FINANCING MECHANISMS FOR RESEARCH INSTITUTES IN THE FIELD OF AGRICULTURE IN LATVIA

Marta Meženiece[1], **Santa Feifere**[2], **Baiba Rivža**[1]
[1] Latvia University of Agriculture
[2] University of Latvia
marta.mezeniece@izm.gov.lv; santa_feifere@inbox.lv; baiba.rivza@llu.lv

Abstract. Latvia is a territorially small country with small open economy, and its main and the most competitive recourses are highly educated society and well developed science which is based on research, innovation and modern technologies. To create a well functioning innovation system as a part of knowledge-based economy, several conditions has to be met to insure that all parts of national innovation system effectively work together. This article is dedicated to analysis of financing mechanisms that can be used by research institutes in the field of agriculture in Latvia to ensure sustainable rural development. The research in the field of agriculture in Latvia is mainly performed by the state research institutes and research agencies of Latvia University of Agriculture. To provide favourable environment for development of research and science, there is set legislation framework and financing mechanisms such as base financing from the state budget, state research programmes, European Commission Framework Programmes, and the European Union (EU) Structural Funds assistance. The analysis has shown that support of EU Structural funds has positive impact on number of applied research carried out in research institutes in the field of agriculture in Latvia. EU Structural funds assistance helps to develop fundamental research activities and innovative approach to the science that is one of the preconditions for the development of states' competitiveness. In conclusion, the authors resume that it is necessary to establish a strong link between higher education institutions, research institutes, and entrepreneurs in the process of building effectively working national innovation system.
Key words: research policy, financial mechanisms, research institutes, innovation.

Introduction

Latvia is considered to be a country in transition between efficiency driven and innovation driven economy according to Global Competitiveness report 2009-2010. This means that the development of the country soon would be impossible by improving productivity adopting existing technologies or making incremental improvements in other areas. The role of country's competitiveness will be in its ability to innovate. Firms in these countries must design and develop cutting-edge products and processes to maintain a competitive edge. This requires an environment that is conducive to innovative activity, supported by both public and private sectors. In particular, this means sufficient investment in research and development (R&D) especially by the private sector, the presence of high-quality research institutions, extensive collaboration in research between universities and industry, and the protection of intellectual property. In the period of crisis, it will be important to resist pressures to cut back on the R&D spending both at the private and public levels that will be so critical for sustainable growth going into the future (Global Competitiveness..., 2009).

There are several authors in Latvia that have been writing about innovative activities (Boļšakovs, 2008), innovation process and system (Dimza, 2003), knowledge society (Karnītis, 2004), higher education institution's role in economic development (Sloka and Vilciņa, 2009), (Mazūre et al., 2009), Many studies on the research policy topic are carried out in the world about – interactions between technology imports, educational attainment and local R&D efforts (Teixera and Fortuna, 2010), more educated society and introductions of new technology (Hanushek, 2004), science, technology, innovation and growth systems, and choose between neutral versus non-neutral instruments (Aghion et al., 2009), science policy issues (Beeseley, 2003), national innovation systems (Freeman (1995), learning organisation and national systems of competence building and innovation (Nielsen and Lundvall, 2002; Lam and Lundvall, 2007), multilevel system approach for analysing national innovation systems (Smith et al., 2010), but there is lack of studies in the field of research policy that concentrates on Latvian national research system as a part of national innovation system.

One of five science priority areas stated in the direction issued by the Cabinet of Ministers of Latvia on the science priority areas in basic and applied research financing for the year 2010-2013 is the sustainable use, new products and technologies on local resources (subsoil, forests, food and transportation).

Regarding this, it is topical to perform research about financing mechanisms that are available to research institutes whose scientific activities are performed in the field of agriculture int. al, forest, and food.

In order to establish preconditions for prosperous growth of innovative actions, the authors are of the opinion that deeper research is needed about research institutes' abilities to develop in Latvia. To illustrate the Latvian research policy, the authors, as an example, use research institutes in the field of agriculture and their facilities to take advantage of available financial mechanisms.

The aim of the study is to detect obstacles that impede the use of financial instruments that are

available for research institutes operating in the field of agriculture.

To reach the aim the authors set the following targets:

Analyse current situation as well as political, economic, social, and technical aspects that influence research institutes operating in the field of agriculture.

