KNOWLEDGE MANAGEMENT

TRANSNATIONAL R&D COOPERATION AND BARRIERS TO COOPERATION IN THE DANUBE REGION – SERBIA CASE

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Abstract: *Transnational R&D cooperation is becoming an increasingly important factor in improving cohesion and for increasing the competitiveness of countries through cooperation. Globalization of research activities has contributed to the increase in endeavors in exploring international scientific and technological cooperation. The aim at this paper is to review the current situation of international cooperation in the Danube region with regard to co-publication analysis and to introduce barriers that influence transnational R&D cooperation with a special focus on Serbia. The main results conducted under the research project Danube-INCO. NET are presented.*

Keywords: *R&D, barriers, international RTDI cooperation, danube region*

1. INTRODUCTION

Some previous results, of analysis of the national innovation system (NIS) in Serbia, given by Kutlača and Semenčenko (2015), shown that cooperation, on the different levels of the NIS, is one of the crucial problems of system's functionality. Although, international cooperation was always seen as a more preferable than cooperation within the system, in particular, between its parts - science and research (S&R) sector and business sectors, as it was stated in Semenčenko (2009) and Semenčenko et al (2013).

International research and development (R&D) cooperation is quite demanding, objectively as well as subjectively. This is not only regarding inner capacities of the R&D but also concerning certain R&D programs ' rules, the geopolitical affiliation with the country e.g., which are changing into the time , however in the particular period constitute meaningful obstacles . Having in mind trends in regional clustering of European countries, Serbia is mostly connecting with West Balkan and South East European countries, but through the long period of time, and geographically and historically, more logical affiliation is within the Danube Region, which is also confirmed with the latest European Union's strategy for the Danube region (EUSDR) (2010, 2013).

The Danube region is characterized by much diversity: starting with the countries' level of economic development and political status regarding EU, up to the often different and contradictory observations of the region in the context of research and development systems' excellence and cohesion. The aim at research which we are calling upon in this paper was to clarify the relationship between scientists and researchers from the Danube region towards cooperation in one hand, and barriers and various concepts of scientific and innovation work in the other hand, regarding their R&D cooperation inside the region. Therefore, the territorial limitation could be one of the consequences although, as it was shown, chosen indicators were fairly enough for making a picture of the current situation of international cooperation in the region. Therefore, the territorial limitation could be one of the consequences but, as it was shown, chosen indicators was fairly enough for making a picture of the current situation of international cooperation in the region, as well as barriers which make obstacles in stronger cooperation achievements. Our analysis is grounded on researches done in the frame of the FP7 project Danube-Inco.net, where authors have been team members.

Specific attention will be devoted to these subjects' features of Serbian R&D system.

The project Danube-Inco.net is gathering researchers from 19 partner organizations, belonging to 14 DR countries. One of the preconditions for the region definition is classification of countries/regions of the Danube region, according to geopolitical affiliation: EU member states (MS) and regions upstream of the Danube: Austria, Croatia, Czech Republic, Hungary, Slovakia, Slovenia, Germany – in particular Baden-Württemberg and Bavaria; EU MS and regions downstream of the Danube: Bulgaria, Romania; Enlargement countries: Bosnia and Herzegovina, Montenegro, Serbia; Neighborhood countries: Moldova and Ukraine (in particular oblast Odessa, Uschhorod, Ivano-Frankowsk and Czernowitz).

In general, two types of analysis have been done, first one regarding cooperation barriers in the Danube Region and the second one within activities regarding monitoring of research and innovation cooperation. In the frame of the project, authors of this paper particularly were working on the analyses of barriers to cooperation in R&D cooperation in DR.

The first type of study supposed to increase awareness of the presence of barriers to cooperation and to offer recommendations for overcoming of such kind of obstacles. In this way, stakeholders will be able to better understand potential omissions in cooperation and communication, including social and cultural aspects of them. Somewise similar survey was conducted in 2008 in the frame of project WBC-Inco.Net, where have been identified differences in barriers perception of R&D projects cooperation among Western Balkan countries and EU member countries, results of which are presented in Švarc, J. et al (2009).

The second type of studies was focused on identification of synergies, initiatives for joint activities improvement. This study scrutinizes both the co-publications and the co-patents in Danube Region Countries (DRC) and the Western Balkan countries (WBC) for the years of 2003-2013, and cooperation in projects also. Each analysis has its distinct methodology and yields specific results which are shortly presented below.

2. SCIENCE AND RESEARCH COOPERATION IN THE DANUBE REGION

2.1 Co-publication analysis

As already indicated above, the Danube Region is a very diverse geographical area, especially in terms of national research and innovation systems, ranging from highly developed countries like Germany or Austria to less developed ones like Moldova. The following circumstances should be taken into account, when looking at the numbers of publications, since a less developed country usually also spends smaller money on its RTDI system, hence affecting herewith also the publication output of its scientific/academic institutions. In general, the share of internationally co-authored publications is between 40-50%. Further, the general estimation that smaller research communities are, due to limited national capacities, better internationally connected seems to be valid. One of the first research in international cooperation as co-authorship did by Frame and Carpenter (1979) resulted in three main rules: 1. international cooperation has a higher intensity in basic research, 2. the bigger national research system – less international cooperation in co-publication, 3. the external factors play the major role in international cooperation. As Glänzel and Schubert (2005) point out, this "international ambition" in producing publications has another positive consequence: International co-publications are more likely to appear in high-impact journals and have a better chance to be cited, than "domestically" produced papers. Austria, for example, has one of the highest shares of internationally co-authored publications. We registered fewer international co-publications for Croatia (26%), Romania (26%), Serbia (31%), Czech Republic (33%), and Ukraine (34%).

