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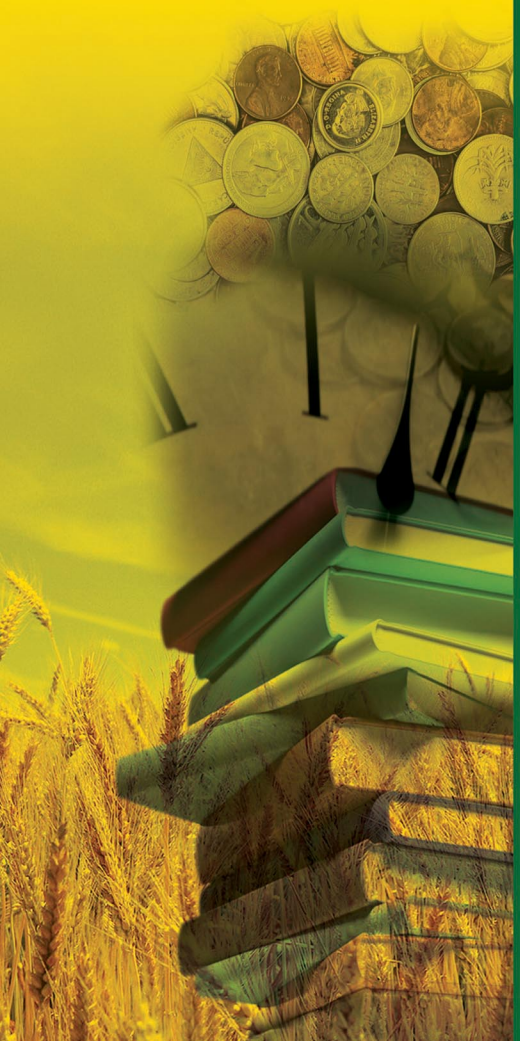

FINANCING THE RESEARCH AND DEVELOPMENT ACTIVITY FOR THE AGRI-FOOD SECTOR AND RURAL AREAS

Adam Wasilewski[1], Anna Wasilewska[2]

Abstract

The objective of the study was to assess the level of acquiring funds from the Horizon 2020 programme by Polish institutions carrying out agricultural and rural development projects and to assess the internal financing of research in the field of agricultural science. For this assessment, we used primarily the studies on the literature of the subject and carried out an analysis of acquiring funds for research from the Horizon 2020 programme as well as of internal financing for the research and development activities. Based on these studies, it has been found that a consequence of the current scale of financing for the research and development activities could be a significant slowdown in the transfer of new knowledge and innovation to the agri-food sector and to rural areas, which, in turn, could be a barrier to implementing the concept of smart rural development.

Key words: research and development, financing sources, internal expenditures, Horizon 2020, knowledge transfer, innovations.

JEL[3]: O38, I25

Introduction

One of the key priorities defined by the European Union in the Europe 2020 Development Strategy is smart development, which is mainly the result of the transfer of knowledge and innovation to various sectors of the economy. A similar approach is presented by the European Commission towards the food economy and agriculture after 2020. In the document entitled "The future of food and farming" (European Commission, 2017a), the dissemination of research and innovation in economic practice and in the markets is envisaged. The transfer of knowledge and innovation is to apply to virtually all areas of pursuing economic activity, e.g. farming, livestock rearing and breeding, zoo-technics or issues related to the vertical integration of agriculture. It is also planned to build a system of so-called

1 Adam Wasilewski, Ph.D., Assistant Professor, Institute of Agriculture and Food Economics - National Research Institute, Swietokrzyska Street no. 20, 00-002 Warsaw, Poland, Phone: +48 22 505 44 19, E-mail: Adam.Wasilewski@ierigz.waw.pl

2 Anna Wasilewska, Ph.D., Assistant Professor, Warsaw University of Life Sciences, Faculty of Economic Sciences, Nowoursynowska Street no. 166, 02-787 Warsaw, Poland, E-mail: anna_wasilewska1@sggw.pl

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smart villages. These objectives challenge the research sector of all European Union countries as a prerequisite is the continuous development of the research activities. These challenges also apply to Polish institutions in the research and development sector (Dworak et al., 2016). The smart development of rural areas and agriculture in Poland will require the use of knowledge resources that arise both at the European Union and national level. The involvement of Polish scientists and researchers in its creation at the Union level should also facilitate access to this knowledge to all entities involved in implementing the concept of this development.

