivalent (FTE) basis.

⁹ A sample covering one third of staff capacity (technical sciences) found that 79% of research engineers, 81% of holders of Masters Degree in science, and 75% of holders of PhDs in science had left the country. After the war, by December 1998, some 25,200 students had returned home, but this figure represented only 7% of the total number of students (for references see the *Review Document for Bosnia and Herzegovina* [2007]).

Therefore, **the number of researchers in the Bosnia and Herzegovina agrifood sector is estimated at 350-400**. This estimate is in line with the Review Document for Bosnia and Herzegovina [2007] quote:

Table 5

Total number of researchers in the Bosnia and Herzegovina agrifood sector as estimated for 2006

Agriculture and Veterinary Science	150
Food Science & Technology	129
Natural Resources Management & Agricultural Engineering	25
Rural Economics & Development	10
TOTAL	314

Source: *Review Document for Bosnia and Herzegovina* [2007]

According to the latest 2005 UNESCO statistics, the total number of **FYROM** researchers is around 2500 (headcount) and about 1100 on a Full Time Equivalent (FTE) basis.

By February 2008, 40 agrifood research groups (35% of the total) have answered the BAFN questionnaire, reporting 358 researchers on a Full Time Equivalent (FTE) basis. This is already more than the 314 in the *Review Document for FYROM* [2007].¹⁰ Our estimate for **the number of agrifood researchers is 500-550, but with high uncertainty**. This means that in comparison with the UNESCO statistics, more than half of the FYROM researchers work in the agrifood sector.

In Serbia, FYROM, Bosnia and Herzegovina and in Croatia **the vast majority of the research organisations employ less than 15 employees**; in Albania all of the surveyed agrifood research groups less than 30 (half of them has less than 15 employees). In Serbia 16% of the respondents have between 16 and 50 employees, in FYROM 24%, while in Serbia 9% employs more than 50 people, in FYROM 8%. In Bosnia and Herzegovina only one of the respondents has 21 employees (Laboratory for Plant Biotechnology, Sarajevo), and one employs 93 people (Institute of Technology of Agricultural and Food Products, Sarajevo).

Fig.8

Research groups by size categories (% respondents only, 2005)



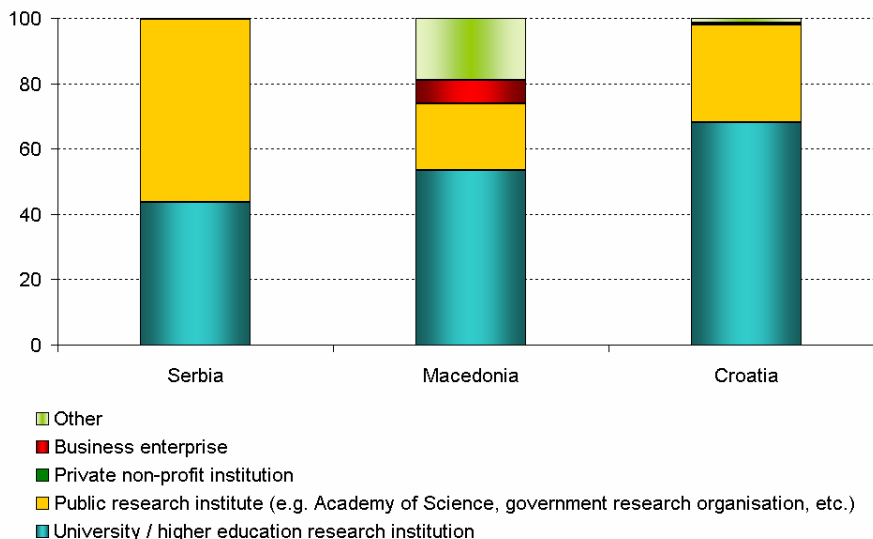
Source: BAFN Survey, March 2008

¹⁰ The 313 researchers were probably indicated for public institutes only (and not higher education units).

In Serbia 44% of the employees work in higher education institutions, 56% in public research institutes. In FYROM 53% of the employees work in higher education institutions, 20% in public research institutes, 7% in business enterprises and 19% in other (not specified) institutions. In Croatia 68% work in higher education institutions, 30% in public research institutes.

Fig.9

Number of employees (2005, FTE) by organisation type (% respondents only)

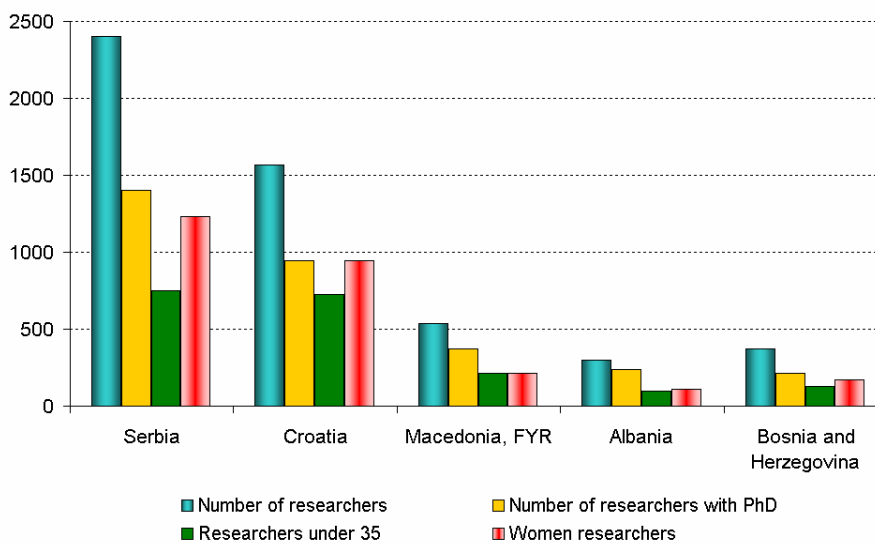


Source: BAFN Survey, March 2008

In Albania 79% of the agrifood researchers have a Ph.D. degree or higher, while 69% in FYROM, 60% in Croatia, 58% in Serbia and 57% in Bosnia and Herzegovina. The proportion of researchers under 35 is the highest in Croatia (46%) and in FYROM (39%), while it reaches about one third of the total researchers in the remaining three countries. The proportion of women researchers reaches the highest level in Croatia (60%), lower in Serbia (51%) and in Bosnia and Herzegovina (46%), while it is under 40% in FYROM and in Albania.

Fig.10

Estimated number of agrifood researchers (FTE) in the public sector 2005



Source: BAFN Survey, March 2008

According to the survey results, more than half of the research personnel work on the following scientific fields (in FYROM more than 65%, in Croatia a bit less than a half):

Serbia

economic, social and political aspects
plant production and protection
food technology, human nutrition and consumer concerns

Albania

plant production and protection
management of natural and biological resources
animal health and welfare

Bosnia and Herzegovina

economic, social and political aspects
food technology, human nutrition and consumer concerns
plant breeding and biotechnology

FYROM

economic, social and political aspects
management of natural and biological resources
plant production and protection

Croatia

food technology, human nutrition
plant production and protection
management of natural and biological resources

This also means that **in Serbia, Bosnia and Herzegovina and FYROM the less technology-intensive economic, social and political aspects are more in focus.**

By research areas animal sciences seem to have a low share compared to the importance and potential of animal husbandry in Serbia and in FYROM.