The analysis of the publication data was carried out along several dimensions (data is available in the study Lampert, D. et al (2015)): overall co-publication output numbers per country to provide an overview, the internationalization of publications, the strongest co-publication links among the countries under scrutiny, main scientific research fields, and some highlights regarding scientific impact.

The methodology of the co-publication analysis was based on the two main academic citation databases, namely Web of Science and Scopus. By unification of data onto these two databases was achieved high quantity of 25% higher publication coverage, and quality because each data source can be taken as a quality check for the other or as an additional source for missing information.

The study analyzes all publications of both databases that featured any affiliation with one of the countries of the Danube Region in order to be able to draw conclusions of the differences between "all publications" and the "co-publications". Regarding document types, scientific articles are taken into account in the same way as conference proceedings, academic letters, and other document types that were tracked by the both data sources. The reason for this procedure is the idea that jointly published conference papers can indicate international cooperation activity, which is of prime interest in the Danube-INCO.NET project. The data are available only with partly different field names and different quality (depending on the data source).

Over 1 million records were analyzed and almost each has, on average, been authored by 7 researchers affiliated with 1.8 countries and been cited about 6.5 times. Of those overall publications, around 394,000 are Danube Region co-publications, each involving at least one DRC and one other country outside the DR in

the period between 2003 and 2013. Each of those co-publications has, on average, be authored by about 13 researchers affiliated to 3 countries and been cited 11.87 times. Output patterns suggest the following three country groupings: Austria, Czech Republic, Romania, Hungary, and Ukraine (between 8,000 and 25,000 publications per year); Serbia, Croatia, Slovenia, Slovakia, Bulgaria (between 1,000 and 8,000 publications per year); Bosnia and Herzegovina, FYROM, Albania, Moldova, Montenegro, and Kosovo* (between 40 and 1,000 publications per year).

In addition to the absolute number of DR publications, the growth rate of production of their publication of the reporting period of eleven years is obvious. Among all DRC, Romania and Serbia have expressed particularly high growth in their production of publications.

2.2 Scientific research fields in Serbia's (co-)publications

As it could be found in the analysis presented in Lampert, D. et al (2015), "Serbia's specialization in the area of Clinical Medicine is clearly visible but does not translate into the situation in Serbia's co-publications - whereas the share of Clinical Medicine co-publications in Serbia's overall international co-publications is 22.89%, the share of Clinical Medicine in Serbia's publications is 29.11%." Clinical Medicine is followed by Physics & Astronomy (10.43%) with even a higher share for Serbia's co-publications (17.50%) and Danube Region co-publications (18.74%). Science Metrix fields in Serbia's publication and co-publication are shown as a whole in the table 1.

Table 1: Science Metrix fields in Serbia's (co-)publications, 2003-2013 (Source: Danube-Inco.net project D.4.16, according to WoS+Scopus)

Science Metrix fields (most important)	RS overall publications	Share	RS co-publications	Share	RS-Danube Region co-publications	Share
Agriculture, Fisheries & Forestry	1,833	**3.59%**	502	**3.27%**	311	**4.14%**
Biology	2,688	**5.27%**	865	**5.63%**	503	**6.69%**
Biomedical Research	2,177	4.26%	709	4.62%	333	4.43%
Chemistry	4,239	**8.30%**	1,298	**8.46%**	671	**8.92%**
Clinical Medicine	14,858	**29.11%**	3,514	**22.89%**	1,792	**23.83%**
Earth & Environmental Sciences	943	**1.85%**	320	**2.08%**	185	**2.46%**
Economics & Business	708	1.39%	169	1.10%	82	1.09%
Enabling & Strategic Technologies	4,085	**8.00%**	1,344	**8.76%**	642	**8.54%**
Engineering	3,847	7.54%	958	6.24%	528	7.02%
Historical Studies	338	0.66%	121	0.79%	77	1.02%
Information & Communication Technologies	3,979	7.79%	941	6.13%	366	4.87%
Mathematics & Statistics	2,715	**5.32%**	1,166	**7.60%**	263	**3.50%**
Physics & Astronomy	5,324	**10.43%**	2,687	**17.50%**	1,409	**18.74%**
Social Sciences	1,334	2.61%	238	1.55%	141	1.88%

According to the above mentioned study Lampert, D. et al (2015), in Serbia's DR co-publications, strong growth (more than 800% growth rate) is visible from Agriculture, Fisheries & Forestry, Biology, Biomedical Research, Clinical Medicine, Enabling & Strategic Technologies, Engineering, and ICT. Contrary to Romania, there is a rather strong growth visible from Physics & Astronomy as well, from 34 Serbian DR co-publications in 2003 to 288 Danube Region co-publications in 2013. Compared to the growth rate of the above-mentioned fields with strong growth, this is not as much, but nevertheless, the yearly co-publication output is more than six times as high as in 2003. But, Physics & Astronomy, like for Romania, is at least not the main driver behind the output growth of Serbia. Compared to the average times cited counts in the Danube Region collaboration output, the strengths of Serbia are in physics & astronomy.

2.3 Overview of research and innovation projects in the region

The main objective of this activity was to identify and analyze the project results in the field of cluster development, technology transfer and other innovation support measures that have a transferability potential for the Danube Region. The activity is not focused on analysis of research cooperation in the region as such but rather on selection of most relevant success stories (results of the EU-funded projects implemented during 2007-2013) that have significant relevance and potential for transferring the know-how, methods, schemes and tools to the Danube Region in implementation of research and innovation strategies and targets set on the macro-regional level.