Creation of new knowledge resources and the adaptation of existing ones to the economic practice requirements require the financing for the research and development activities which is provided at the Union level, by the Horizon 2020 programme and at the national level, by state budgets. Participation of the research and development institutions from the individual Member States in the Horizon 2020 programme and the internal financing of their activities can consequently lead to the differentiation in the rate of smart rural and agricultural development. For this reason, the objective of the study is to assess the degree of acquiring funds from the Horizon 2020 programme by Polish institutions carrying out agricultural and rural development projects and to assess the internal financing of research in the field of agricultural sciences.

The assessment used mainly the studies of the literature of the subject and methods of descriptive and comparative analysis. In addition, the analysis of correlation, regression and linear trend model were used. The empirical material were the data and information on research projects related to agriculture and rural development, implemented under the Horizon 2020 programme, which were acquired from the CORDIS database as of 10th October 2017. In addition, the Eurostat statistical data was used in the studies.

Theoretical basis

The studies focused on assessing the level of financing the research and development sector in Poland. The scale of financing for this sector has a direct impact on improving the level of knowledge and skills of employees and on the level of innovation of the Polish economy, which is currently very low (European Commission, 2017b). Innovation must also be improved the agri-food sector, whose competitiveness results mainly from low labour costs (Wigier, 2014; Szczepaniak, 2017), while being characterised by the relatively low labour productivity (Wasilewski, 2016). It becomes necessary to step up the activities related to extending the existing knowledge resources, adapting the existing solutions to Polish conditions and transferring knowledge to economic practice if the concept of smart rural development is to be implemented. In the economic literature, we can find many justifications for this statement. It has been proved, *inter alia*, that qualifications and skills of employees are factors of improving the productivity of real capital (Boeke, 1953; Schultz, 1962;

McClelland, 1962; Hagen, 1963; Firszt, Jablonski, 2016). In turn, the improvement in the skills and qualifications, acquired as a result of the knowledge transfer, determines technical progress (Kondonassis et al., 2000; Firszt, Jablonski, 2016). Some authors even state that human capital can have, in a long term, a stronger impact on the economic growth than real capital (Caballe, Santos, 1993; Galor, Moav, 2004).

In the endogenous theory of economic growth, it is assumed that the process of creating new technologies is an endogenous factor and stems from the decisions and activity of entities in the economy (Firszt, Jablonski, 2016). One of the most important stimulants of this process is investments in the research and development sphere (Romer, 1990; Aghion, Howitt, 1992; Caballero, Jaffe, 1993; Aghion, Jarave, 2015). It follows from this theory that the rate of creating new knowledge and its transfer to economic practice depends on the level of financing for this sector. Therefore, an important issue is to provide the research and development activities which include basic research, applied research and development work, with a sufficiently large scale of investments. However, in Poland, as opposed to the Western European countries, the state budget plays a dominant role in financing this activity (Prystrom, Wierzbicka, 2015; Wasilewska, Wasilewski, 2016). In view of the low level of innovation of the Polish economy, there is a need for a significant increase in expenses for this activity. It is assumed that the business sector should play an increasing role in this financing through self-financing or own external financing (Prystrom, Wierzbicka, 2015). Nevertheless, in the agricultural sector this can be difficult to achieve or simply unreal. The agrarian fragmentation, dependence of income on direct payments or lower income of the rural population can severely reduce the possibility of non-budget financing for the research and development activities. Meeting by Poland of the criteria for the small rural and agricultural development will be associated primarily with the level of financing this activity by the state budget or the European Union budget.