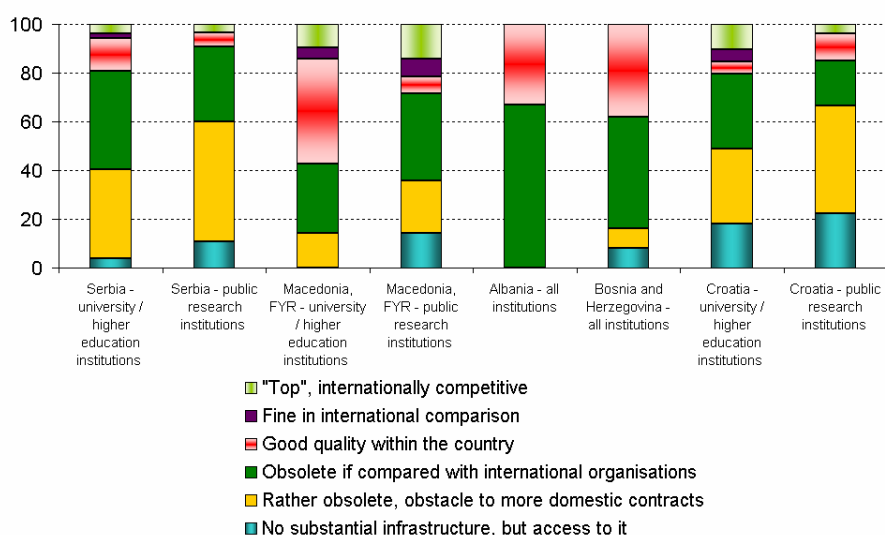
The *Review Documents* [2007] also notes that in **Albania** and in **Bosnia and Herzegovina age discontinuity is a serious problem** in scientific institutions in general and agrifood research units in particular.

2.4. Research infrastructure

In Serbia universities or higher education institutes have more developed research infrastructure than public research institutions: almost 20% of the higher education institutes have at least good quality research infrastructure within the country and 6% possesses internationally competitive technology and able to conduct top research in cutting-edge research topics. 81% of the public research institutions have obsolete research infrastructure and infrastructure enables to conduct top research in cutting-edge research topics only at 4% of them.

In Albania 67%, in Bosnia and Herzegovina 62% of the research institutions have obsolete research infrastructure. In Albania 33% has good quality infrastructure within the country, in Bosnia 38%, nevertheless in these countries there are no research units with internationally competitive research infrastructure. In Croatia 80% of the universities or higher education institutes and 85% of the public research institutes have obsolete research infrastructure. In FYROM **higher education institutes seem to have better research infrastructure** than public research institutions: more than 57% of the universities or higher education institutes have at least good quality research infrastructure within the country and 71% of the public research institutions have obsolete research infrastructure.

Quality of the research infrastructure 2006-2007

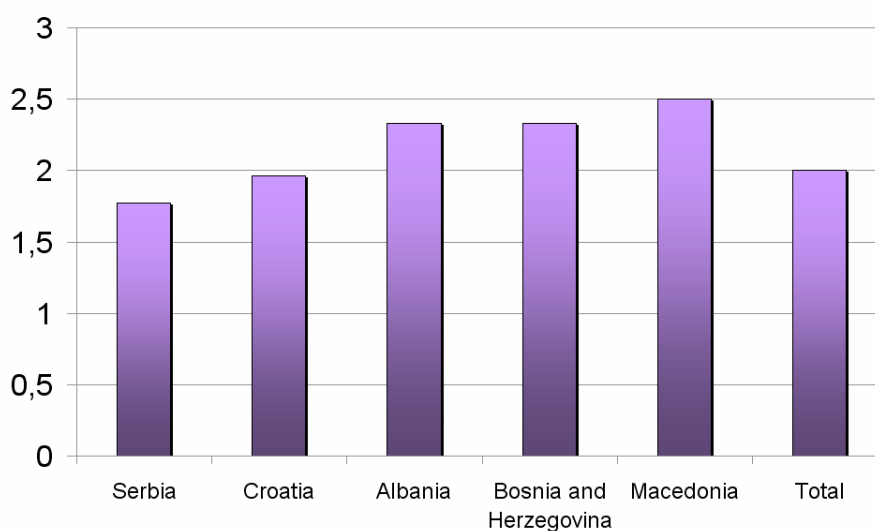


Source: BAFN Survey, March 2008

Even so, the vast majority of the agrifood research units have obsolete and outdated technological infrastructure in the BAFN countries, however in FYROM the average is better than in the others. In researching the economic, social and political aspects it is fairly easy to have good infrastructure, only office equipment is needed. However, for doing research in food technology, human nutrition and consumer concerns, plant breeding and biotechnology, and plant production and protection the infrastructure is not adequate – and most of the researchers work on these fields of science.

Table 6

Average quality* of the existing agrifood research infrastructure 2006-2007



*The following scale was used:

5 - The research organisation has an internationally competitive technology and it is able to conduct top research in cutting-edge research topics;

4 -The research organisation has top research infrastructure, the infrastructure enables regular international research co-operation but it is not competitive if compared with the 'best in our research field'

3 - The research organisation has good quality research infrastructure, probably one of the most up-to-date in the country, but it is not good enough to join in international research on a regular basis

2 - The research organisation has an obsolete research infrastructure if compared with international organisations and it is an obstacle to international research co-operation

1 - The research organisation has a rather obsolete research infrastructure and it is an obstacle to more domestic contracts

Source: BAFN Survey, March 2008

Nevertheless, it should be noted that the above values concern only 212 out of the surveyed 236 organisations, because 24 research units reported that they have access to good quality infrastructure, but lack an own research infrastructure.

3. Agrifood research performance

3.1. Innovative and scientific output

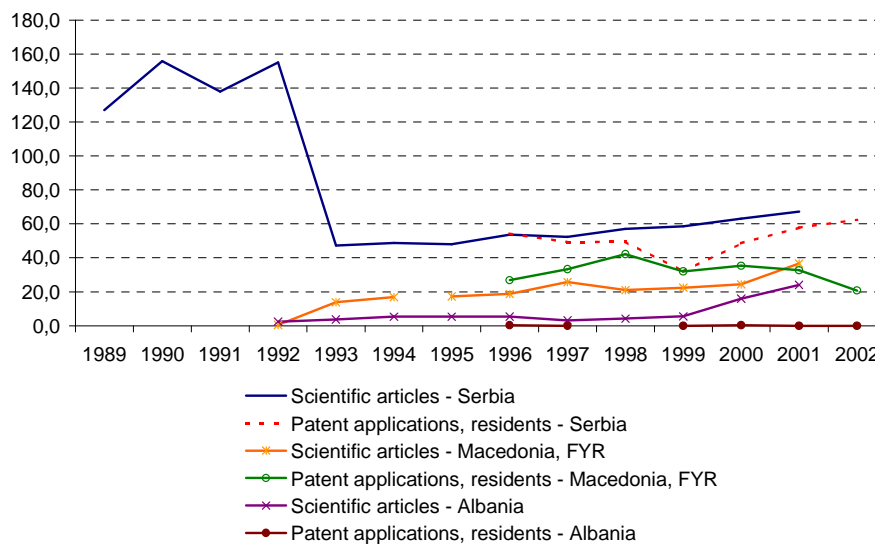
In Serbia and Bosnia and Herzegovina the political and economic calamity of the 1990's has had a great impact on the scientific and technological productivity of the country. The number of scientific and engineering articles per population fell to its fraction. Although some gradual development has begun in Serbia, quite some time will be needed before the country can reach its position before 1990. The current figure is very low in international comparison. In Bosnia the number of scientific and engineering articles as well as that of patents per population is hectic and very low and no development can be seen.

After the first years of political and economic transition the number of scientific and engineering articles started to grow sharply in Albania, but the level is still very low in international comparison. In terms of patents per population no development can be seen.

The steadily increasing number of scientific and engineering articles per population shows that FYROM could start organising its public research with some success. Nevertheless, the number of patents per population is falling and both figures are very low in international comparison. It takes long before FYROM becomes an innovation-driven economy.