The results of analysis (for more details Filus, I., et al (2015)) are targeted to national or regional administration and policy makers, future programs participants, relevant stakeholders and members of the EUSDR Priority Areas or respective parties involved in planning and implementation of the funding programs (e.g. DRRIF) for sectorial replication, implementation of proven tools, making synergies and creating further added value based on already available resources. The presence of such tools in the EU and/or Danube Region creates a potential for transfer of the success stories in the region, mutual learning, building the synergies and possible development of common mechanisms for the region. The analysis might be also used as a knowledge base and inspiration for the other macro-regions, for authorities on regional and local level or for the development of the R&I support actions.

According to this analysis, 75 projects were gathering partners from DRC as it is shown in Table 2.

Table 2: Number of analyzed projects per area (Source Danube-Inco.net project D.4.15)

AREA / PROJECT	SEE	CE	FP7	CIP	TOTAL
Cluster development	4	9	20	1	**34**
Technology transfer	15	14	26	4	**59**
Financing tools	3	3	3	0	**9**
Non-financing tools	12	15	13	3	**42**
TOTAL PROJECTS	**18**	**21**	**32**	**4**	75
TOTAL RESULTS	**46**	**92**	**130**	**6**	274

Serbia was a partner with other DRC in 13 different projects out of 75: AUTOCLUSTERS (SEE), CAPINFOOD (SEE), ClusterPoliSEE (SEE), EVAL-INNO (SEE), FORSEE (SEE), I3E (SEE), INTERVALUE (SEE), IPRforSEE (SEE), ISEDE-NET (SEE), SEE-IFA Network (SEE), TECH.FOOD (SEE), BALCON (FP7), Enterprise Europe Network (CIP).

3. BARRIERS TO R&D COOPERATION FOR SERBIAN R&D COMMUNITY

3.1 Perception of barriers

Data collection method, which has been used by authors of this paper, in the study about R&D barriers, was a web-based questionnaire. The questionnaire was delivered to the respondents through the dissemination of information about the survey (with the link to the questionnaire). The questionnaire was mainly addressed to the wider science, research & innovation community from all Danube Region countries. At the end of the process, 1590 answers to the questionnaire were received. More details of methodology are available in Kutlača, Đ. at al (2015). A sample of respondents from Serbia included 425 respondents of different ages, research areas, and work experience. The highest percentage of respondents in the sample was between 41-50 years old, while over 75% was between 31-60 years old, 56% of them had a minimum 10 years of work experience.

The survey consisted of 5 main parts and 22 questions in total: general data, general data on international cooperation, priorities in selecting the country of cooperation, barriers to cooperation, and recommendations. Statistical analysis is conducted using Statistical Package for the Social Sciences (SPSS). The following statistical methods were applied: descriptive analysis, t-test for equality of means, chi-square test, one-way and two ways ANOVA, factor analysis. The first level of the analysis was descriptive statistics of general data which enabled an overview of the socio-demographic characteristics of respondents, general information about the cooperation, and priorities of respondents in selecting the country for cooperation.

The following figure 1 shows experience of respondents from Serbia in cooperation with the Danube region countries in all research programs measured on the Likert scale from 1 to 5, in the last seven years. Among four types of cooperation, partnership in RTDI projects inside the region exists on the highest percentage. Although the sample of respondents consists mainly of experienced researchers, it can be concluded that the experience in international RTDI projects is not high. If we limit RTDI projects only on the Danube Region and 14 countries in the Danube region, only 37% of Serbian respondents participated in the international cooperation with these countries. On the level of the whole DRC sample, the highest differences are perceived regarding participation in international collaborative RTDI projects inside the region, where EU MS and regions upstream of the Danube have the most respondents with positive answers – 72.22% while only 37.39% of participants from Enlargement countries have been involved in such projects. Respondents from Enlargement countries also have the smallest percent of visits to the Danube region countries for RTDI cooperation - just 38.03% (in Serbia only 36%) of respondents had that kind of visits in the last 7 years. EU MS and regions upstream of the Danube and Neighborhood countries have a higher score – more than 57 %.
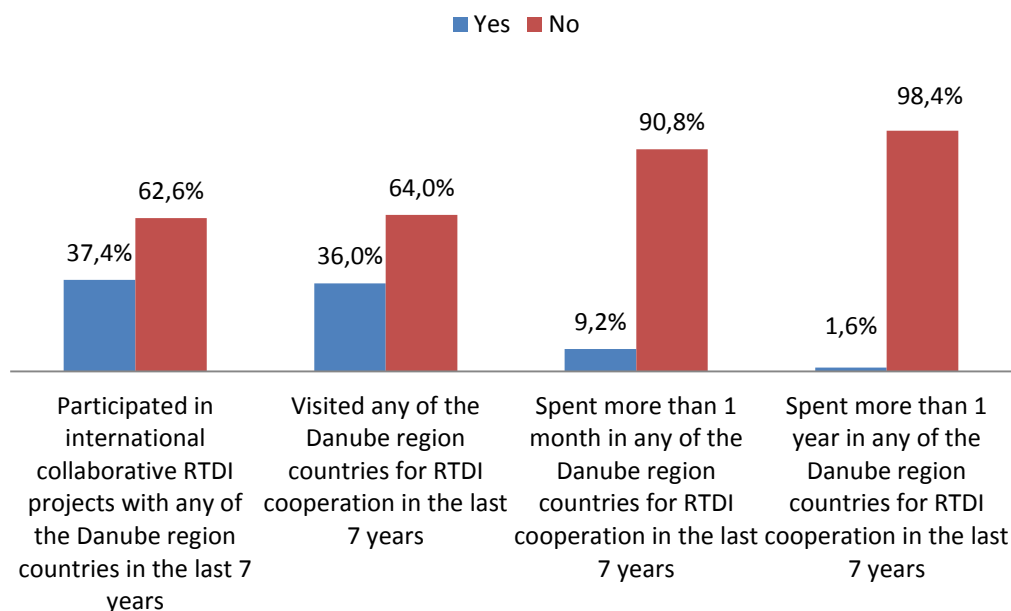

Figure 1: Experience of respondents in cooperation with the Danube region countries

Respondents from EU MS and regions upstream of the Danube have also significant results when it comes to the living in DR countries with the purpose of RTDI cooperation – 12.78% of them have spent more than 1 month in some of the DR countries, while 5% have spent more than 1 year in some of these countries. EU MS and regions downstream of the Danube have low share in visits to DR countries which last more than 1 month, but a very high share of visits that last more than 1 year (9.52%). In Enlargement and Neighborhood countries the situation is quite opposite – the share of shorter stays in DR countries is much higher than the share of longer stays in these countries.

