

STUDY ON THE COOPERATION IN RESEARCH - DEVELOPMENT – INNOVATION ACTIVITIES IN ROMANIAN AGRICULTURE

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Abstract

The societal challenges in 2020 horizon are represented by food security, sustainable agriculture and bioeconomy. Romania, as member of European Union, has as objective the competitiveness development in agriculture area, through integration of innovation in business environment. Many research studies proved that the performance of innovation process is directly influenced by the cooperation between business environment, research organizations and other catalytic entities. The paper scope is to highlight the cooperation capacity in the innovation process in Romanian agriculture. The analysis carried out is based on finding answers to the following questions: Which is the level of research - development – innovation (RDI) cooperation in Romanian agriculture? Which are the opportunities for financing the cooperation projects in the 2014 – 2020 period? What is the interest of agricultural entrepreneurs to collaborate with research organizations? The research methodology was based on: documentary analysis, socio – economic investigation and multiple correspondence analysis. The results revealed the existence of a poorly developed network of cooperation between research environment and business in Romanian agriculture. The advantages of firms involved in these partnerships consist in access to high quality RDI services (eg. elaboration of soil studies with the latest equipment, by the partner research institutes), transfer of scientific information from the research environment, access to input suppliers networks and customers networks etc. Farmers specialized in different branches of agriculture have common interests in the production area, market and innovation. For example, their interest is to get the higher production in terms of quantity and quality, to charge a price increasingly better and to perform minimal consumption on inputs, with maximum effect in outputs. Cooperation between business and research organisations from agriculture has a very important place at the level of programs and funding measures which are promoted by the European Union. Thus, they stimulate by European funds the partnerships between various categories of economic actors in agriculture and related fields. In the future we believe that there is a high potential for cooperation in this economic field.

Key words: cooperation, research and development, innovation, agriculture

The agricultural sector is subject to significant challenges in terms of economic competitiveness and also protecting the environment (Leaver J.D., 2010). Facilitating farmers' access to innovative technologies is vital for the success of companies in the sector on the global market. Innovations in agriculture evolves as a result of interaction between different economic actors, like farms, suppliers of inputs, public organizations, civil society, research organizations etc., defining the innovation systems in agriculture (Klerkx L. *et al*, 2012). At EU level, through the development policies, farmers and other economic actors in agriculture and rural development are encouraged and financially supported to innovate and collaborate with research organizations for integrated research - development activities.

Developing a cooperation network between research environment and business environment in Romanian agriculture is a key element of increasing competitiveness in Romania's agricultural sector. Due to the increasing complexity of the processes that generates innovation and technical progress, companies are becoming increasingly dependent on external sources of research - development - innovation (eg. the technical expertise of researchers, the equipment and research equipment of research organizations) (Bougrain F. and Haudeville B., 2002). Various empirical studies have confirmed the positive impact of cooperation on innovation performance growth, which is measured by the share of innovative products and processes released on the market (Maurasse D.J., 2013; Lööf H. and Heshmati A., 2002; Belderbos R. *et al*, 2004). Nevertheless, at the Romanian economy

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level, the relations between business environment and research organizations are still very poor. As outlined in the National Strategy for Research, Development and Innovation 2014 - 2020, the Romanian public research sector has a research offer poorly adjusted to the real economy, respectively a low capacity of attracting private clients.

Based on the results of aforementioned studies, this paper aims to find answers to the following questions:

- Which is the level of RDI cooperation in Romanian agriculture?
- Which are the opportunities for financing the cooperation projects in the 2014 – 2020 period?
- What is the interest of agricultural entrepreneurs to collaborate with research organizations?

MATERIAL AND METHOD

To answer the research problem, the paper used the following methods for data analysis: documentary analysis, socio – economic investigation and multiple correspondence analysis.

Documentary analysis was performed on the following types of documents:

- Official documents (eg. National Strategy for Research, Development and Innovation 2014 - 2020, National Rural Development Programme 2014-2020, etc.);
- Statistical documents (eg. Statistical Yearbook of Romania, Eurostat Reports etc.).

The socio - economic investigation is an indirect method of data collection. It was based on the statistical questionnaire as a tool for data collection. Our demarche during the field research focused on conducting an exploratory study on the level of interest of agricultural companies for collaborating with the University of Agricultural Sciences and Veterinary Medicine "Ion Ionescu de la Brad" (UASVM) of Iasi, în RDI activities within the Research Institute for Agriculture and Environment (ICAM) Iasi. The empirical study was conducted during June to August 2015, at the agricultural business level from North - East and South – East Development Regions. In this area were applied 150 questionnaires to managers of companies in the field. The respondent must meet the following criteria: to be manager of an agricultural business and to conduct business in the vegetable sector. The response rate was 80% and we have received 120 completed questionnaires. The questionnaire consisted of six questions and a section with information about the respondent (residence, age and sex).

The multiple correspondence analysis was used to describe qualitative variables in the statistical questionnaire. It has observations on N qualitative variables X^q ($q = 1 \div N$, $N > 2$), with n

response modalities. In the analysis were included nine qualitative variables with 2 to 4 response modalities which are mutually exclusive.