Fig.12

Scientific articles and resident patent applications per million people



Source: WDI 2006 database

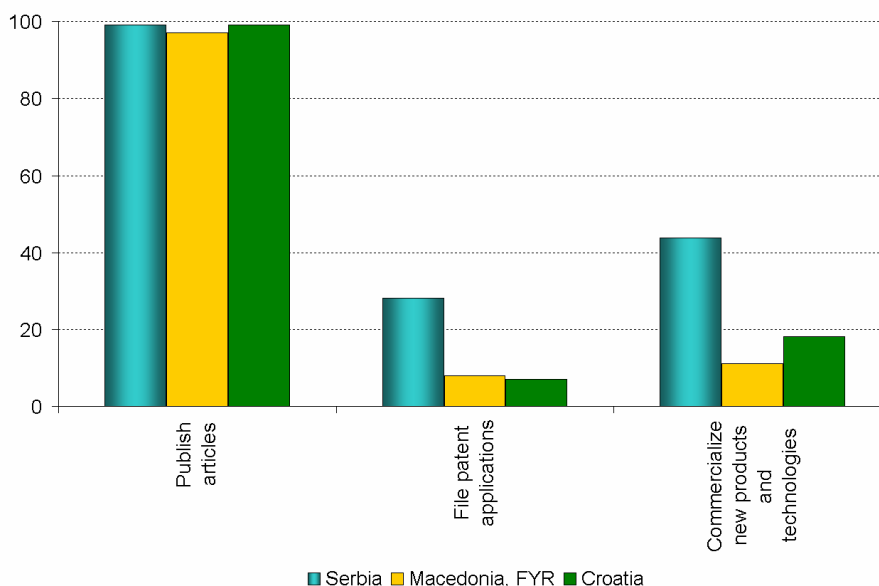
The statement above is supported by the survey results as well.

As regards agrifood research, over the last 3 years virtually all research organisation published articles. In Serbia less than half (44%) took part in the commercialisation of new products and technologies, while less than one third (28%) filed patent applications. The latter two ratios are at

the better end as compared with the New Member States of the European Union (results from the *AgriMapping* project¹¹).

Fig.13

Innovative and scientific activity of agrifood research groups in 2003-2005 (%)



Source: BAFN Survey, March 2008

The situation is different in the remaining three countries: in FYROM only 11%, in Croatia 18% took part in the commercialisation of new products and technologies, while 8% and 7% filed patent applications in these countries. In Albania none of the surveyed institutions commercialized new products and technologies, and only one patent applications was filed. In Bosnia and Herzegovina only 2 commercialized new products and technologies, and no patent applications were reported. These numbers show **poor innovation capabilities** even if compared with the New Member States of the European Union.

To measure the real innovative impact and relative scientific performance, the BAFN consortium decided to measure the following:

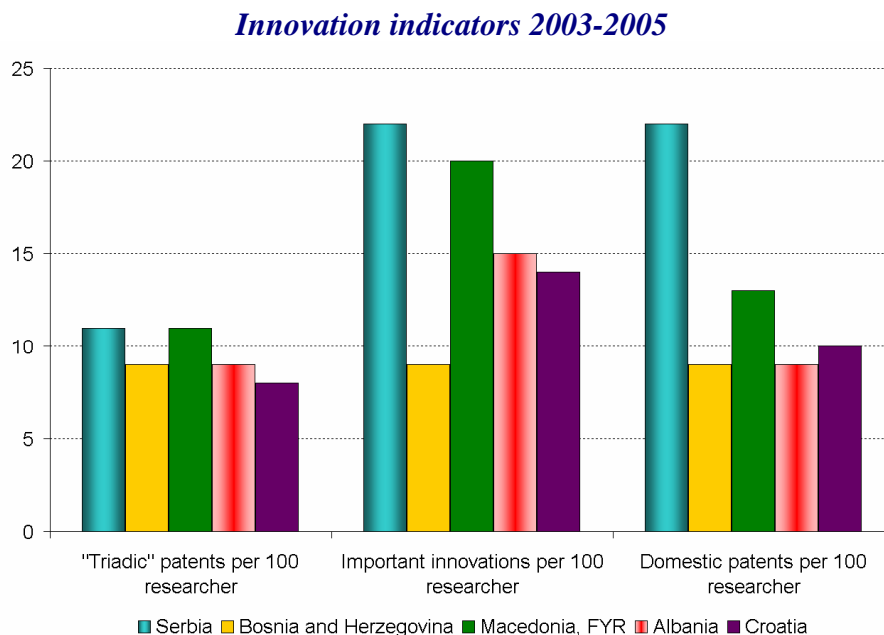
- *Important innovation*: a new product / technology / organisational mode / tool or method had or contributed to an additional turnover of more than EUR 100 thousand or more than 500 people use a new product/technology or it saved life or improved the quality of life substantially. The research organisation's contribution is substantial if at least one third of the new knowledge came from the research organisation.
- *Triadic patents*: patents granted by the EPO (European Patent Office) and/or JPO (Japan Patent Office) and/or the USPTO (United States Patent and Trademark Office).
- *International publications*: publications in journals reviewed by the Institute for Scientific Information.

The research units of **Serbia** developed 22 important innovations, patented 22 domestic and 11 Triadic patents per 100 researchers between 2003-2005. In FYROM the research units developed 20 important innovations, patented 11 Triadic patents per 100 researchers during this period. These numbers are in the mid-range as compared with the New Member States of the EU (results from the *AgriMapping* project).

¹¹ Available at www.agrifoodresearch.net.

The research units of **Albania** developed 15 important innovations, patented 9 domestic and 9 Triadic patents per 100 researchers between 2003-2005. These numbers are slightly lower than the average as compared with the New Member States of the EU (results from the AgriMapping project).

Fig.14



The performance of the research units of **Bosnia and Herzegovina** in the 2003-2005 period is the following: 9 important innovations, 9 domestic and 9 Triadic patents per 100 researchers. With the exception of triadic patents, these numbers are very low as compared with the New Member States of the EU (results from the *AgriMapping* project).

The research units of the **FYROM** developed 20 important innovations, patented 11 Triadic and 13 domestic patents per 100 researchers between 2003-2005. These numbers are in the mid-range as compared with the New Member States of the EU, with the exception of international publications, which is lower (preliminary results from the *AgriMapping* project).

The research units of **Croatia** developed 14 important innovations, patented 10 domestic and 8 Triadic patents per 100 researchers between 2003-2005.

In **Serbia** the **most significant research areas** in the agrifood sector by research activity according to the BAFN Survey (March 2008) are food technology, human nutrition and consumer concerns, plant production and protection, plant breeding and biotechnology and animal production and husbandry, while in **FYROM** the food technology, human nutrition and consumer concerns, animal production and husbandry and economic, social and political aspects. This finding is somewhat in accordance with the *Review Document* [2007], which states that in 2005 the Ministry of Agriculture initiated financial support to Serbian enterprises to introduce HACCP standards (food safety is a very important recent issue in Serbian agrifood companies).

In **Albania** the **most active research areas** in the agrifood sector by research activity are the management of natural and biological resources and animal production and husbandry, in **Bosnia and Herzegovina** the economic, social and political aspects and food technology, human nutrition and consumer concerns.

In **Croatia** the most active areas are food technology, human nutrition and consumer concerns, the economic, social and political aspects and the management of natural and biological resources.

As regards the self-reported number of international publications reviewed by the Institute for Scientific Information, they proved to be not in accordance with the available figures from the Web of Science database. Based on the bibliometric analysis carried out by the Institute for Research Policy Studies, Hungarian Academy of Sciences, **there are less than 15 agrifood publications for the 1996-2005 period for all BAFN countries** (with the exception of Croatia, where the total number of publications in the mentioned period is 161).

Detailed agrifood research activities by research areas are to be found in the Annex of this study.

3.2. Research competence

Research competence is shown by two rather different measures:

- the ability to take part in and conduct large *research projects*, in which the total project budget is above EUR 100 thousand and the research organisation's share is at least EUR 20 thousand;
- the ability to *attract foreign researchers* for doing real research work, which is defined with the help of the hosting period (hosting a foreign researcher for more than 6 weeks).