Considering the issue of financing the creation and transfer of knowledge and innovation to economic practice, it is worth paying attention to the approach of the representatives of the New Institutional Economics to this problem. According to North (2005), the competition restricts the organisation's motivation to invest in new knowledge and consequently does not result in sudden institutional changes. In turn, the strong competition accelerates institutional changes. Due to his considerations, the author further states that the reason for improving the efficiency is generally the competition and that the measure serving this goal is improving the level of knowledge. If the competition is negligible, support for the enterprise development by financing the knowledge transfer may have negligible effects, as companies will not be motivated to use this knowledge. Different effect will be in the highly competitive environment. Direct transfers of funds to selected companies can lead to the elimination of competitive companies and, in a long term, limit the willingness to invest in new knowledge, due to the lack of sufficient competition. However, under certain conditions, such transfers may have a positive effect. This situation will appear

when in the conditions of negligible competition these transfers will contribute to the emergence of new companies, which will motivate existing companies to improve their efficiency by absorbing new knowledge.

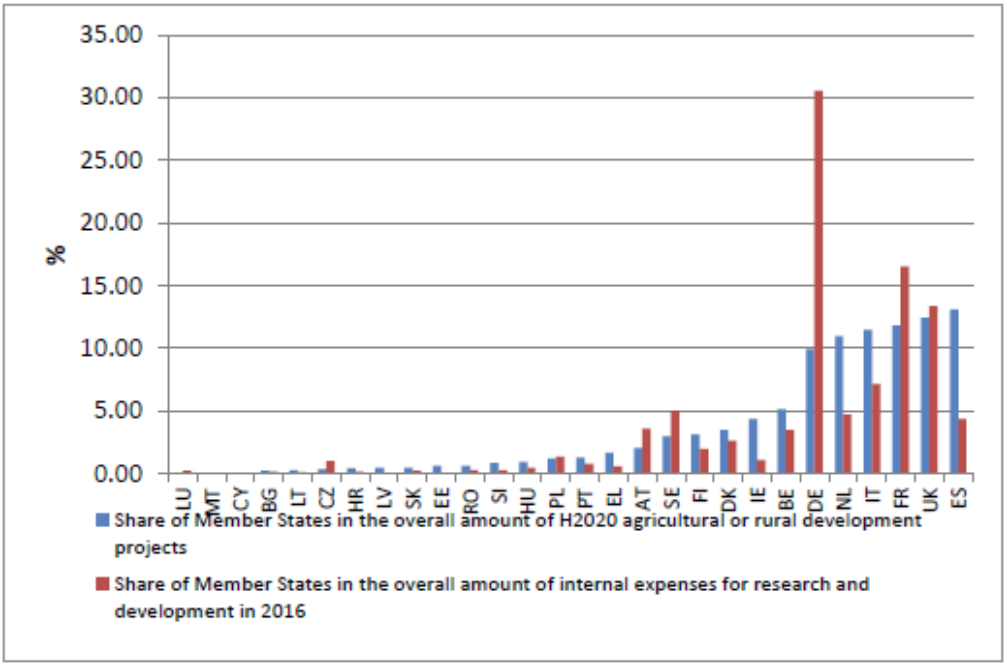
Financing the research and development activities

The provision of financing for the research and development activities is a prerequisite for the creation and transfer of new knowledge to the economic activity and for the broadly understood improvement of innovation. This applies to all sectors of the national economy, including also the agri-food sector. In 2016, the total internal expenses of the EU Member States for research and development amounted to nearly EUR 303 billion. In Poland, around EUR 4.3 billion in 2015 and about EUR 4.1 billion in 2016 were allocated for this purpose. In 2015, agricultural sciences received an amount of nearly EUR 200 million as part of the internal financing which accounted for about 4.5% of total expenses for the research and development activity.

Since the accession of Poland to the European Union, an important source of knowledge for the agri-food sector and the broadly understood rural economy may be the results of studies conducted by international research teams, which are financed from the common budget. Participation of Polish research institutions in EU programmes may also reflect to some extent the possibilities of this sector in the field of providing services to economic practice. Since 2014, the Horizon 2020 programme has been implemented, where 194 projects include research on the development of agriculture and rural areas. This research is participated in by 1,637 research institutions, including 1,398 from the European Union countries. The total budget for these projects is about EUR 402.8 million, of which EUR 369.5 million are the budget of institutions from the European Union countries.