Investigate external threats and opportunities, as well as internal strength and weaknesses of the research institutes operating in the field of agriculture.

Organise two questionnaires to find out financial mechanisms that are currently used, and what the research institutes plan to use in the near future. Evaluate and analyse the results of the survey.

Elaborate suggestions for use of various financing mechanisms that are available for the research institutes in the field of agriculture to enhance their development.

The research in the field of agriculture in Latvia is performed by six state research institutes, four research agencies of Latvia University of Agriculture, and seven private research institutes. This article concentrates on analysing state research institutes and state university research institutes performing research in the field of agriculture. Five out of ten state research institutes and Agencies of Latvia Agricultural University are located in Riga region; other research institutes are spread around all regions of Latvia except Latgale – two in Vidzeme, two in Zemgale, and one in Kurzeme.

There are several financial instruments available for research institutes which differ by source and aim. The main financial instrument that the government uses to implement the research and development policy is base funding. The aim of base funding is to ensure scientific activities and development in the state research institutes and state university research institutes, as well as to cover maintenance costs of research institutes and salary expenses for scientific staff. Considering the regulation of the Cabinet of Ministers of Latvia on the base financing appropriation for the state research institutes, state higher education institutions, and state higher education institution's research institutes Ministry of Education and Science calculates the base funding yearly on the ground of previous year performance of research institutes and taking into account qualitative indicators, such as variety and number of projects implemented, researchers employed, number of scientific publications, patents registered, doctoral and master theses elaborated, and percentage of young scientists employed.

Other funding provided by the state budget are grants of Ministry of Agriculture to support education, science and information dissemination in the field of agriculture and livestock breeding and grants supported by Latvian Council of Science to ensure definite project implementation awarded in competitive conditions. State budget alternative is financial support from European Structural Funds and Framework Programme 7. State loan is an option available for state research institutes to borrow financial resources to ensure developmental project completion also as substitute to commercial bank loans. The result of collaboration with entrepreneurs and investors from private sector can conclude contracts and attract additional financial resources to the research institutes.

Materials and Methods

The authors investigated situation of research institutes in Latvia and research institutes facilities to attract available financial mechanisms using PEST (Political, Economic, Social, and Technical) and SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis. PEST analysis which measures market and operation potential according to external factors was used to understand the political, economic, socio-cultural and technological environment affecting research institutes (SWOT alongside PEST/PESTLE can be used as a basis for the analysis of business and environmental factors). Using PEST analysis results, the SWOT analysis provided a framework for reviewing current research institutes development strategy, position and direction. As follows the authors did elaborate alternative suggestions for development of research institutions.

The research methods envisaged to detect the article is a monographic descriptive method; analysis and synthesis are used in the paper to study the problem elements and synthesize coherence. The authors studied legal framework in Latvia and scientific publications in research policy. Induction method is used for summarising individual facts in general statements, but deduction method for theoretical explanations and logical synthesis of the empirical study.

The investigation of research institutes in Latvia is based on statistical data obtained from Central Statistical Bureau of Latvia, Eurostat and the information included in research institutes' reports (year of 2008) acquired from Ministry of Education and Science during the last available period.

The authors organised two questionnaires in December 2009 during annual general meeting of Latvia Academy of Agricultural and Forestry Sciences in Jelgava and during informative seminar of the European Union 2007-2013 planning period ERDF activity 'Support to international co-operation projects in research and technologies (EUREKA, 7th FP, etc.)' in Riga, whose target group was employees and heads of the research institutes, as well as experts working at the state universities. Total number of questionnaires respondents is 40. Random set is representative because respondents work mainly at research institutes in the field of agriculture (63% of respondents). Age structure shows that less than half (45% of respondents) – scientists, leading researchers, project managers, directors working at universities and research institutes, also state research institutes were above 55 years, 26% respondents were above 65 years, and 26% respondents working in institutes or writing a project for university or research institutions were aged between 25 and 34 years. The number of

women and men participants is almost equivalent (respectively 19 women and 18 men, 3 respondents answers were incomplete).

All data analysis was performed using the statistical methods. Comparative, analytical and historical methods have been mainly used in the paper, taking into consideration the large amount of scientific literature.

Results and Discussion

Using the PEST analysis which measures market and operation potential according to external factors the authors outlined the political, economic, socio-cultural and technological environment affecting research institutes.