In addition to descriptive statistics and basic data on the perception of barriers in the Danube region, particular attention was given to the perception of barriers according to demographic characteristics of respondents, in that way we have defined 5 working hypothesis.

Hypothesis 1: Older researchers (minimum 10 years of working experience) have a lower perception of barriers in international R&D cooperation in comparison with younger researchers (less than 10 years of working experience). Using T-test of independent samples, medium values of barriers in R&D cooperation between older and younger researchers were compared. According to results, it could be concluded that there are no significant differences in barriers perception of less experienced and more experienced researchers. Hypothesis 1 was not justified.

Hypothesis 2: The age of researchers influenced barriers in R&D cooperation perception. Results of one-way ANOVA analysis shown, that there is no differences in perception of barriers, according to the age of respondents. Although there was an assumption that researchers at the beginning of their careers will have more obstacles to cooperation, this difference was not statistically significant.

Regarding gender ratios to this sample were prevailed women, thus, 53% of respondents were women, and 47% men.

Hypothesis 3: In the perception of R&D barriers in international cooperation there are differences between female and male. A t-test of independent samples was used for the variable "gender" since in this variable is only two answer groups. There is a significant difference between male and female with regard to the perception of administrative and personal barriers.

Barrier perception mean values of the Likert scale of 1 to 5 indicate that women have statistically significant difficulties in international cooperation when it comes to problems with projects application, then the process of project implementation and reporting. Furthermore, personal factors, such as gender, family situation, the preferred career, are significant barriers more for women than for men.

The vast majority of respondents in the sample came from the high education sector (70%), followed by public sector (mostly public institutes) 25%, and only 4% was from the business sector. Relatively a small number of respondents from business sectors are a limitation of the analysis due to the inability of overview the whole R&D sector in Serbia. All in all, the sample corresponded most to the structure of human resources in the R&D system in Serbia (based on the statistical data of the Statistics Office of the Republic of Serbia), and the results can be considered adequate for making conclusions and recommendations.

Hypothesis 4: researchers from the different types of institutions have the different perception of barriers in international R&D cooperation. Using one-way ANOVA analyses of variances mean values of barriers in international R&D cooperation of respondents from all three sectors had been compared. According to the results, we can conclude that there is the significant difference in perception of institutional barriers among respondents. Researchers from faculties have statistically significant barriers in international R&D cooperation in comparison with researchers that are working with public institutes.

The vast majority of respondents are in engineering sciences (29%), following with natural sciences and social sciences with percentage respectively 21% and 17%. The category "other", covers 4% of the sample of respondents that are not directly from R&D sector, they are rather stakeholders from the business sector and public administration.

Hypothesis 5: There is a difference in perception of barriers in R&D cooperation among researchers from different scientific fields. Hypothesis testing showed that there are no significant differences in barrier perception of researchers from different science fields. Hypothesis 5 has not been justified.

3.2 Defining activities for overcoming barriers

With the aim to overcome barriers to international R&D cooperation, researchers assessed 15 suggested measures on the Likert scale of significance from 1 to 5. The mean value of activities' significance (with a range from 4.15 to 3.05), shown that researchers consider realization of those activities, as an important step in overcoming the barriers.

The most important activities to the majority of researchers are international conferences attendance and program of mobility - single visits to research organizations of the aim at the joint project proposals preparations. Besides mentioned, very important and necessary activities are those which promote more efficient information canals about potential projects funding, in order to promote international cooperation and increased the number of project applications.

Respondents were given the opportunity to propose measures to overcome barriers in international RTDI programs in reply to an open-ended question. Responses were classified according to the criteria to whom the activities are directly or indirectly related to. According to the level at which the improvement should be implemented, 4 main groups were identified:
- Support from the European Commission (EC) - activities related to project financing, administration and legal framework of projects, better reallocation of funds etc.,

- National support - activities to be undertaken at the state level in order to overcome barriers to international cooperation.
- Institutional supports - activities to be undertaken at the level of institutions
- Objective problems - problems that should be solved by the teams, include personal approach.

Based on defined key stakeholders for activities implementation, according to respondents' answers, it is necessary to undertake concrete measures.

European Commission has to contribute to following:
1. Improving control of project implementation (Allow individual faculties to be independent of the university; Nullify all university regulations specifying that international cooperation must be done at the university level; Preventing of abuse in spending project funds by university management office; Introduce penalties for head/director who abused their position of authority for personal financial gain).
2. Addressing legal and administrative problems (Better harmonization of different programs; Reducing lobbying for other countries in EU administration).
3. Increasing funding opportunities (More calls for small collaborative research projects; More money for infrastructure facilities; More study visits to other countries, and more opportunities for research fellowships).

National support refers to following:
1. Solving legal issues (Adjustment of legal provisions; Harmonization of laws and science programs with EU; Mismatch between international and national law and economy regulations; Improving high education and scientific youth).
2. Financial support (National financial support for strategic international project proposals; Increasing investment in RTDI; More investment in science; More investment in science and RTDI; More investment into institutional capacity building).