The number of ongoing large agrifood research projects¹² was 227 in 2005 in Serbia, 136 in Croatia, 89 in FYROM, 44 in Albania and 18 in Bosnia and Herzegovina. In Serbia almost, in Bosnia and Herzegovina more than 90% of the large projects was realized in collaboration with industry, while this proportion is 64% in Croatia, 61% in FYROM and 52% in Albania.

In Bosnia and Herzegovina 94% of the ongoing large agrifood research projects was co-ordinated by the surveyed research organizations, while 89% in Serbia, 81% in Croatia, 74% in FYROM and 52% in Albania. In Bosnia and Herzegovina 78% of the projects were organized in the EU Framework Programmes, 52% in FYROM and in Croatia, 51% in Serbia and 41% in Albania.

In Serbia 225 large projects were completed in 2005, while 117 in Croatia 87 in FYROM, 24 in Albania and 14 in Bosnia and Herzegovina. In Bosnia all the projects were completed in collaboration with industry (and all in co-ordination of the research organisation), 88% in Serbia (86% with in-house co-ordination), 68% in Croatia (84% with self co-ordination), 59% in FYROM (67% in co-ordination of the research organisation) and 92% in Albania (92% co-ordinated by the respondents). In Bosnia 93% of the projects run in the EU Framework Programme, while proportion is 59% in Croatia, 50% in Serbia, 49% in FYROM and 42% in Albania. The high share of EU Framework funded projects shows the **importance of the European Union** for Serbian, Croatian, Bosnian and FYROM agrifood research, which **mostly means smaller projects**.

Table 7

Number of large agrifood research projects

	Ongoing / started in 2005					Completed in 2005				
	Serbia	Bosnia and Herzegovina	FYROM	Albania	Croatia	Serbia	Bosnia and Herzegovina	FYROM	Albania	Croatia
Number of large research projects*	227	18	89	44	136	225	14	87	24	117
<i>Of which</i>										
projects in collaboration with industry	203 (89% of total)	17 (94%)	55 (61%)	23 (52%)	87 (64%)	197 (88%)	14 (100%)	51 (59%)	22 (92%)	80 (68%)
projects in which the organisation co-ordinates	201 (89%)	17 (94%)	66 (74%)	23 (52%)	110 (81%)	193 (86%)	14 (100%)	58 (67%)	22 (92%)	98 (84%)
European Union Framework Programme projects	116 (51%)	14 (78%)	46 (52%)	18 (41%)	82 (60%)	112 (50%)	13 (93%)	43 (49%)	10 (42%)	69 (59%)

Source: BAFN Survey, March 2008

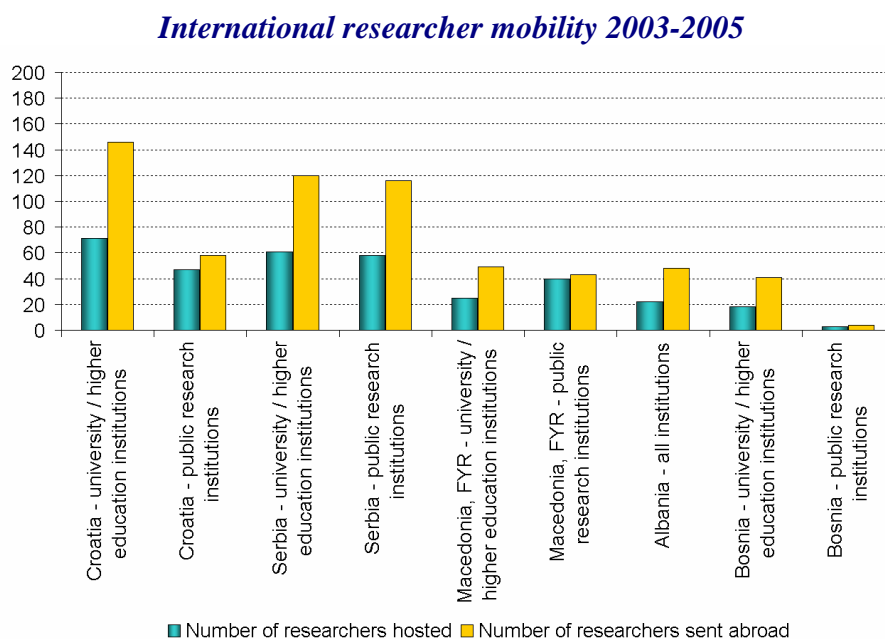
¹² The total project budget is above EUR 100 thousand and the organisation's share is at least EUR 20 thousand.

In **Serbia** large projects per 100 researchers is average (or somewhat lower than the average) as compared with the New Member States of the EU, with the exception of projects done with industry involvement: they are much lower in number (results from the *AgriMapping* project). In **Albania** and in FYROM this measure is higher than the average, in the case of FYROM especially in terms of projects coordinated by the research organisations and projects in collaboration with industry. In **Bosnia and Herzegovina** and in **Croatia** large projects per 100 researchers is lower than the average as compared with the New Member States of the EU, however in Bosnia with the exception of projects done with industry involvement: they are slightly above the average.

Compared to the population of the surveyed countries and especially to the number of researchers, **the ability to attract foreign researchers is poor**. The case of FYROM is slightly outstanding, because the ability to attract foreign researchers is comparable with New Member States of the EU.

In Serbia in 2003-2005 the total number of foreign researchers hosted for more than 1,5 months (without those, who came to acquire a Ph.D. degree) in the period 2003-2005 was 119, at the same time the number of researchers sent abroad to do research for at least 1,5 months was 236. At the same period Croatia hosted 118, sent 204, Albania hosted 22, sent 48, Bosnia hosted 21 and sent 45, while FYROM hosted 65 and sent 92 researchers.

Fig.15



Source: BAFN Survey, March 2008

International researcher mobility is the most intensive on the following scientific fields:

Serbia

- Plant production and protection
- Food technology, human nutrition and consumer concerns
- Plant breeding and biotechnology

Albania

- Economic, social and political aspects
- Food technology, human nutrition and consumer concerns

Bosnia and Herzegovina

- Food technology, human nutrition and consumer concerns
- Horizontal issues

FYROM

Economic, social and political aspects
Plant breeding and biotechnology
Plant production and protection
Croatia
Food technology, human nutrition and consumer concerns
Plant production and protection
Management of natural and biological resources

This finding is in line with the importance of these research areas in terms of human resources and infrastructure.

Albania, Bosnia and Herzegovina and FYROM are above-average sender of their own researchers abroad as compared with the New Member States (results from the *AgriMapping* project). This shows some dynamics on the few agrifood research fields these countries pursues. Nevertheless, there is a strong **general trend of brain-drain** in the agrifood sector in all the surveyed countries.

4. Concluding remarks

Agriculture is an important economic sector in **Serbia**, but investments in the agrifood industry remain low also because the transition process is relatively slow. The economic sanctions and late opportunities to be part of the transition process have had a dramatic impact also on the R&D sector.

For nearly a century **Albania** has been a sovereign state, but the country has chosen the hard road of transition after a closed communist regime. Albania has always been a peripheral area of continental Europe, with traditions in subsistence farming. Although some industrial progress and economic growth has started, the country is still very much hit by poverty and low-technology agriculture based on very small plots of land has a major weight in the economy. This means that a longer period is needed before Albania can focus on science and technology, because building basic infrastructures need to come first.

Born in war, **Bosnia and Herzegovina** has had history as a state only for less than two decades. Settling legal and political issues as well as building the basic economic institutions still comes before a unified national science and technology policy. The policy institutions of a national innovation system (NIS) are missing.

FYROM is a transition economy that tries hard to adapt to market economy conditions. Although its agrifood industry is substantial, fragmentation of land and the missing statistical infrastructure put substantial obstacles to developing the sector. The former problem is a long-term challenge. Besides, the policy institutions of a national innovation system (NIS) are mostly missing.