The main **political** factors that have an impact on research institutes' ability to develop are: structural reforms carried out in order to accomplish external creditor requirements, level of bureaucracy and corruption, tax policy, and forthcoming parliament elections in October 2010.

Economical factors that mostly influence research institute operation potential are: stage of economic cycle – economic downturn with sharp decrease of gross domestic product growth (the year 2009 - 18% comparison to previous year (Eurostat)), and unemployment rate increase (22.9% unemployed persons as a percentage of the labour force in January 2010 (Eurostat)), with sharp decrease of vacant work places, inflation rate 3.3% year 2009 (Eurostat), decrease in R&D investments both public and private, as well as distribution of the EU structural funds, small size of market for innovative products, low level of solvable consumers.

Socio-cultural factors that influence research institutes' advancement are: ageing of population, ageing of scientists working at research institutes, education system, employment patterns that show that scientists are mainly employed in the public research institute and rarely in the private sector, R&D personnel constituted just 0.54% of the labour force in 2008 (Eurostat), prestige of the science and public opinion about the scientific activities.

The influence of the **technological** environment to the research institutes can be described by those factors – emerging technologies, exports of high technology products as a share of total exports 4.205% in the year 2006 (Eurostat), patent applications to the European Patent Office (EPO) - number of applications per million inhabitants (refer to applications filed directly under the European Patent Convention) 9.84 year 2006 (Eurostat), gross domestic expenditure on R&D in the year 2008 business enterprise sector 27%; governmental 47.3%; higher education sector 2.5%; abroad 23.1% (Eurostat), orientation to science-intensive production, and the increasing role of science-intensive and interdisciplinary areas.

In order to elaborate suggestions for further sustainable development of research institutes in the field of agriculture, the authors did SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis. External threats and opportunities were summarised from previously described PEST analysis, but internal strengths and weaknesses were concluded after detailed analysis of research institute reports for the year 2008.

Strengths: highly qualified researchers and scientific stuff, good practise and elaboration of researches performed, good international reputation, in programming period 2004-2006 of the EU structural funds the infrastructure of research institutes has been improved (the total amount of EU structural funds assistance to the modernisation of the research institutes in the programming period 2004-2006 was 14'347'029 LVL), some of research institutes are strong in patenting.

Weaknesses: a lack of experience in project implementation (lack of the procurement specialist, project managers), lack of public relations activities, week traditions of technology transfer, lack of collaboration with entrepreneurs, lack of practicality, market, and production oriented research, ageing of scientists working at research institutes, brain drain of young scientists.

Opportunities: education system, high proportion of labour force with higher education - 27% of labour force (15-74 years) in 2008 (Labour force..., 2009), opportunity to switch orientation to science-intensive production, availability of the EU structural funds assistance to support practical research projects promoting the integration of research and production and the use of research results, to ensure the development of the capacity of research institutions, development of new co-operation projects and participation in technological platforms, to improve scientific and research equipment and provide the relevant infrastructure in order to ensure a modern material and technical base for research activities at the leading national and regional research centres, develop information system, data basis and academic data transmission network of Latvia, provide science and research resources and their accessibility, thus, promoting the development of the intellectual potential of research and involvement of Latvia science in the unitary European science – total amount of the assistance 188'738'293 LVL in the EU structural funds programming period 2007-2013 (Operational programme..., 2007).

Threats: decrease in R&D investments both public and private, unfavourable tax policy to entrepreneurs investing in R&D, small size of market for innovative products, low level of solvable consumers, comparatively low prestige of the science, and public opinion about the scientific activities, that results in the insufficient number of doctoral students to assure alternation of researchers generations.

There has been no research on all the state funded research institutes in the field of agriculture carried out yet, but Kaufmane et al. (2007) as strength of agro-biotechnology field in Latvia mentions good scientific traditions, research potential and competence in the basic research, as well as good international reputation

and relations. The authors agree with these statements and apply them to all the research institutes in the field of agriculture, while the statements that the partnership of NGO's facilitate the researches, and the researchers working in Latvia the field of agro-biotechnology have a comprehension of technology transfers significance to states economic growth are not fully applicable to all research institutes in the field of agriculture.