Objective problems would be solved in the following way.
1. Improving communication between partners and colleagues (Better communication with colleagues; Better communication and collaboration between scientific institutions in the Danube region; Better overall communication; More individual contacts between experts from the same or similar field of research).

2. Other (Implementing in all research institutions an advisor regarding project preparation and submission; Better distribution of tasks at the university; Proactive approach; Professional help in writing proposals).

4. CONCLUSION AND RECOMMENDATIONS

Since our research shown that the most significant obstacles to the cooperation of researchers from Serbia within the Danube region (and beyond) are those related to the 1. The overall capacity of the country; 2. The administrative and bureaucratic procedures in the application process, implementation, and reporting on the international projects and 3. Socio-political conditions in the country, we will conclude this paper with an attempt to define specific recommendations.

1.   Barriers regarding overall capacity of the country are the most important barriers in international RTDI cooperation among the Danube region countries. Strong recommendation to the S&T policy makers in the countries of Danube region is to increase investments in science and technology and particularly increase financial support for international cooperation from public sources.
In addition, Serbian government should harmonize the laws and science programs with EU. Aligning national strategies is a crucial point in order to improve the cooperation in the Danube region.
2.   Following the findings based on the analysis of administrative and bureaucratic barriers, recommendations for S&T policy makers not only in Serbia but also in EU countries are:
- to establish efficient processes for programs and projects evaluation.
- to reduce the quantity of projects' documentation.
- to speed-up evaluation procedures and to shorten the time needed for contracts.
- to standardize procedures for project submission and monitoring.
- to secure forehand / on time payment by funding organizations, reducing delays.
3.   Socio-political barriers are not so important to the international cooperation at the whole sample of the Danube region countries. As the main obstacle, an inferior position of research and innovation compared to the economic development and political stability was emphasized. Accordingly, it can be concluded that in order to improve international cooperation, the greater concentration of resources on research and development in the Danube region is needed.

If we call upon above mentioned three main rules of international co-publication, in the case of Serbia we can agree with two of them: 1. international cooperation has a higher intensity in basic research 2. the

external factors play the major role in international cooperation. Although Serbia is a small country percentage of co-published papers are under average bellow of DRC, which could be the only result of barriers explained in our analysis. As production of publications is, in general, the outcome of joint projects an additional recommendation to the S&T policy makers in the region is to promote S&T cooperation within the Danube Region in order to increase motivation and interest of the participants for such cooperation.In order to avoid fragmentation of the innovation efforts in the future, we recommend implementing efficient coordination and communication mechanisms between the programs on EU level, e.g. between Framework programs (Horizon 2020, COSME) and trans-regional programs (Central Europe, Danube Region) as well as within these groups. Coordination and synergy building have to be developed also between programs on the EU level and national or regional programs and initiatives (including specific operational programs of the European Structural and Investment Funds).

Socio-political barriers in Serbian international cooperation are primarily caused by its geopolitical status (small, non-EU member country), this is not possible or, it is very challenging to change or overcome. However, expenditure of research and technological development are also limiting factor for Serbian researchers in international cooperation, and recommendations for improving the overall capacity of the state are also very important to be applied in this area.

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COMPETENCY OF REGISTERED FARMERS FOR INDEPENDENT BUSINESS

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Abstract: *Subject of this paper is a state of competence of the owners of the registered agricultural holdings to independently lead operations of their farms. The aim of this paper is to determine the extent to which holders of registered agricultural holdings are trained to independently perform tasks which require basic economic and technical knowledge in business like bookkeeping, calculation of production costs, business plan, whether they use incentives for the development of agriculture, banking services and the like. Findings are not encouraging. Therefore, it is necessary to conduct an organized social action aiming to educate farmers in the area of keeping business on their farms. Advisory services play an important role in this process. Their task is to mediate between farmers and other institutions that may contribute to the development of agriculture.*

Keywords: *farmer, holding, knowedge, business, advisory sevices*

1. INTRODUCTION

Based on the Regulation of 2004 The Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia has started registration of agricultural holdings with the intention to have a clear record of who has the right to use the funds from the agricultural budget. The aim of these measures is to control the use of funds to encourage the development of agricultural production and the establishment of direct links with government services to agricultural producers, without intermediaries. Registration is based on a voluntary basis and is not related to the time period, but only the registered holdings have the right to use earmarked funds from the state budget for premium, subsidies and lending and other services of government extension services.

Into the Register of agricultural holdings may be entered: (1) natural persons - farmers, together with members of their family farm; (2) companies registered to perform agricultural production; (3) agricultural cooperatives; (4) entrepreneurs registered for carrying out the agricultural production, and (5) scientific research organization in the field of agriculture.

The subject of this paper is to analyze farms that are owned by private individuals. More specifically direct object of research is a state of competence of the household heads to independently lead operation of their farms. It is assumed that farmers are mostly lower educated and are generally not familiar with what is the bookkeeping, which it serves, how records of costs and revenues are kept and how to make a calculation of production costs, what is a business plan, whether they need assistance in its drafting, which it serves for, who gives incentives for the development of agriculture, how to apply for them, if they need assistance in applying for these funds, do they know which are the instruments of payments and the like. The aim of this paper is to determine the extent to which holders of registered agricultural holdings are trained to independently perform tasks which require basic economic and technical knowledge in business.

