

INNOVATION SYSTEMS APPROACH AND SUPPORT ELEMENTS FOR INNOVATION IN AGRICULTURE

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Abstract. The formation and development of innovations is unimaginable without some particular system. Innovation systems approaches may be classified as national, regional and sectorial, and individual system elements may be analysed as well. A national innovation system has been created in Latvia, yet no such a system has been established at the level of individual industries of the national economy. The research aim is to develop an innovation systems approach model for the agricultural industry in Latvia and to assess financial support elements. The national innovation system creates prerequisites for a favourable environment for innovation in the country. Three key sectors are distinguished by the innovation systems approach model for the agricultural industry: 1) farmers; 2) national institutions; 3) service, involved institutions and agents. A number of factors hindering cooperation among institutions affect the creation and introduction of innovations in the agricultural industry. Although support elements are available, they are not exploited sufficiently.

Keywords: innovation systems approach, agricultural industry, financial support elements.

JEL code: O13; O31

Introduction

The development pace and effectiveness of innovation processes are determined by the economic environment where the innovation system is implemented and innovative activities take place. The innovation systems approach focuses on interaction among various governance levels in innovative development. Even though the innovation systems approach does not considerably change at various governance levels – the governance and the innovation system may not be evaluated independently of each other, as the government plans the innovation system and implements its policy by harmonising the national, regional, sectorial, public and private interests. The research **aim** is to develop an innovation systems approach model for the agricultural industry in Latvia and to assess financial support elements. The innovation systems approach model was developed for the agricultural industry in Latvia. The financial support elements for innovation were assessed from the perspective of their use and popularity by interviewing entrepreneurs that were engaged in the bioeconomic sector, which was also represented by agricultural enterprises. Both conventional sources of finance for agriculture: bank loans, leasing etc. and custom-made

resources such as, for example, the European Business Support Network, the Horizon 2020 programme etc. are available as support elements for the introduction of innovations.

There are several elements, institutions and actors involved in the process of creating, adapting and exploiting innovations that forms a system known as an innovation system. The term "innovation system" has been rather widely used recently, it can be defined as a network of organisations focused on bringing new products, new processes and new forms of organization into economic use, together with the institutions and policies that affect their behaviour and performance (Enhancing Agricultural ..., 2006). Nowadays, the innovation systems approach is widely used in describing relations among heterogeneous agents in various sectors, including agriculture.

Research results and discussion Innovation systems approach

The innovation systems approach emerged in the mid-1980s as a Schumpeterian perspective that drew significantly from the literature on evolutionary economics and system theory (Speilman, 2005; Agwu et al., 2008). This approach was primarily linked with industry, as it emerged in the times of a rapid industrialisation.

The innovation system may be researched both through the territorial dimension, at national and regional levels, and through the structural dimension, which focuses on individual system elements.

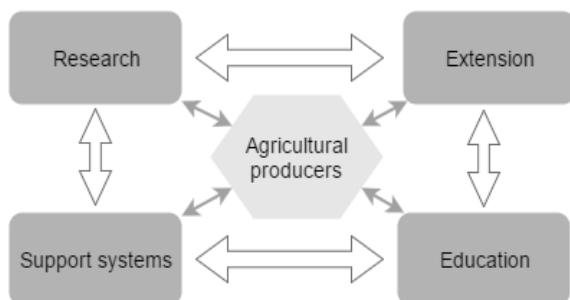
In the late 1980s and early 1990s, researchers B.Lundvall and K.Freeman focused on innovation at national level, examining distinctions among countries; in the result, they created a term **national innovation system**, which was explained as a set of institutions that jointly or individually contributed to the development and distribution of new technologies. National infrastructure, human capital and the diversity of institutions are the factors within a country that explain the differences in international competitiveness and economic growth across countries (Lundvall, 2007; Dimza, 2003). Not a single industry or some particular factor but an entire range of them, which synergistically contribute to innovation in the country as a whole, are reflected within the context of the national innovation system. However, the term **regional innovation system** was introduced along with policy makers focusing on regional competitiveness, popularising systemic local knowledge and researchers having found that a region's specific and informal norms, just like the regular face-to-face interaction of social agents, not only promote fast information exchange and the creation of new knowledge but also could serve as an initiator for innovation (Neimanis, 2013). An innovation support policy made at regional level, to a great extent, depends on opportunities and constraints in a particular region (Road maps and, 2011). The key element of regional investment potential is local enterprises and their capability to engage in the innovation process. If some specific industry has been developed in a region, the innovation potential of the region could be potentially strengthened based on the industry, as it has