Beside Croatia, **Serbia traditionally has the most substantial capacities for agrifood research** among the BAFN countries. Together with Bosnia and Herzegovina, Albania has the smallest capacities. The short history of Bosnia and Herzegovina as an independent country and the war damages also explain the few and rather small agrifood research capacities.

In all the BAFN countries **the sector is dominated by state-owned institutions** (universities and public research units), which receive institution financing and have only few linkages with industry. In FYROM two ministries share the role of supporting the government-dominated agrifood research sector, but higher education units receive partly their financing on a competitive basis and public research units also do so. As a result, FYROM agrifood research is

somewhat forced to have linkages with industry, and the proportion of such linkages is high in the BAFN group of countries.

The **number of researchers** in the agrifood sector is estimated at 2300-2400 in Serbia, close to 500 in FYROM (estimation), 350-400 in Bosnia and 300 in Albania. It would not be a surprise if half of the FYROM researchers worked in agrifood research, implying also a substantial portion of FYROM R&D expenditures.

Many university and public research institute capacities **lack middle-age researchers**, which is a consequence of migration of the qualified personnel, and in Bosnia and Herzegovina mainly of the war and uncertainty. **Brain-drain and brain-waste from agrifood research is substantial**, hopefully these processes will slow down in parallel with economic catching up, which has started.

In Serbia food technology, human nutrition and consumer concerns; plant production and protection; plant breeding and biotechnology; and animal health and welfare are the most important scientific research areas in the agrifood domain in terms of human resources. In Albania and Bosnia and Herzegovina the agrifood research capacities are concentrated on scientific fields, which are less technology-intensive (economic aspects and horizontal issues), but some specific competence in food technology, human nutrition and consumer concerns could also be shown. In FYROM the capacities are concentrated on the scientific fields of food technology, human nutrition and consumer concerns, animal production and husbandry and economic, social and political aspects.

The general state of agrifood research infrastructure is rather poor in the BAFN countries, however in FYROM it is somewhat better than in the others. In Serbia the generally poor state of infrastructure (with the exception of a few public research institutes) is even poorer in the most important scientific research areas.

Currently, **Serbia is much less part of the international bloodstream of agrifood research than it could be**: the reasons are partly political and partly financial. **Making agrifood research more market-oriented and competitive remains a challenge for a longer period of time.**

Agrifood research in Albania has the chance to develop if the whole country develops and if the agrifood sector catches up in terms of technologies. If managed well, the state owned agrifood research could help the modernisation process.

Quality **agrifood research in Bosnia and Herzegovina** seems to be **dependent on the international community**. The European Union in general and the Framework Programmes in particular are important initiatives to keep agrifood research above the water surface.

According to the **country's ability to attract foreign researchers**, some quality agrifood research is present in FYROM. Nevertheless, **future success seems to be dependent on the speed of the catching-up process and the international community.**

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Annex 1: Agrifood research groups – the BAFN master list by countries

Albania

Name	X, if took part in the BAFN survey
Academy of Science	
Hydrometeorological Institute	
Department of Meteorology	
Agrometeorological Sector	
Agricultural University of Tirana (AUT)	
Department of Agro-food Technology	X
Faculty of Agriculture	
Department of Animal Production	X
Department of Agroenvironment and Ecology	X
Department of Crop Production	X
Department of Economics & Agrarian Policy	X
Department of Farm Management and Agrobusiness	X
Department of Horticulture and Plant Protection	X
Faculty of Forestry Sciences	
Department of Wood Processing	
Forestry Department	X
Faculty of Veterinary Medicine	
Department of Clinical Subjects	
Department of Morphofunctional Subjects	X
Department of Preclinical Subject	X
Center of Agricultural Technology Transfer-Korca	
Department of Agriculture	
Plant Laboratory, Milk Laboratory; Experimental Station	
Livestock Department	
Center of Agricultural Technology Transfer-Lushnja	
Department of Vegetables	
Laboratories: Germoplasm Room; Experimental Station	
Wheat Section (Technology Transfer & Seed Production)	
Center of Agricultural Technology Transfer-Shkodra	
Department of Agriculture	
Plant Laboratory & Experimental Station	
Centre of Agricultural Technology Transfer-Fushe Kruja	
Department of Agriculture	
Land & Water Service Department	
Livestock Department	
Centre of Agricultural Technology Transfer-Vlora	
Department of Agriculture	
In-Vitro Laboratory and Experimental Station	
Institute of Food Safety and Veterinary-Tirana	
University of Korca Fan S. Noli	

Source: *Review Document for Albania* [2007]

Bosnia and Herzegovina

Name	X, if took part in the BAFN survey
Agricultural Institute (crops fruit and vegetables, feed food, pedology)*	
Džemal Bijedić University of Mostar	
The Agromediterranean Faculty	
- Department of Fruit growing and viticulture	
- Department of Vegetable growing and floriculture	
Federal Agricultural Institute of Sarajevo	
Department for animal production and technology	
Department for plant production	
Laboratory for control	
Federal Agromediterranean Institute of Mostar	
Institute for Genetic Engineering and Biotechnology	
Laboratory for Plant biotechnology	X
Institute for Health Protection	
University of Banja Luka	
Faculty of Agriculture (Agronomy, Husbandry, Fishing)*	
Faculty of Forestry	
- Department for Forest Ecology	
- Department for Forest Management planning	
- Department for forestry economics and organization	
- Department for Forestry Exploitation	
- Department for Silviculture and Forest Protection	X
Faculty of Technology	
- Department for Food Quality and Food Safety	X
- Department for Food Science and Food Analysis	X
- Department of Biochemistry and Biotechnology	X
- Department of Food Technology	X
- Department of Microbiology	X
University of Bihać	
Faculty of Biotechnology	
- Department for Food production	
- Department of Agriculture	
University of East Sarajevo	
Faculty of Agriculture	
- General Department	
Faculty of Technology	
- Department for General and Inorganic Chemistry	
University of Mostar	
Faculty of Agronomy	
Pan-European University APEIRON – Banja Luka (Sanitary Engineering)*	
University of Sarajevo	
Faculty of Agriculture	
- Department for agricultural economic	
Institute for agricultural economics of food technology	X
- Department for Animal production	
Institute for animal husbandry	
- Department of Plant production	
Institute for fruit and grape growing	X
Institute for plant protection	X
Institute of crop husbandry	
- Department of Technology of agricultural and food products	
Institute of technology of agricultural and food products	X
University of Tuzla	
Faculty of Technology	
- Department of Chemical Technology	X
- Department of Process Engineering	
Veterinary Institute of Republic of Srpska	
RENESO: Team for renewable and new energy sources	X

*Additions in March 2008, after the review of the first version of this report

Source: *Review Document for Bosnia and Herzegovina* [2007]

Former Yugoslav Republic of Macedonia (FYROM)

Name	X, if took part in the BAFN survey
Institute "GAPE" (Skopje)	
Agency for motivating the development of agriculture	X
FYROM Academy of Science and Arts (MANU)	
Department for Biology & Medical Science	
Research centre for Genetic engineering & Biotechnology	X
FYROM Scientific Association (MDN)	
RR-group 2006	
State Phytosanitary Laboratory	
Department for Diagnostics of Harmful Organisms	X
University „Ss Cyril & Methodius,,	
Faculty for Agriculture Sciences and Food	
Department of Agricultural Economics	X
Department of Agricultural Machinery	
Department of Agricultural Practices and Herbology	
Department of Botany and Microbiology	X
Department of Field Crops and Tobacco Production	
Department of Food Technology	X
Department of Fruit Production and Processing	X
Department of Genetics and Plant Breeding	X
Department of Livestock Production	
Department of Plant Protection	X
Department of Soil Sciences, Agrochemistry and Land Reclamation	X
Department of Vegetable and Flower Production	X
Department of Viticulture and Enology	
Faculty for Forestry	
Department for Economy and Organisation of Forests	X
Department for Anatomy and Technical Specification of Wood	
Department for Botany and Dendrology	
Department for Composit Materials	
Department for Constructions and Production Preparation	
Department for Final Production Technologies	
Department for Forest and Wood Protection	X
Department for Forest exploitation and transport	
Department for forest genetics and species	
Department for Forest Managment and Raising	
Department for Hunting	
Department for Land and Water	X
Department for Machinery, Energy and Transport	
Department for Primary Wood Processing	
Department for Forest Landscaping	
Faculty for Medicine*	
Department of Microbiology and Parasitology*	
Department of Pharmacology and Toxicology*	
Department of Hygien*	
Department of Medecine of labour*	
Department of Epidemiology and statistic and informatic*	
Faculty of Natural Sciences and Mathematics	
Institute for Biology	
Faculty Technology and Metalurgy	
Department of Food & Bio Technology	
Institute of Agriculture	
Deapartment for Field Crops and Gardening	X
Deaprtmet for Vinyards and Vine	X
Department for Economical Analysis & Project Planning	X
Name	X, if took part in the BAFN survey
Department for Fruit Growing	X