If we compare our SWOT analysis of state funded research institutes to the strengths, weaknesses, opportunities, and threats that Beļšikovs S. mentions in his monograph *The Innovative Actions in Latvia* (2008) describing SWOT of Latvian national innovation system such statements as highly qualified researchers (strength), low private and state investment in R&D (weakness), opportunity to switch to orientation to science-intensive production are overlapping with our findings.

One of suggestions is to enhance activities of public relations of research institutes, which would help with communication, community relations, crisis management, customer relations, employee relations, government affairs, industry relations, investor relations, media relations, mediation, publicity, speech-writing, and visitor relations.

Other alternative that would increase the research institutes activity's effectiveness is the structural reform including amalgamation of research institutes in the field of agriculture, establishment of a department of development, with the main functions to develop strategy outline and its implementation, to carry out activities in the field of public relations, to build a dialogue with entrepreneurs and investors, to establish collaboration with the producers, to administrate as well as partly implement institute's projects.

In order to explore the scientists' attitude and vision of the research institutes they represent, collaboration experience with entrepreneurs, use of available financial instruments for research institutes evolution, and to detect obstacles that impede the research institutes development, the authors organised the questionnaire.

Questionnaire results approve assumption that many of the state financed research institutes rely on basis financing and do not see a private funding as a considerable source of funding. The most common answers to the question about research institutes financial resources in the future are the EU structural funds financing, followed by Latvian Council of Science grants and national research programs, and the state budget financing through the basis financing. In regard to that, the government expenditure is reduced, and European Union funds promoted as substitute to the state budget with planning period 2004-2006 experience, research institutes take challenge to apply and implement the projects. Latvian Council of Science grants and other financial resources from the state budget are more easily to be obtained than EU structural funds and other foreign financial assistance.

Analysing reports (year 2008) submitted to Ministry of Education and Science by research institutes operating in the field of agriculture, the authors ascertain that proportion of base funding from the state budget at total funding varies from 5.70 to 46.36% (Table 2).

Table 2

Funding for State Funded Research Institutes in the Field of Agriculture in Latvia, 2008

Research institute	Total funding, LVL	Int.al. base funding from state budget, LVL	Proportion of base funding from state budget at total funding, %
Institute of Agrarian Economics of Latvia	2 435 980	138 800	5.70
Latvia State Institute of Fruit-Growing	1 044 955	175 568	16.80
Latvia State Institute of Wood Chemistry	2 041 600	403 900	19.78
Latvia State Forest Research Institute 'Silava'	2 640 476	354 768	13.44
State Priekuli Plant Breeding Institute	779 926	92 391	11.85
State Stende Plant Breeding Station	757 444	113 308	14.96
Agencies of Latvia University of Agriculture			
Research Institute of Agricultural Machinery	270 001	122 356	45.32
Research Institute of Agriculture	295 453	115 691	39.16
Research Institute of Biotechnology and Veterinary Medicine 'Sigra'	912 482	158 879	17.41
Research Institute of Water and Land Management	137 913	63 942	46.36

Source: research institute reports (year 2008) submitted to Ministry of Education and Science

Table 3

Collaboration with entrepreneurs and impact on research institute development

		Collaboration with entrepreneurs				Total
		bad	neutral	good	very good	
Impact on research institutes' development	none	0	0	0	0	0
	low	0	2	0	0	2
	a little	1	2	9	0	12
	fairly sufficient	2	7	7	0	16
	sufficient	0	1	4	3	8
Total		3	12	20	3	38

According to legislation calculating amount of base finance incorporate research institutes' effectiveness indicators including collaboration with entrepreneurs, and realised projects. Research shows that the most commonly used policy instrument is the public provision of basic research that potentially creates positive externalities that favour industrial applications over the long run (Peneder, 2008). In two questionnaires, the question about obstacle impeding the development of research institutes was organised in two different ways. This question was given as a closed question with a possibility to choose two of the main obstacles mentioned to the first part of respondents. The answers showed that 80% of respondents chose the cut of basis financing from the state budget as one of liability and the second obstacle that impedes the research institutes to develop was the legislation framework (44.45%) and the lack of collaboration with entrepreneurs (44.45%). But the second part of respondents had to answer the same question in an opened way. Then the answers varied more, and 38.18% of respondents named the lack of funding, 16.36% of respondents think that one of the obstacles that delay the research institutes development is the lack of young scientists, 10.91% blamed the legislation framework, 9.09% the lack of collaboration with entrepreneurs, but 25.45% of respondents gave other different answers.