The variables were simultaneously observed on a sample of 120 individuals. In the analysis it was calculated *The Cronbach's alpha coefficient* (α). Cronbach's alpha coefficient (internal consistency of scales) shows a test measurement accuracy and the fidelity of psychological instruments used.

$$\alpha = \frac{N \times r_n}{1 + (N - 1) \times r_n}$$

where,

N – number of variables

r_n – the average of correlation coefficients

between variables

Cronbach's alpha coefficient can have values between 0 and 1, and 0.7 is the minimum threshold accepted by scholars, so that the scale to be considered consistent and relevant.

RESULTS AND DISCUSSION

The analysis of cooperation in innovation process between research environment and business environment in Romanian agriculture is based on a study which includes the following parts:

I. Analysis of the current degree of cooperation in research - development – innovation (RDI) field;

II. Analysis of financing opportunities of cooperation in RDI, as part of projects financed in the programming period 2014 – 2020 (COP, NRDP);

III. Carrying out the field research through a socio – economic investigation based on questionnaire.

Analysis of the current degree of cooperation in RDI field

The research activity of public research organizations and private innovative companies, was supported in the period 2007 - 2013, especially through the Sectoral Operational Programme Increase of Economic Competitiveness (SOP IEC), Priority Axis 2 - Research, Technological Development and Innovation. According to the lists of grants beneficiaries under the SOP IEC 2007 - 2013, published on the website of NASRI, in this period were contracted in total 675 projects with a total value of over 1,14 billion euro (*table 1*).

We noted from Table 1 that only 39 contracted projects (5.78% of total projects) were in the agriculture field (including agro-food industry) with a total grant of 85 million euro (7.45 % of the total). These projects were contracted in six operations of the eight available under the

program. The most important operation for financing projects in agriculture field was represented by OP 221 - Development of the existing R&D infrastructure and the creation of

new infrastructures (laboratories, research centres), through which were financed 11 projects amounting to 61.37 million euro.

Table 1

Situation of of the research projects contracted through SOP IEC 2007 - 2013, Axis 2

Operations	No. of projects		Overall grant - euro	
	Total, of which:	in agriculture	Total, of which:	in agriculture
OP. 211	59	5	19.091.503	1.828.319
OP. 212	43	4	44.681.516	16.896.787
OP. 221	111	11	790.234.808	61.377.618
OP. 223	11	-	4.732.000	-
OP. 224	77	10	24.977.974	808.809
OP. 231	147	5	24.126.627	870.449
OP. 232	89	4	125.898.640	3.632.629
OP. 233	138	-	112.010.692	-
TOTAL	675	39	1.145.753.760	85.414.611
Pondere	100%	5.78%	100%	7.45%

Source: National Authority for Scientific Research and Innovation - NASRI - The beneficiaries of grants under the SOP 2007 - 2013, own calculations

Through these projects have been upgraded or created major research infrastructures in universities and other research organizations, representing the necessary technical basis for the partnerships with the business environment. Also, through the projects developed under OP 211 - Joint R&D projects between universities/research institutes and enterprises and OP 212 – Complex research projects fostering the participation of high-level international experts, it was strengthened the ability to cooperate both with the private sector and international research organizations, by attracting foreign researchers. The grants have facilitated investments in last generation research equipment, in performant laboratory which can compete with those from countries called leaders of innovation (Norway, Sweden, etc.). Moreover, partner enterprises had benefited from the access to knowledge, to research facilities of public entities and to researchers expertise.

Along with the research projects supported by SOP IEC, a great importance for developing the innovation and cooperation potential in agriculture, is given to the innovation clusters. A leading proponent of the cluster concept is M. Porter (2000) which defines it as "*geographic concentration of interconnected companies and institutions, in a particular field*".

The cluster is a social community specializing in the creation and transfer of knowledge, respectively is a network of independent economic actors sharing the same geographical location and market segment to achieve common strategic objectives, including innovation (Boschma, R.A. and Martin, R., 2010; Mudambi, R. and Swift, T., 2012). Partnerships formed by clusters include four types of

organizations, following the "*four-leaf clover*" model, respectively: companies in the industry - research organizations - public authorities - catalysts (Cosnita D. and Guth M., 2010). In Romania, in the agriculture field (including agro-food industry) are currently six clusters shown in Table 2.

Table 2

Romanian clusters in the agriculture field

Cluster	No. of partners			
	PE	RO	P	C
AgroFood Crisana Banat	3	5	3	6
AGROPRO Oltenia Cluster	16	3	4	1
Agro-Food Regional Cluster	25	5	6	15
Agro Transilvania Cluster	22	2	1	3
Ind Agro Competitiveness Pole	14	16	2	8
IND AGRO VEST	12	4	0	0
TOTAL	92	35	16	33

Source: Romanian Cluster Association

PE – private enterprises; RO – research organizations; P – public authorities; C – catalysts

According to Romanian Cluster Association, in the six clusters from agriculture field are engaged 176 partners, of which over 50% are private enterprises, and 20% research organizations.