Institute of Southern Crops	Department for Plant Protection	X
	Department for agro-technology	X
	Department of Plant Protection	X
	Department of Plant Biotechnology	X
Veterinary Faculty	Department of Plant Genetics and Breeding	X
	Institute for Food	X
	Institute for Reproduction, Genetics and Animal Breeding	
	Institute for Veterinary Biomedicine	X
University St Kliment Ohridski	Institute for Veterinary Medicine	
	Faculty of Biotechnical Sciences	
	Departement of Agro-economy, Menagment and Marketing	X
	Departement of Biology and Microbiology	
	Departement of milk production and dairy products	X
	Departement of Plant production and food	X
	Departement of veterinary medecine	X
	Department of agriculture and food processing equipement	
	Department of breeding and animal nutrition	X
	Department of Chemistry and biochemistry	
	Department of production and meat transformation	X
	Statistics, Economics, Entrepreneurships and Insuring in agriculture	
	Institute of Hydrobiological Sciences	
	Department for Bental Fauna	
	Department for Chemical and Physical researsh	X
	Department for Ciprinidae and floor Fauna	X
	Department for Macrophytic Vegetation	
Department for Microbiology		
Department for Parasytes and Illnesses of Fish	X	
Department for Phitoplancton Research	X	
Department for Zooplancton research		
Department of Salmonidic Fauna research		
Tobacco Institute - Prilep	Departement for Agrocultrual technological, Nutrition and Irrigation	X
	Departement for selection and production grain	
	Department for tobaco Technology, Fermentation and Production	
	Department of Agrochemistry	
	Department of Tobacco Protection, Enthmology & Phytopathology	

*Additions in March 2008, after the review of the first version of this report

Source: *Review Document for FYROM* [2007]

Serbia

<p>University of Belgrade, Belgrade</p>	<p>Faculty of Veterinary Medicine, 11000 Belgrade, Bul. Oslobođenja, http://www.vet.bg.ac.yu/ Department for Pharmacology and Toxicology Department for Ruminants and Swine Diseases Department for Forage Crops Department for Animal Husbandry and Animal Genetics Department for Physiology and Biochemistry Department for Microbiology and Immunology Department for Animal Nutrition Department for Animal Food Hygiene and Technology Department for Radiology and Radiation Hygiene Department for Parasitology</p> <p>Faculty of Agriculture, 11080 Zemun, Nemanjina 6 http://www.agrifaculty.bg.ac.yu/ Institute for Agricultural Economics Institute for Fruit Science and Viticulture Institute for Crop Science Institute for Agricultural Engineering Institute for Livestock Production Institute for Phytomedicine (former Inst. for Plant and Food Protection) Institute for Soil Management Institute for Food Technology and Biochemistry</p> <p>Faculty of Forestry, 11000 Belgrade, Kneza Visaslava 1, http://www.sfb.bg.ac.yu/ Department of Seed Production, Nursery Practice and Afforestation Department of Forest Ecology Department of Silviculture</p>
<p>University of Belgrade, Belgrade</p>	<p>School of Medicine, 11000 Belgrade, Deligradska 34, http://www.med.bg.ac.yu Oncology Institute Institute for Hygiene and Medical Ecology</p> <p>Faculty of Pharmacy, 11000 Beograd, Vojvode Stepe 450, www.pharmacy.bg.ac.yu/ Institute of Microbiology and Immunology Institute of Bromatology Institute for Toxicological Chemistry Institute of Pharmacognosy</p> <p>Faculty of Technology and Metallurgy, 11120 Beograd, Karnegijeva 4 , http://www.tmf.bg.ac.yu/ Department for Biochemical Engineering and Biotechnology</p>
<p>Research Institutes, BELGRADE</p>	<p>Institute for Plant Protection and Environment, 11000 Belgrade, Teodora Drajzer 9, Department of Weeds Department of Phytopharmacy Department of Plant Pests Department of Plant Diseases</p> <p>Institute for Animal Husbandry, 11080 Belgrade-Zemun, Autoput 16, http://www.istocar.bg.ac.yu/</p> <p>Institute of Agricultural Economics, 11050 Belgrade, 15 Volgina,</p> <p>Institute for Soil Science, 11000 Belgrade, Teodora Drajzera 7, http://www.soilinst.co.yu/</p> <p>Institute of Meat Hygiene and Technology, 11000 Beograd Kacanskog 13, PP 33-49, http://www.inmesbgd.com/ Dept. of Food Quality Residues Department Dept. of Meat Hygiene and Technology</p> <p>Institute of Molecular Genetics and Genetic Engineering , 11000 Beograd, Vojvode Stepe 444a, P.O. Box: 446 Laboratory for Molecular Genetics of Industrial Microorganisms</p> <p>Maize Research Institute “Zemun-Polje”, 11185 Beograd, Slobodana Bajica 1, http://www.mrizp.co.yu/</p> <p>Institute of Forestry, http://www.izas.org.yu/</p> <p>Institute for Oncology and Radiology of Serbia, 11000 Beograd Pasterova 14, http://www.med.bg.ac.yu</p> <p>Institute for Medicinal Plant Research “Dr. Josif Pančić”, 11000 Belgrade, Tadeusa Kosciuska 1</p>