built up competences and experience. One of the most essential specifics in the context of infrastructure is a region's financial autonomy that involves both public funding and private financing. From the perspective of public funding, it is important whether there are opportunities for a region to financially support risky private innovation projects. A region's autonomy may take the form of, for example, centrally administered funding systems available at regional level. Regions might also have a tax collection opportunity that provides that they can use the tax revenue to foster innovation processes in their territories (Cooke et al., 2000). The scientific literature also refers to the term **sectorial innovation system**, which, just like the terms national innovation system and regional innovation system, does not have a single definition and explanation. The dynamics of a sectorial innovation system is characterised by knowledge and learning, technologies and agents as well as interaction among the agents (Malerba, 2004). A sectorial innovation system views individuals, enterprises (producers of goods and services), research and educational institutions (creators and disseminators of knowledge), financial institutions (banks, investors), international, national and local administrative institutions and nongovernmental and other organisations, the activity of which may be attributed to a particular industry, as social agents (Neimanis, 2013). An examination of the classifications of sectorial elements by the authors shows that NACE and ISIC are considered to be actually ones of the most well-known classifications of economic activity. Industries may be also classified by technological level, yet such a classification should be employed if dealing with specific problems.

In its simplest form, an innovation system has three elements: 1) an organisation and individuals involved in generating, diffusing, adapting and using new knowledge; 2)

interactive learning that occurs when organisations engage in these processes and the way that leads to new products and processes (innovation); 3) institutions – rules, norms and conventions, both formal and informal – that govern how these interactions and processes take place (Anandajayasekeram, 2011, Horton 1990; North 1995).

In agriculture, innovation systems are tied together with knowledge systems forming Agriculture Knowledge and Innovation Systems (AKIS). The AKIS concept has been developed out of the old AKS (Agricultural Knowledge Systems) concept that originated in the 1960s in scholarly work on agricultural advice and extension. That system was driven by an interventionist agricultural policy that sought to coordinate knowledge and innovation transfer in order to accelerate agricultural modernisation. In many countries, this was reflected in a strong integration of public research, education and extension bodies, often under the control of the Ministry of Agriculture. In the 1970s, an "I" was added to the AKS: "agricultural knowledge and information systems" (AKIS). This addition was linked to the increased attention to information, probably also in connection with the large scale introduction of computers. The term AKIS popped up in policy discourses at the OECD and FAO. Later and rather silently the "I" was redefined in Innovation: Agricultural Knowledge and Innovation systems (EU SCAR, 2012).



Source: authors' construction based on Rivera, 2005

Fig 1. Agricultural Knowledge and Innovation Systems (AKIS) model

The AKIS model shown in Figure 1 displays the relations among the AKIS actors. Ideally, there should be a flow of information among all actors mutually sharing the knowledge and developing innovation. It should be stressed that the bottom-up approach is important – catching the ideas from the grass-roots level and developing ready to-use and practical innovations in line with the needs of the agricultural producers is an important aspect of spreading knowledge and innovation in agriculture and characterises the modern approach to AKIS.

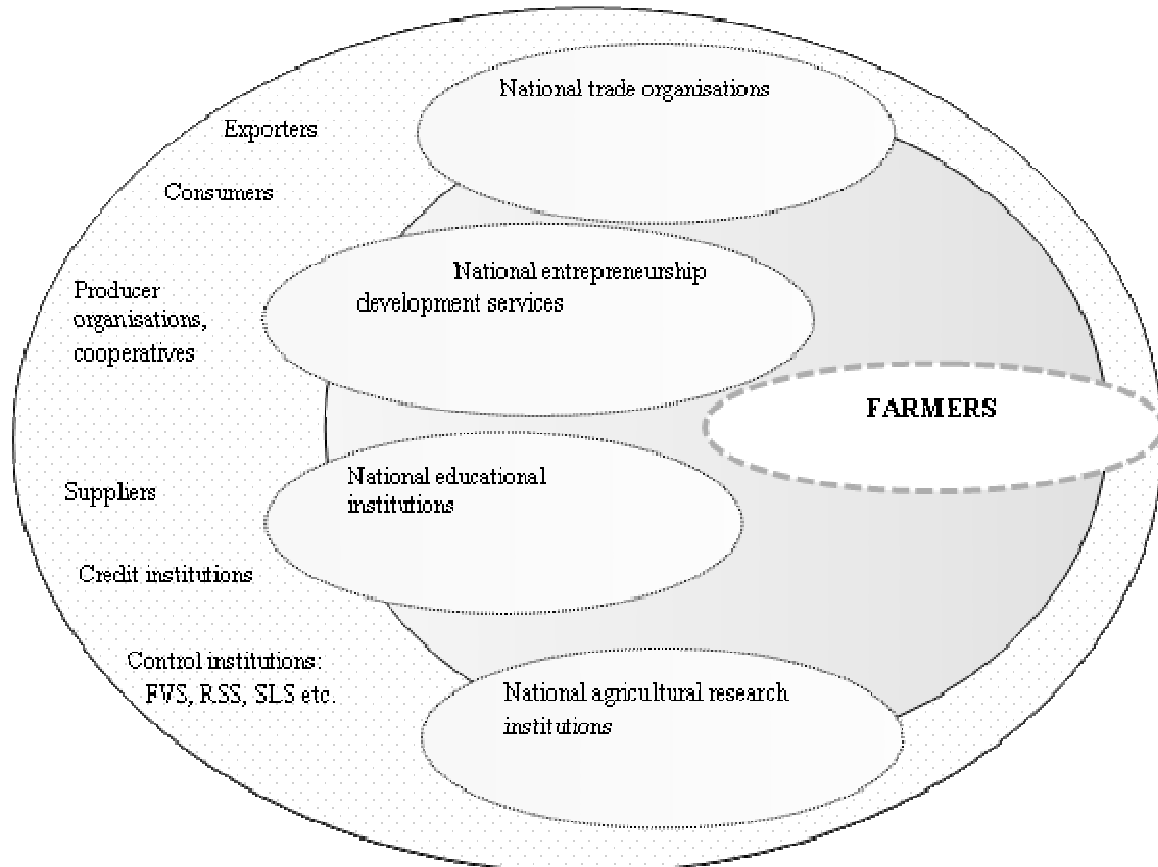
The development pace and effectiveness of innovation processes are determined by the economic environment where the innovation system is implemented and innovative activities take place. In the present research, the authors have developed an innovation system for the agricultural industry based on the National Innovation System of Latvia and the Innovation System of the EU as well as the Agricultural Knowledge and Innovation Systems model, which is presented in Figure 2. A uniform agricultural innovation system has not been developed in Latvia before; the system allows interaction among a number of elements. The model deals with cooperation among scientists, researchers, farmers and support and control institutions aimed at achieving common objectives and tackling problems.