Here are analyzed the results of the survey research performed in 2014 in three regions of Serbia (Šumadija and Western Serbia, Southern and Eastern Serbia and the Belgrade region). It covers 344 villages in 83 municipalities. The survey was conducted by 73 interviewers - the adviser of total 167 currently engaged in the Agricultural Advisory and Support Service of the Republic of Serbia (AASS). They are arranged in 21 AASS covering the entire territory of the above mentioned regions (Institute for science application in agriculture, Report 2015). AASS advisors actively and continuously are monitoring agricultural production to 3,005 family farms selected according to the criteria for the selection of agricultural holdings (Official Gazette of the Republic of Serbia, 2014). Selecting the surveyed households is covered the entire territory of the observed region, made proper pattern dispersion, in proportion to the surface covered by AASS and the number of holdings for each AASS which came to approximate number of required number of surveys. In this way it is provided the homogeneous sample and comparable with the results of the Census of

Agriculture at the same time, as well as the mutual comparability of the indicators between the regions, thereby creating the conditions for the application of the comparative method where they are synthesized characteristics of the region and the entire sample. Data were collected in the field in written form, and then entered and processed in Microsoft excel and SPSS. The sample included 165 households with a dominant crop-livestock production. With only livestock production are 142 holdings, with a crop production is 43. These three types of households are represented with 68% in the total sample followed by fruit farms with 99 - wine with 15, vegetable farms with 38, beekeeping farms with 8 and 6 others.

2. FARMERS AND THEIR BUSINESS

According to the agricultural census in 2012 family farms dominate in the total structure of agricultural holdings in Serbia (99.6%), while the remaining 0.4% consists of legal persons holdings (companies, cooperatives) and entrepreneurs (Statistical Office of the Republic of Serbia: 2012: 190). According to the findings of the Census the total number of members and full-time employees on farms totaled 1,442,628 persons, of which 421,016 were holders of farms and 537,479 the members of households engaged in agriculture out of which 243,380 were employed full time throughout the year. These data refer only to households that are in the possession of more than 0.5 hectares of utilized agricultural land and/or above a certain number of cattle, poultry, etc. By this, 108,230 households and their members are excluded from the list (Bogdanov and Babovic, 2014: 20). Three years later, the structure remained practically unchanged (Trezor, 2016). At 31 December 2015 there were 346,135 registered farms in active status, of which 344,404 family farms, 1,448 agricultural enterprises, 114 agricultural cooperatives and 70 agricultural holdings with legal personality and 7 research organizations.

These data speak eloquently about the importance of agriculture in the overall economy of Serbia. Despite two and a half decades of transition, similar trends are happening which are registered in neighboring countries. In Serbia, outside the large urban centers and urban areas agriculture has a key importance for the development of the local economy but nevertheless it has a low economic efficiency. Similar trends were recorded in the neighboring countries and even those that joined the European Union, such as Romania and Bulgaria (Andrei Eftimie & Matei, 2014: 121).

Nowadays there is almost theoretical consensus that the family farm are socio-economic base around which is creating the peasantry as a social class and as long as it exists, it will reproduce interpersonal relations and the local cultural patterns typical for the rural environment. Additional problem is the fact that the land property of agricultural holdings is quite fragmented, consisting of a plurality of mutually separate plots, which only contributes that the overall agricultural production remains extensive. This greatly contributes to the fact that today's agriculture in Serbia lags behind on agriculture of the European Union, according to farmers' income and to the technical equipment, productivity and most of the other economic indicators (Mitrovic, 2015: 114).

In recent years, innovation has become one of the most important factors of economic development. They ensure the competitiveness of the market. Their importance is even greater in agricultural production since they enable the production of larger quantities of high-quality food for a steadily growing population and the need to release a wider and even the world market but also for the local and regional self- sustainable development.

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The problem is that our society may be understood as a society of belated modernization. This means that the majority of the population is dominated by traditional conscience and traditionalism as the dominant value orientation. Rural areas typically are not ready to accept modernization and innovations that it brings, and may be considered as centers of resistance to all major social changes (Pešić, 2015). Accordingly, it may be

expected that the rural population, including the holders of registered farms, is mainly traditionally oriented and that is not ready to change neither checked patterns of traditional ways of the agricultural production nor everyday social life. This fact constitutes an aggravating circumstance in any attempt to improve the agricultural production.

Given that one of the main objectives of each production is income generating (profit) then it is important for each producer to have permanent insight into the financial flows of its own business. Given that the Serbian agriculture is dominated by the production of a relatively small land ownership, and that farmers generally have low level of education, it is understandable that they did not have the habit of keeping accounting records of production costs and incomes. Another important question is whether if they may, with regard to their education, understand the importance and necessity of bookkeeping of its own holdings and whether they were sufficiently expert to independently perform their job.

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Table 1: Do you keep records of expenses and income of agricultural production on your holding?

Yes, I do	32.6%
Yes, I do it with the help of another person	41.7%
I do not keep records	25.0%
Yes, I pay an accountant	0.8%
Total	**100.0%**

Even nine-tenths of the holders of registered farms argue that they are familiar with the concept of bookkeeping records the cost of production (91.5%). Even though only three-quarters of them say that they keep records of the costs. This is a relatively high number of holders of registered farms. The assumption is that the record keeping is necessary, for various reasons, to obtain loans, grants, subsidies, aid from the various funds and similar but also for personal insight into the profitability of its own business. What is interesting is that only one in three keep personally this records, two-fifths of them do it with the assistance of a professional person while very few of them pay an accountant. So, for the contemporary registered farmers we may not say that they are enough versed or knowledgeable enough to take their own business on (registered) farms.

Of course, it's not just about the need to keep accounting records of production costs. Keeping family farm means not only responsibility for the successful business but also the ability to survive in the market conditions. This includes rationalization the business and achieving the cheapest possible production of a satisfactory quality and scope with the intention to achieve a satisfactory profit in the final realization of production in the market. Therefore, it is necessary to do the previous calculation of costs and benefits with the bookkeeping as well as the question of whether the farmer is able to do that alone. It is not necessary to speak about the importance this work. It is much more important question of whether the holders of registered farms practice it. Without it can not be assessed in advance the real profitability of the production cycle or the amount of expected profit.