	<p>Pesticide and Environment Research Institute, 11080 Zemun, Banatska 31 b</p> <p>Dept. of Multidisciplinary Research</p> <p>Dept. for Chemistry and Technology</p> <p>Dept. of Applied Zoology</p> <p>Dept. of Applied Plant Pathology</p> <p>Dept. of Toxicology</p> <p>Dept. of Weed and Herbicide Research</p> <p>Dept. of Insect Toxicology and Applied Entomology</p>
University of Novi Sad, NOVI SAD	<p>Faculty of Technology , 21000 Novi Sad, Cara Lazara ,</p> <p>http://www.tehnol.ns.ac.yu</p> <p>Department of Chemical Engineering</p> <p>Feed Technology Department</p>
	<p>Faculty of Agriculture, 21000 Novi Sad, Trg Dositeja Obradovica 8,</p> <p>http://www.polj.ns.ac.yu</p> <p>Department for Veterinary Medicine</p> <p>Department for Agricultural Economics and Rural Sociology</p> <p>Department for Field Crops and Vegetables</p> <p>Department for Fruit and Viticulture and Horticulture</p> <p>Department for Plant and Environmental Protection</p>
Research Institutes, Novi Sad	<p>Scientific Institute of Field and Vegetable Crops, 21000 Novi Sad, Maksima Gorkog 30, http://www.ifvcns.co.yu</p>
	<p>Scientific Veterinary Institute, 21000 Novi Sad, Rumenacki put 20, http://www.niv.ns.ac.yu</p>
	<p>Institute for Food Technology, http://www.fins.ns.ac.yu/</p>
University of Kragujevac, KRAGUJEVAC	<p>Faculty of Agronomy, Cacak, 32000 Cacak, Cara Dusana, 34, http://www.afc.kg.ac.yu/</p> <p>Genetics and Breeding of Small Grains</p> <p>General Major</p> <p>Technology of Agriculture and Food Products</p> <p>Management in Agriculture</p>
Research Institutes, KRAGUJEVAC	<p>Centre for Small Grains, 34000 Kragujevac, S. Kovacevica 31</p> <p>Genetics and Breeding of Small Grains</p> <p>Plant Protection</p> <p>Agricultural Practices and Physiology</p>
Research Institutes, ČAČAK	<p>Fruit Research Institute, 32000 Cacak, Kralja Petra I br.9, http://www.institut-cacak.org/</p> <p>Dept. for Fruit Processing Technology</p> <p>Dept. for Production and Maintaining of Fruit Planting Materials</p> <p>Dept. for Experimental Fields</p> <p>Dept. for Fruit Pomology and Breeding</p> <p>Dept. for Fruit Growing Technology</p> <p>Dept. for Plant Protection</p> <p>Dept. for Fruit Physiology</p>
Research Institutes, KRUŠEVAC	<p>Institute for Forage Crops, 37000 Krusevac, Trg Kosturnice 50, http://www.ikbks.com/</p> <p>Dept. for Agricultural Practices in Forage Crops Growing</p> <p>Department for Genetics and Breeding</p>
Research Institutes, SMEDEREVSKA PALANKA	<p>Institute for Vegetable Crops, 11420 Smederevska Palanka, Karadjordjeva 71</p>
University of Niš, NIŠ	<p>School of Medicine http://www.medfak.ni.ac.yu/</p>
	<p>Faculty of Natural Sciences and Mathematics, 18000 Nis, Visegradska 33 , http://www.pmf.ni.ac.yu/</p>
	<p>Faculty of Occupational Safety – 18000 Nis, Carnojevicева 10a, http://www.znfak.ni.ac.yu/</p> <p>Department for Environmental Protection</p>
	<p>Faculty of Technology, Leskovac, 16000 Leskovac, Bulevar oslobodjenja 124, http://www.tehfak.ni.ac.yu</p>
University of Priština, LESKA-LEPOSAVIĆ	<p>Faculty of Agriculture, http://www.leposavic.org/</p> <p>Institute of Fruit Growing and Viticulture</p> <p>Institute of Animal Husbandry</p> <p>Institute of Field Crops</p>

Source: compilation by *M. Mojasevic et al.* in 2008

Annex 2: The BAFN survey questionnaires

Two survey questionnaires were used, they are shown as the responders saw them. Some of the questions were adopted from the *Record Manual* [2004].

Questionnaire for registration on www.bafn.eu

THE ANSWERS WILL BE PUBLISHED

Respondent

Full name	
Phone	
Email	

Information on the research group

Name in national language	
Name in English	
City name in national language	
City name in English	
Country	

Contact person of this research group (published on agrifoodresearch.net)

Full name	
E-mail	
Tel	

Additional contact information

Web Site	
I agree to display the e-mail of the contact person on agrifoodresearch.net	Yes No

BASIC INFORMATION

C1. Please mark: your research organisation is (or belongs to) a:

University / higher education research institution	<input type="checkbox"/>
Public research institute (e.g. Academy of Science, government research organisation etc.)	<input type="checkbox"/>
Private non-profit institution	<input type="checkbox"/>
Business enterprise	<input type="checkbox"/>
Other type, please specify	<input type="checkbox"/>

C2. Average number of employees in your research group:

Average number of employees in 2005	
-------------------------------------	--

C3. Over the last 3 years, did your research group:

	Yes	No
Publish articles?	<input type="checkbox"/>	<input type="checkbox"/>
File patent applications?	<input type="checkbox"/>	<input type="checkbox"/>
Commercialise new products or technologies?	<input type="checkbox"/>	<input type="checkbox"/>

C4. Please indicate the scientific area in which your research group has produced at least one article, or contributed to at least one project report over the past 3 years:

	Research field code (cf attached list)
1	
2	
3	
4	
...	

C5. Name and Email of researcher

Please indicate the name and E-mail of the researchers from your research group.

	Name of the researcher	E-mail address
1		
2		
3		
4		
....		

Note 1 : An invitation to register on agrifoodresearch.net researcher database will be sent by E-mail.

Note 2: Researchers will indicate the reference of their publications and research projects. Without this information, the research group will not appear in the search of agrifoodresearch.net.

Questionnaire for the mapping survey

THE INFORMATION WILL NOT BE PUBLISHED

A.1. PLEASE MARK IF THE A, B, C OR D TYPE IS THE CLOSEST TO YOUR ORGANISATION:

Organisation tasks / Organisational forms	'Complete' research organisations	'Partial' research organisations
Commercial (non-public)*	A <input type="checkbox"/> (e.g. R&D enterprises)	B <input type="checkbox"/> (e.g. in-house R&D in industrial enterprises)
Public (non-commercial)**	C <input type="checkbox"/> (e.g. research institutes in Academy of Sciences networks, foundations that perform research as their professional activity etc.)	D <input type="checkbox"/> (e.g. universities, state-financed institutes that conduct routine analysis as well as research, foundations that perform research as a part of their activities, etc.)

* organisations that operate in a competitive business environment and primarily for business purposes

** organisations that operate in a non-competitive, non-business environment

B.1 NUMBER OF EMPLOYEES AND RESEARCHERS (INFORMATION FOR THE RESEARCH GROUP)

	2005
Total number of employees on a Full-Time-Equivalent (FTE) basis	
Total number of researchers* on a Full-Time-Equivalent (FTE) basis	
Number of researchers with Ph.D. degree or higher on a Full-Time-Equivalent (FTE) basis	
Number of researchers under 35 on a Full-Time-Equivalent (FTE) basis	

*Ph.D. students can be included if they are involved in research projects that would be ongoing even without the Ph.D. student concerned. 'Engineers of the department' and technical support staff are also to be included

Please mark your assessment on the evolution of young research personnel (researchers under 35) in the research group:

The percentage of young researchers has increased in the last 5 years (there are more young researchers)	<input type="checkbox"/>
The percentage of young researchers has not changed in the last 5 years	<input type="checkbox"/>
The percentage of young researchers has decreased in the last 5 years (there are less young researchers)	<input type="checkbox"/>

B.2 INTERNATIONAL MOBILITY

Total number of foreign researchers hosted for more than 1.5 months in the last 3 years (2003 – 2005) *	
Number of researchers sent abroad to do research for at least 1.5 months in the last 3 years (2003 – 2005)	

*please do NOT calculate those, who came to acquire a Ph.D. degree

B.3 GENDER

Percentage of women in the total number of researchers	
--	--

Please mark your assessment on the gender of research personnel:

The percentage of women researchers has increased in the last 5 years (there are more women researchers)	<input type="checkbox"/>
The percentage of women researchers has not changed in the last 5 years	<input type="checkbox"/>
The percentage of women researchers has decreased in the last 5 years (there are less women in research)	<input type="checkbox"/>

B4. RESEARCH INFRASTRUCTURE

Please mark your assessment of the physical research infrastructure (without office equipment):

The research organisation has an internationally competitive technology and it is able to conduct top research in cutting-edge research topics	<input type="checkbox"/>
The research organisation has top research infrastructure, the infrastructure enables regular international research co-operation but it is not competitive if compared with the 'best in our research field'	<input type="checkbox"/>
The research organisation has good quality research infrastructure, probably one of the most up-to-date in the country, but it is not good enough to join in international research on a regular basis	<input type="checkbox"/>
The research organisation has an obsolete research infrastructure if compared with international organisations and it is an obstacle to international research co-operation	<input type="checkbox"/>
The research organisation has a rather obsolete research infrastructure and it is an obstacle to more domestic contracts	<input type="checkbox"/>
We have no substantial infrastructure, but we have access to it and can participate in top research both nationally and internationally	<input type="checkbox"/>

C1. SCIENTIFIC PRODUCTION AND INNOVATION IN THE LAST 3 YEARS

	2003-2005
Number of important innovations*	
Number of domestic patents granted:	
Number of patents granted by the EPO and/or JPO and/or USPTO **	
Number of publications in journals reviewed by the Institute for Scientific Information***	

*Important innovation: a new product / technology / organisational mode / tool or method had or contributed to an additional turnover of more than EUR 100 thousand or more than 500 people use a new product/technology or it saved life or improved the quality of life substantially. The research organisation's contribution is substantial if at least one third of the new knowledge came from the research organisation.