We see a very small number of companies that were involved in cluster partnerships, which indicates a reduced capacity for cooperation and change from Romanian companies, and also an insufficient promotion of these entities. In other words, many companies do not have the necessary information on cluster joining opportunities and benefits of such a partnership.

Companies adhere to cluster desiring to improve the economic performance, to change and innovate, with an attitude of openness and cooperation (Rubach S. *et al.*, 2014). The advantages of firms involved in these partnerships consist in access to high quality RDI services (eg.

elaboration of soil studies with the latest equipment, by the partner research institutes), transfer of scientific information from the research environment, access to input suppliers networks and customers networks etc. Farmers specialized in different branches of agriculture have common interests in the production area, market and innovation. For example, their interest is to get the higher production in terms of quantity and quality, to charge a price increasingly better and to perform minimal consumption on inputs, with maximum effect in outputs.

Analysis of financing opportunities of cooperation in RDI

The literature confirms that lack of resources is one of the main factors that inhibit the activity of innovative companies (Fakhri S. and Bahoussa A., 2014; Božić, Ljiljana, 2011; Tiwari, A.K. *et al*, 2007).

As innovation is a priority of EU development policy in 2020 horizon, the economic

actors in various fields can benefit from grants for RDI activities. Analyzing the strategic programming documents for the 2014 – 2020 period, of EU and Romania, we extracted the main opportunities for financing the RDI projects in the agricultural sector (*table 3*).

The 16 Measure - Cooperation is dedicated exclusively to projects in agriculture filed, while the priority axes of the *Regional Operational Programme (ROP) 2014-2020* and *Competitiveness Operational Programme (POC) 2014-2020* supports projects included in health area and in the areas of smart specialization: bio-economy (agriculture); information and communication technology, space and security; energy, environment and climate change; eco-nano-technologies and advanced materials.

Table 3

Main european funding sources for RDI projects for 2014 – 2020 period

Program/ Measure – Axis	Total budget (euro)	Main result indicators
NRDP 2014 – 2020/ M16 - Cooperation	31.134.556	- 24 operational groups - 187 other cooperation operations
ROP 2014 – 2020/ PA 1 - Technology transfer	175.531.915	- 60 technology transfer units - 600 SMEs benefiting from technology transfer services
COP 2014 – 2020/ PA 1 - Research, Technological Development and Innovation (RDI)	797.872.340	- 18 scientific public-private co-publications / 1 mil. loc. - 270 mil. euro contribution from Horizon 2020 attracted by Romanian entities - 420 enterprises supported - 437 new researchers in enterprises supported
TOTAL	1.004.538.811	

Source: NRDP 2014 – 2020, ROP 2014 – 2020, COP 2014 – 2020

Given our research problems, we will analyze the capacity of cooperation in agriculture through the National Rural Development Programme 2014 - 2020, M16 - Cooperation through operational groups (OG) and other types of partnerships.

The operational group is a partnership between farmers, research organizations, universities, consultants and other relevant economic actors in the agricultural sector (eg. banks, suppliers of agricultural inputs etc.). Its aim is to develop the innovation degree in the agricultural sector and to increase the competitiveness at European level.

Specifically, through this measure will be developed pilot projects, new products and processes, will be stimulated the transfer of ideas and best practices, will be facilitated the farmers's access to agricultural inputs, to finance sources and to markets. In these projects, it will play an important role the public research organizations from Romania, in agriculture field, which will provide technical resources (laboratories,

equipment, installations etc.), human resources (academics, researchers) and information (databases, know-how etc.), required by RDI activities. There will also be stimulated and projects carried out by partnerships for horizontal and vertical cooperation between actors in the supply chain, for example, farmers, processors, food traders etc.

Accessing European funds to develop innovative capacity of the agricultural sector will reduce costs of production factors, will increase the economic returns (by optimizing the use of resources, implementation of new agricultural technologies, etc.) and will add value to obtained production (quality, diversity and larger quantities). Promoting the agricultural products and the local brands is a key element in increasing economic importance of agriculture in Romania. The formation of operational groups and other partnerships is a prerequisite for the future development of new clusters of innovation, through which Romanian agriculture may increase its international competitiveness.

CONCLUSIONS

The specialized studies demonstrates the priority role of the cooperation between research environment and business environment, in the area of economic growth and development.

Cooperative relationship between research environment and business environment is the accelerator of economic growth and development through knowledge transfer. In this regard, enterprises are increasingly dependent on external sources of research - innovation.

The access to knowledge is achieved through partnerships. The analysis of the ability to achieve partnerships in the agricultural sector of Romania used the information relating to the existing partnerships, the research environment offer and the requirements of private economic environment.

In the field of agriculture there are six partnerships as clusters, mainly geographically located in West and Central Development Regions of Romania. This number is very low compared to the existing potential

The requirements of private economic environment, to access knowledge are a function of size and type of manager. Thus, companies with a holding of less than 500 hectares, whose manager has no specific studies are not willing to cooperate with research organizations. In contrast, large firms led by managers with agricultural education, present a high interest for partnerships.

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