This part of the research approves that assumptions made during SWOT analysis were topical to respondents mind as well.

The data in matrix displayed in Table 3 show that all respondents, except one have pointed out that their research institute collaborates with an entrepreneur. The analysis shows that nearly 60% of respondents consider that resent collaboration with entrepreneurs was positive (very good and good), 32% neutral and 8% as bad. To 63% respondents' opinion, research institute's collaboration with entrepreneurs has a positive impact (fairly sufficient and sufficient) on development of research institute.

Although almost only one tenth of respondents considered previous collaboration with entrepreneurs as negative, there is no definite attitude whether it can impact institutions further development, as well as respondents who considered collaboration as good – estimations vary from a little to sufficient. Most frequent answer was good present collaboration with little impact on research institute development.

The European Commission also underlines that the co-operation with business has to be strengthened. A broad range of research and innovation related actions may be funded, such as regional and transregional clusters, poles of excellence, technology transfer, business support services and actions to develop human capital and help workers and enterprises anticipate and adapt to economic change. Member States can use the EU structural funds in a flexible manner to help to meet their specific needs and exploit the synergies with Framework Programme 7. Innovative actions will also be co-financed by European Agricultural Fund for Rural Development to develop new high quality and value added products and to promote the sustainable use of natural resources. Member States are invited to take full advantage of the EU structural funds and the European Agricultural Fund for Rural Development to strengthen and build strong research and innovation systems (More Research..., 2007).

Therefore, the authors of the research anticipate the growing necessity to make a strong fundamental for national innovation system that would include effectively working research system in collaboration with universities and entrepreneurs that would increase the competitiveness of Latvia.

Questionnaire results denote that research institutes identify changes or improvements needed to ensure the development of scientific activities in Latvia that are related to increase of state budget funding and reduction of bureaucratic barriers or lighten the administrative burden on research institutes as project implementers. Dependence on state budget should be diversified and substituted with other financial mechanisms. More common legislative framework and reduction of bureaucratic barriers in the field of economics and science could promote the collaboration with entrepreneurs.

Conclusions

1. According to the study that is carried out, the authors conclude that the research institutes operating in the field of agriculture mainly use financing from state budgets appropriation as a

base financing and Latvian Council of Science grants and other financing from the state budget that is more easily to be obtained in the current situation.

2. The SWOT analysis showed that the main weaknesses such as lack of co-operation with entrepreneurs, lack of experience in the project implementation, and ageing of scientific staff in the research institutes operating in the field of agriculture as well as threats – decrease in the R&D investments, low prestige of scientific activities, and unfavourable tax policy to entrepreneurs investing in R&D should be diminished using internal strength - highly qualified researchers and scientific stuff – combined with opportunity to switch orientation to science-intensive production and availability of the EU structural funds assistance (total amount 188.74 million lats).
3. The authors of the research propose to enhance public relations activities of research institutes' that would help to establish and develop communication, community relations, customer relations, government affairs, industry relations, investor relations, media relations, publicity. Therefore, a structural reform is needed in order to increase the research institutes activity's effectiveness. This reform should include amalgamation of research institutes in the field of agriculture, establishment of a department of development, whose main functions would be the development strategy outline and implementation, activities in the field of public relations of the research institute, the building of dialogue with entrepreneurs and investors, the establishment of collaboration with the producers, administration and part of implementation of institute's projects.
4. The study shows that one of the main obstacles that impede the research institute development after restricted amount of funding is lack of young scientists. The authors suggest strengthening collaboration between the universities in the field of research involving more and more students of all levels (starting from bachelor to doctoral level).
5. The research shows that in order to attract young scientists to the research institutes, they have to be involved in the implementation of research projects and the mentoring approach could be used to gain good results in the alternation of researchers' generations. The EU structural funds assistance is available to the doctoral students and young scientists.
6. The authors conclude from research that dependence on state budget should be diversified and substituted by other financial mechanisms.
7. In the current situation, the experience of successful examples abroad has to be studied and systemic market oriented national research system established. Moreover, there is a need for the further research about reorganising national education system, national research system, as well as national innovation system that could guarantee sustainable economic development and improve states competitiveness.

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