The analyses carried out show that the involvement of Polish institutions in research for the development of agriculture and rural areas, including the improvement of innovation in the rural economy, is low. This research involves only 30 institutions, i.e. about 1.8% of all institutions. Their total budget is around EUR 4.3 million, accounting for 1.1% of the overall budget for agricultural and rural development projects and 1.2% of the budget of institutions of the European Union Member States (Figure 1.). Poland in terms of the resources acquired under the Horizon 2020 programme for the above objectives is ranked only fourteenth among the EU countries. The scale of funds acquired under the Horizon 2020 programme to a certain extent reflects the scale of overall internal expenses for research and development. This means that most financial resources from this programme are acquired by institutions from these countries, which incur much higher internal expenses for the financing of the entire research development sector (Figure 1.).

Figure 1. Internal expenses for research and development and acquisition of financial resources from the Horizon 2020 programme for agricultural or rural development research in the European Union countries



Source: Own calculation based on CORDIS and EUROSTAT data.

In the case of Poland, the share of internal expenses in internal expenses of the EU Member States for research and development is less than 1.4%. In other words, the share of funds acquired by the Polish research institutions in the budget of projects related to agricultural and rural development is at a similar level as the share of Poland in the total amount of internal expenses of the EU countries for the research and development activities.

When analysing the distribution of the Horizon 2020 funds among the European Union countries and the scale of their internal expenses for research and development (Figure 1.), attention should be paid to one more issue. In the group of the largest programme beneficiaries two types of countries can be identified. The first type, an example of which are Germany and France, the relative level of expenses for research and development significantly exceeds the relative level of funds acquired under the Horizon 2020 programme for agricultural and rural development projects. It can therefore be assumed that these countries attach more importance to internal financing. However, the result is also the relatively large scale of EU funds acquired. The other type, which may include primarily Spain, Italy and the Netherlands, has

a reverse situation, namely, the relative level of EU funds acquired is significantly higher. This means that these countries attach much more importance to international research projects.

The existence of a substantial relation between the level of internal expenses for research and development and the level of funds acquired from the Horizon 2020 programme for agricultural and rural development research is confirmed by the regression analysis carried out. The analysis shows that this relation can be represented as a function:

$$y = 6{,}94 + 0{,}0006x$$

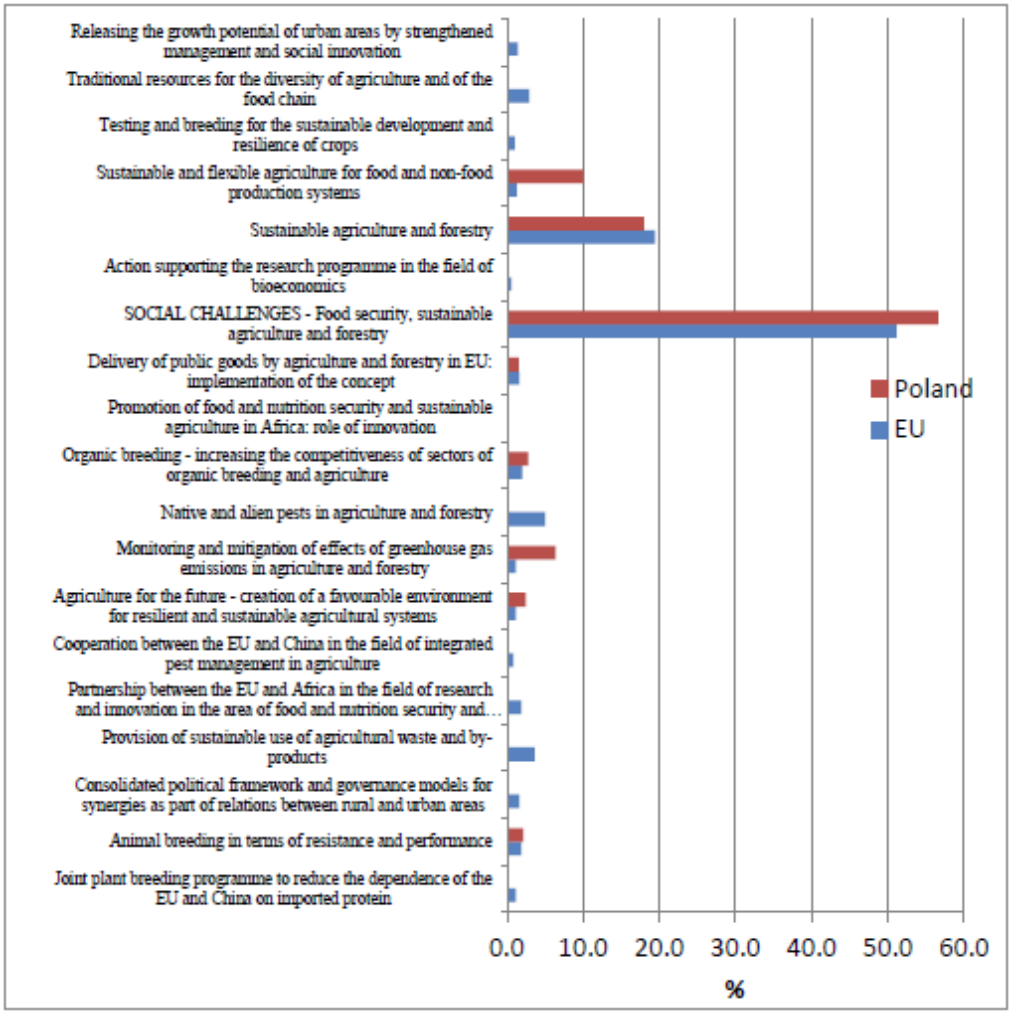
where:

x - internal expenses for research and development;

y - funds acquired under the Horizon 2020 programme for agricultural and rural development research.

The coefficient of determination (R2) for the above relation is 0.49 and is statistically significant. In view of the above, it can be concluded that the increase in overall internal expenses for research and development in the European Union countries by EUR 1 million leads to an increase in funds acquired from the Horizon 2020 programme for agricultural and rural development research by about EUR 600. Therefore, financing by a given country for the broadly understood research and development activities brings tangible benefits in a form of the higher involvement of research teams in international research. In other words, the increase in internal expenses for this purpose generates for the economy, on the one hand, a refund of partial expenses incurred and on the other – the increase in knowledge resources to which this economy or sector thereof has access. Increasing the knowledge transfer to economic activity, including the agri-food sector, and improving innovation require a significant increase in internal expenses for research and development.

Figure 2. The share of individual types of research in the total amount of the Horizon 2020 programme funds, contracted as part of agricultural and rural development projects

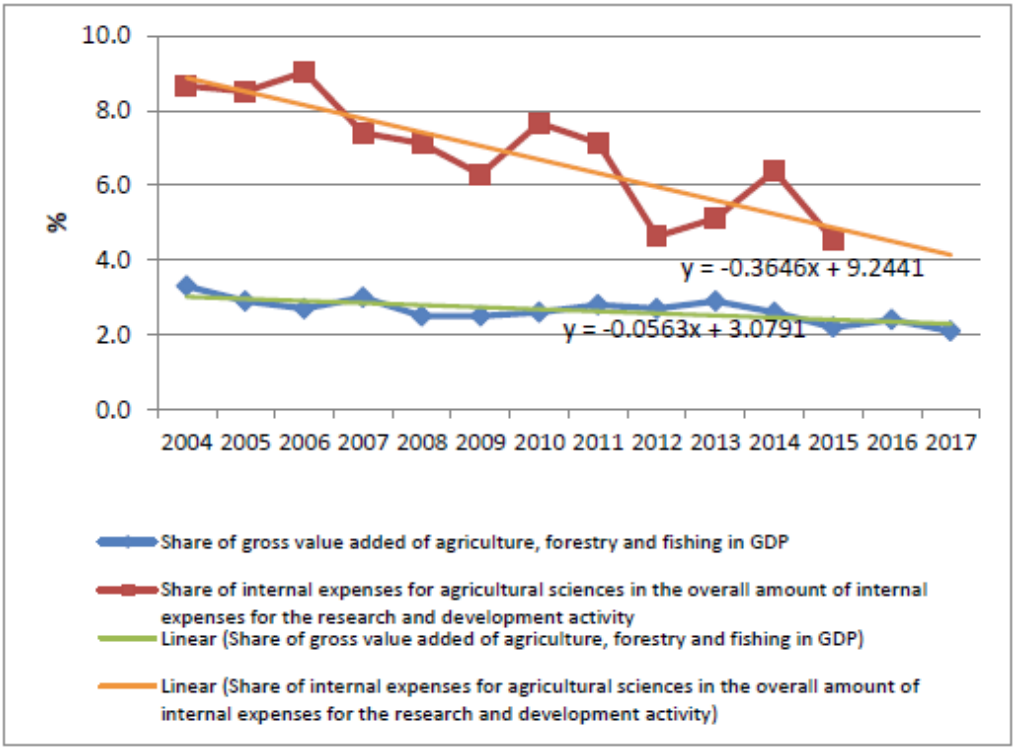


Source: Own development based on CORDIS data.

Considering, in turn, the structure of financial resources acquired by Polish research institutions from the Horizon 2020 programme for rural development projects (Figure 2.), it should be noted that much of these funds are allocated for research related to social challenges i.e. food security and sustainable agriculture. Polish institutions also undertake research covering the ecological aspects of agricultural production, including those relating to the prevention of environmental pollution by this sector. However, in many areas financed under the Horizon 2020 programme, there is no involvement of Polish institutions at all. Examples include research aimed

at strengthening governance and social innovation in rural areas, research on the diversity of agriculture and the food chain, or research in the field of bio-economics. Polish research institutions also do not implement projects involving cooperation with non-European countries. The result of the non-involvement in the specific areas of research could be the lack of economic benefits for Poland. It is therefore important to identify and eliminate the reasons of the phenomenon. As already indicated, one of the barriers may be the insufficient level of internal expenses. However, it can be assumed that it explains this phenomenon only in less than 50%. On this basis, it is necessary to assume the existence of other barriers to participation of Polish teams in international projects. An example of a different barrier can be, as often indicated by the research and development sector, a system for the parametric assessment of units in which the assessment of participation in such projects and the assessment of cooperation with economic practice are inadequate to expenses incurred.