** EPO : European Patent Office ; JPO: Japan Patent Office ; USPTO: United States Patent and Trademark Office

***and thus appears in the Science Citation Index

Annex 3: Agrifood research activity by research areas

Serbia	Number of important innovations	Number of international patents (EPO, JPO, USPTO)	Number of large projects	Number of articles in international journals	Number of studies and reports*	Number of standards written**
Economic, social and political aspects	5	3	14	56	56	0
Food technology, human nutrition and consumer concerns	40	0	68	106	87	45
Engineering, mechanisation, ICT	2	0	1	56	11	3
Plant breeding and biotechnology	66	11	56	85	11	25
Plant production and protection	6	0	44	93	148	204
Animal production and husbandry	37	0	23	106	57	145
Animal health and welfare	7	0	12	52	31	38
Aquaculture and Fisheries	4	0	3	19	4	11
Forestry and landscape	0	0	1	4	4	97
Management of natural and biological resources	3	0	24	51	31	14
Horizontal issues	3	0	7	28	5	15
Not identified research area	68	119	0	0	0	0
Total	241	133	253	656	445	597
Bosnia	Number of important innovations	Number of international patents (EPO, JPO, USPTO)	Number of large projects	Number of articles in international journals	Number of studies and reports*	Number of standards written**
Economic, social and political aspects	0	0	3	0	39	0
Food technology, human nutrition and consumer concerns	0	0	1	0	28	0
Engineering, mechanisation, ICT	0	0	0	0	0	0
Plant breeding and biotechnology	0	0	2	1	0	0
Plant production and protection	0	0	0	0	1	0
Animal production and husbandry	0	0	0	0	2	0
Animal health and welfare	0	0	0	0	0	0
Aquaculture and Fisheries	0	0	0	0	2	0
Forestry and landscape	0	0	0	0	4	0
Management of natural and biological resources	0	0	0	0	10	0
Horizontal issues	0	0	0	0	1	0
Not identified research area	13	13	0	17	0	0
Total	13	13	6	18	87	0
FYROM	Number of important innovations	Number of international patents (EPO, JPO, USPTO)	Number of large projects	Number of articles in international journals	Number of studies and reports*	Number of standards written**
Economic, social and political aspects	0	0	12	17	49	8
Food technology, human nutrition and consumer concerns	41	0	44	31	33	69
Engineering, mechanisation, ICT	0	0	0	17	3	2
Plant breeding and biotechnology	10	0	13	10	3	5
Plant production and protection	0	0	6	7	29	0
Animal production and husbandry	10	5	10	34	14	11
Animal health and welfare	0	0	0	4	11	3
Aquaculture and Fisheries	0	0	5	10	38	16
Forestry and landscape	0	0	1	3	1	0
Management of natural and biological resources	0	0	2	1	25	0
Horizontal issues	0	0	0	1	1	0
Not identified research area	14	35	0	0	0	0
Total	75	40	93	135	207	114

Albania	Number of important innovations	Number of international patents (EPO, JPO, USPTO)	Number of large projects	Number of articles in international journals	Number of studies and reports*	Number of standards written**
Economic, social and political aspects	0	0	1	1	4	0
Food technology, human nutrition and consumer concerns	0	0	0	0	0	0
Engineering, mechanisation, ICT	0	0	1	1	0	0
Plant breeding and biotechnology	0	0	1	1	0	0
Plant production and protection	0	0	0	0	5	0
Animal production and husbandry	0	0	9	4	6	0
Animal health and welfare	0	0	3	1	2	0
Aquaculture and Fisheries	0	0	1	1	3	0
Forestry and landscape	0	0	0	1	0	0
Management of natural and biological resources	0	0	4	3	17	0
Horizontal issues	0	0	0	0	0	0
Not identified research area	16	10	0	115	0	0
Total	16	10	20	128	37	0
Croatia	Number of important innovations	Number of international patents (EPO, JPO, USPTO)	Number of large projects	Number of articles in international journals	Number of studies and reports*	Number of standards written**
Economic, social and political aspects	7	0	37	141	59	0
Food technology, human nutrition and consumer concerns	10	0	23	118	84	20
Engineering, mechanisation, ICT	1	0	9	21	12	3
Plant breeding and biotechnology	29	0	9	39	31	8
Plant production and protection	9	0	9	68	17	26
Animal production and husbandry	0	0	2	113	7	7
Animal health and welfare	0	0	7	93	6	4
Aquaculture and Fisheries	0	0	22	76	48	6
Forestry and landscape	0	0	12	26	24	17
Management of natural and biological resources	3	0	19	98	53	2
Horizontal issues	1	0	2	55	0	13
Total	60	0	151	848	341	106

* Only reports financed by and / or supplied to national (and international) organisations. The research group is a major contributor to these reports: at least one third of the knowledge should come from the research group.

** Only approved standards. The research group is a major contributor to these reports / standards: at least one third of the knowledge should come from the research

Source: BAFN Survey, March 2008

Annex 4: Basic BAFN survey results – summary statistics by countries

Countries	AL		HR		MK		BH		SR		Total	
	university/ higher education	university/ higher education	public institution	university/ higher education	public institution	university/ higher education	university/ higher education	public institution	university/ higher education	public institution	other, nec.	
Number of responses	9	39	27	21	14	12	52	55	133	97	3	
Employees (FTE, 2005)	126	1267	554	372	142	168	1151	1470	3084	2187	157	
Researchers (FTE, 2005)	103	540	333	232	93	126	787	620	1788	1063	22	
Researchers with PhD or higher degree (FTE, 2005)	81	318	203	167	69	77	452	368	1095	645	10	
Researchers under 35 (FTE, 2005)	33	255	147	85	50	36	255	182	664	393	6	
Women researchers (FTE, 2005)	330	2073	1557	683	743	524	2793	2640	6403	5011	45	
Organisations that published articles in 2003-2005	9	39	26	21	13	12	52	54	133	94	3	
Organisations that filed patent applications in 2003-2005	1	3	2	1	2	0	11	19	16	23	0	
Organisations that commercialised new products or technologies in 2003-2005	0	7	5	2	1	1	17	31	27	38	0	
Foreign researchers hosted for more than six weeks in 2003-2005	22	71	47	25	40	18	61	58	197	148	11	
Researchers sent abroad for more than six weeks in 2003-2005	48	146	58	49	43	41	120	116	404	221	4	
Important innovations in 2003-2005	15	51	68	43	25	12	100	210	221	304	3	
Domestic patents granted in 2003-2005	9	50	33	27	15	12	68	233	166	282	3	
Triadic patents granted in 2003-2005	9	39	27	21	14	12	55	93	136	135	3	
Large projects ongoing / started in 2005	44	61	70	45	38	16	109	116	275	226	9	
Large projects completed in 2005	24	69	45	45	34	13	93	130	244	210	9	
Large projects ongoing / started with industry in 2005	23	48	37	31	18	15	108	94	225	151	6	
Large projects completed with industry in 2005	14	47	31	28	17	13	89	107	191	156	6	
Large EU projects ongoing / started in 2005	18	45	34	27	15	13	58	57	161	107	5	
Large EU projects completed in 2005	10	39	28	24	15	12	55	56	140	100	4	

Source: BAFN survey 2006-2007