Table 2: Are you doing calculations of production lines that you do?

Yes, with the advisers during their visit	69.0%
Yes, with an another expert	2.4%
Yes, I do it alone	9.5%
I do not do the calculations because I do not know how	19.0%
Total	**100.0%**

On the question of whether you make a calculation of your production lines seven-tenths of them answered that they makes it with the help of a professional person or adviser during their visit to the farm. Thus, the vast majority of them use the assistance of the advisor while a small number of them rely on the assistance of some other specialist and one in ten said that work on calculation himself. On the other hand, every fifth declare that they do not calculate their production lines. Ultimately, it means if they do not work the calculation they let go the elemental forces of the market and expose themselves to a series of accidents and adverse trends that can be counteracted by good planning.

Considering the above findings and observations, it may be assumed that the majority of farmers constantly need the help of an expert. On the other hand, it is required organized education just in the field of management of finances. This would expand their knowledge related to business problems which could help them in quality performance of their core business. It should be added the need for advisory services to have experts on this matter in their composition, but also that every advisor needs to know the basics of bookkeeping in order to help farmers who use their services.

Research findings show that two-fifths of the farmers (39.6%) had an opportunity to learn how to make evidence of expenses and income or making calculations on organized training while the rest (60.4%) claim that they learned to do it on the easiest way for them. The conclusion is that it is necessary to devise a systematic training to farmers to empower them for this activity. Of course, we can assume that the situation is much worse for those farmers who have not registered their farm. They rely solely on their own strength in business and they are left at the mercy of uncontrolled functioning of the market where perhaps the greatest benefit have middlemen and stockbrokers but direct manufacturer remains unprotected.

Lack of formal education has long been a major problem in the agricultural population. In recent years, it is significantly reducing their exclusion from education. Moreover, the research findings show that there is less of those whose education ends with 8 years of primary school (27.8%) compared to 34.43% in the general population according to the last Census (2011). There are significantly more of those who have some level of secondary education (62.2% compared to 48.94% according to the Census). We can conclude that those who have gone through a systematic formal education has primarily decided for registration and that on the other hand those who do not have formal education largely left to themselves. On the other hand, there are significantly less of those with higher education among them (11% compared to 16.24% of the total population). In contrast to this it is the fact that only 13.2% holders of registered farms have the agricultural education.

Here observed trends are typical for other transition countries. An example is Poland where, since 2000, has been observed trend of rapidly raising educational level of the rural population. There were registered 26.4% those with primary education, 61.4% with all levels of secondary education and 12% with high education (equivalent to higher and university education in Serbia) in 2011. In both countries, there is the same number of people who have agricultural education (13.2%) (Chmieliński & Karwat-Woźniak, 2015). Here should take into account the experience of Slovenia in which higher education of the farmer increases his chance to leave agriculture and go to any other occupation (Juvančič, 2005: 325). In the event that this tendency has been registered in Serbia, we would run the risk of reducing educational level of those who continue to engage in agriculture, which could have multiple negative consequences on the further development of agricultural production. It is therefore of particular importance to develop state aid for retaining educated in agriculture.

Table 3: Have you heard the term business plan and do you know what this is?

Yes, but I do not know what it is	19,2%
Yes, I know what it is	74,0%
c) No, I do not	6,8%
Total	**100,0%**

In the world of entrepreneurship business plan plays an important role. Today, many researchers believe that the business plan is of particular importance for the newly-established but also for small businesses (Brinckmann, Grichnik, and Kapsa, 2010: 24). If the registered farm look like a small company then owning a business plan plays a positive role in obtaining state aid, various subsidies, loans and the like. Business plan becomes more and more important in the organization of agricultural production. The data indicate that the majority of them, three-quarters (74.0%), declares that they heard about the concept of a business plan and to know what it is. One in five (19.2%) said that he heard but did not know what this is about until and approximately one in twenty (6.8%) declared that never heard of a business plan.

Table 4: Business plan

	Have anybody done a "business plan" for your holding?	Do you know what is "a business plan" made for and if you can specify for what?	Do know/Do not know
Yes	15.7%	74.8%	7,6%
No	84.3%	25.2%	92,4%
Total	**100.0%**	**100.0%**	**100.0%**

It is interesting that despite the fact that such a large number of registered farmers claimed that they are familiar with the concept of a business plan and to understand its essence and to know why it would be made (three quarters) still relatively few of them has even tried to made it (about one in seven), with the help of professionals. It must be admitted that this is quite unusual discrepancy between knowledge of the importance of something and trying its application, especially if it is about something that is of great importance in practice. Therefore, respondents were asked to indicate for what it is used. After examining the replies it was concluded that the vast majority of them however do not know what is the wright meaning and the purpose of business plan (92.4%). Only 10.7% of those who said that they know gave the right answer.

It follows from this that the average owner of a registered agricultural household does not have enough expertise for conducting their own business. Keeping the registered family farm is a specific type of entrepreneurial activity and it involves mastering of many skills and knowledge not only in relation to the technology of agricultural production but also to the management and entrepreneurship as well as too many other areas. From this arises the necessity of systematic professional training of farmers in different areas of knowledge.