Figure 3. Gross value added in agriculture, forestry and fishing and internal expenses for agricultural sciences in Poland



Source: Own development based on the EUROSTAT data.

When analysing the financing for the research and development activities to the benefit of the agri-food sector, it is still necessary to pay attention to the relationships between the share of these expenses in overall expenses for the research and development sector and the share of agriculture in GDP (Figure 3.) The Eurostat data shows that in recent years the share of expenses for agricultural sciences has been two times higher than the share of added value of agriculture in GDP. It could therefore be assumed that this level of financing should be acceptable to research institutions in this sector. However, given the low level of overall expenses for research and development and a stronger downward trend in the share of expenses for agricultural sciences (about 0.36 percentage point per year) than in the case of the share of agriculture in GDP (about 0.06 percentage point per year) it should be concluded that the transfer of knowledge and innovation to this sector may be very limited in the coming years. In turn, the lack of innovation and the growing labour costs in the sector can lead to a significant decrease in the competitiveness of agricultural products both in the domestic and EU markets. This will in turn be a barrier to the implementation of the concept of smart development.

Summary and conclusions

The studies showed that the transfer of new knowledge to the economy contributes to improving the productivity of real capital and stimulates technical progress. This theoretical approach applies to all sectors of the economy, including the agri-food sector. The creation of new knowledge and innovative solutions, as well as their transfer to the agri-food sector, require considerable financial inputs. The vast majority of expenses for research and development in Poland are financed by the state budget. Since the accession of Poland to the European Union, it is also possible to use EU programmes for this purpose. However, the analysis of the distribution of funds for research on agriculture and rural development shows that the involvement of Polish institutions is low. The acquisition of funds from this source is also dependent on the overall level of internal expenses. In the case of expenses for agricultural sciences, there is also a relatively strong downward trend in their share in overall expenses for research and development. A consequence of the current scale of financing the research and development activities can be a significant slowdown in the transfer of new knowledge and innovation to the agri-food sector and to rural areas, which can be a barrier to the implementation of the concept of smart rural development.

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