Table 5: Using incentives and other funds

	Do you use incentives from the state for agricultural production?	Do you use incentives from the local government?	Have you heard of the possibility of obtaining financial resources for agriculture from EU pre-accession funds?	Do you know the way to receive these funds, and what do you need for it?	Have you had the opportunity to attend a lecture on which explained how to use the pre-accession funds?
Yes	98.4%	54.6%	86.2%	30.6%	27.8%
No	1.6%	45.4%	13.8%	69.4%	72.2%

One of the key issues in the operations of each business entity is issue of providing the necessary resources for normal functioning. Nowadays there are various funds which grants means to farmers for different purposes. The most important resources are mostly in state funds, funds of the local community and the pre-accession funds of the European Union in recent times. Of course, only registered farms could apply for obtaining these funds.

The data show that the registered farmers commonly use financial incentives from the state. Almost all of them do it. Taking into account the fact that the state's resources are given exclusively to registered farms, and then we can assume that this was a moment of great motivational significance in decision about the registration. The incentives that give local governments use a little more than half of the registered farm holdings, which only confirms previous finding.

It is interesting fact that the vast majority of registered farmers are informed about the possibility of obtaining financial resources for agricultural production from pre-accession funds of the European Union. These funds use a relatively small number of them, only three tenths. Despite the fact that many of them are informed of the possibility of obtaining aid from these funds, which are quite significant resources, most of them (more than two-thirds) is not informed in the way how to use these funds and what they need for and only one in four has attended the lecture which was discussed on how to use pre-accession funds. Thus, a significant majority of them do not have adequate knowledge about the possibilities and how to apply for obtaining those funds.

The global trend of the European Union, is that agriculture is supported and protected by Common Economic Policy with the intention to ensure the rational development of agricultural production and full utilization of factors of production and especially of the labor force as well as to increase revenues and provide adequate living standards of farmers. Some of the elements of the Common Agricultural Policy, by themselves, do not stimulate the growth of agricultural production, but given that they have the form of the transfer of knowledge related to agricultural holdings they have important significance for the final economic result in business of the holdings. The experience of the European Union in this regard is very inspiring. Various subsidies have given a special contribution to the development of agriculture but no less significance have the other means from the Rural Development Program that enable other aspects of adjustment to the conditions of market economy and overcoming severe competition (Kołoszko-Chomentowski, 2014: 65-66). This does not mean that it is exclusively about investing in production technology and equipment modernization. Great importance has investments in cultural and human capital of agricultural production and in the first place in

the training of farmers and members of their households on a variety of issues related to agricultural production and farm business.

It seems that the lack of information one of the key problems for faster and easier applying for various forms of support from the above mentioned state, local and international funds. Confirmation of this is found in the fact only 30.9% of them submitted the requests alone while 69.1% said they do it with the assistance of an expert or advisor.

Table 6: Using bank services

	Do you use loans to finance agricultural production?	Do you have the bank account?	Do you know what is a promissory note and what is it use for?	Do you know what is a check and what is it use for?
Yes	23,8%	97,7%	91,9%	97,1%
No	76,2%	2,3%	8,1%	2,9%

Based on the answers it can be considered that the majority of farmers are addressed to the possibility of their use when it comes to the use of banking services. Almost all (over 97%) have opened a bank account and know what the check is. Based on this we can assume that they are trained to perform basic operations related to receiving money and payments of liabilities to third parties. Many of them are probably forced to use banking services since the vast majority of legal persons with whom they cooperate carried out their financial operations exclusively through the account.

In addition to payments, it can be important for farmers some other banking services including perhaps especially important place has the option of taking the loan. Slightly less than a quarter of them say that they use bank loans to finance agricultural production. This is still a small part of them. Of course, we can ask why more of them does not do it with respect that the loan for many of them give chance to purchase the necessary equipment to build greenhouses or other facilities, irrigation, to buy some of the agricultural machine or something else that would have ensured expansion of production and acquisition of higher revenues in the future. The answers probably should be sought in high interest rates, confidence in the bank, long production cycles, unstable purchasing prices, uncertainty of operations due to dependence on natural disasters and etc.

3. CONCLUSION

General social modernization, which, among other things, is characterized by a rapid development and expansion of the educational system, is coming slowly to rural areas which are under the strong influence of traditionalism, relatively static and unprepared for significant changes in patterns of social behavior. This is reflected on the way of the business of agricultural holdings including registered farms which may be considered for more advanced part of the rural society.

This view is confirmed by the findings of the research. A very small number of farmers, owners of registered agricultural households are qualified to perform some of the basic activities related to independently doing business of their own holdings. Every third keep records of expenses and income and one in ten do calculation of its production lines, most of them do not know what a business plan is and why they should have it, many of them do not use the incentives provided by different funds. Moreover they do not know how they can apply for them. Many of them have attended various courses on the conduct of the business but obviously it is not enough to run their own farms. Certainly it requires a broader social action in order to introduce innovation in agriculture, modernize farms and the rural areas as well.

The question is how to accelerate the modernization of rural communities and agricultural holdings. In order to respond to it we firstly need to identify the key actors in the creation and transfer of knowledge relating to agriculture as a productive activity. The key actors in this process are (1) research and educational institutions that are responsible for the development of new ideas, (2) advisory services that mediate between researchers and innovators on the one hand and (3) the end-users of new knowledge on the other hand - the direct beneficiaries of knowledge (farmers) and indirect beneficiaries and i.e. various organizations that fulfill their goals through the application of new knowledge in agriculture and rural development (Tudor, Florian & Chitei, 2013: 91).

Intermediaries linking the farmers with the creators of knowledge and innovation have special importance in activating the direct beneficiaries of knowledge and innovation in agriculture. They ought to have direct cooperation with educational and research institutions and to suggest problems that notice on the ground in

direct contact with the farmers. Educational and research institutions should create specific training plans and programs which will aim to complete the skills that are necessary for the rational organization of agricultural production and management of farms. It is necessary regular interaction of all in the chain of transfer of knowledge for successful resolution of this problem.

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