A number of findings could be made if assessing cooperation among farmers, scientists and advisors in the process of creation of innovations in Latvia. The developed innovation system approach model for agriculture distinguishes three sectors where:

- 1) farmers represent the goods sector and are the key implementers of innovations in the forms of goods, services and processes;
- 2) educational, scientific and research institutions represent the sector of national institutions – products developed by means of applied research could be commercialised. This sector

includes also national trade organisations and entrepreneurship development service organisations as well as the Latvian Rural Advisory and Training Centre (LLKC), the Investment and Development Agency of Latvia etc.;

3) service, involved institutions and agents constitute the third sector, the objective of which is to encourage, control and advise innovation implementers – farmers.



Notes: FWS – the Food and Veterinary Service; RSS – the Rural Support Service; SLS – the State Land Service

Source: authors' construction based on the National Innovation System of Latvia, the Innovation System of the EU and the AKIS model

Fig 2. Innovation system approach model for the agriculture of Latvia

The EU and the legal framework for national policies represent the activity background as well as the basis for all the three sectors of the model. Government policy is the provider of a favourable legal environment, support mechanisms and instruments for innovative activity.

An element of innovation infrastructure in Latvia – the scientific and research sector – is a centralised system, in which research institutes are the structures of universities. University scientists mainly deal with fundamental sciences, while research institutes mainly focus on applied research, including the creation and development

of innovative products, processes etc. Not only the awareness of the need for innovation but also the process of creation of innovations shift from research institutions to agricultural enterprises; at the same time, the role of researchers in providing the process of creation of innovations does not become less important. For example, a researcher develops a disease-resistant variety of wheat, while advisors and support organisations (LLKC Ltd, the Latvian Organic farming Association etc.) makes such a new innovative product known by demonstrations and other ways and, accordingly, farmers start trying the variety. In the opinion of the authors, such an

approach to the creation of innovations is ineffective, as there is a possibility that such an innovative product is not going to be introduced in entrepreneurship practices; in addition, such a model for the introduction of innovations does not promote cooperation. Consequently, entrepreneurs and researchers can work independently from one another, thereby becoming relatively isolated groups, which contradicts the model. It is important to share knowledge during the process of creation and introduction of innovations.

Support elements available for innovation in agriculture

A range of support instruments for innovative activity is available in Latvia to promote the development and introduction of innovations (Pieejamie atbalsta instrumenti..., 2016); the instruments may be used by enterprises engaged actually in a number of industries. Further, the authors give a summary of the support mechanisms. The European Business Support Network provides advice on foreign markets and urgent EU matters; selection of potential cooperation partners; advice on EU support programmes; international technology transfer; advice on innovation matters. Entrepreneurs are offered enterprise income tax (EIT) relief for investing in new technological equipment aimed at raising productivity, as well as EIT deductions are applied to investments in research and development. The development finance institution Altum offers a comprehensive range of financial instruments for various needs at all enterprise development stages: start-up programmes; micro-credit programmes; loans for investment in infrastructure; mezzanine loans; SME growth programmes; support for holding training; seed, start-up and venture capital funds, e.g. , *Imprimatur Capital* – a seed and start-up capital fund; *BaltCap* – a Latvian venture capital fund; *Fly Cap* – a venture capital fund; *Expansion Capital* etc. The mentioned funds

provide financing for development and early-stage financing for innovative micro-, small and medium technology enterprises with international growth potential. One of the highly valued support instruments for the development of innovations is the **European Union research and innovation programme Horizon 2020**. The EU financial mechanism, whose purpose is to ensure the EU's global position in research, innovation and technology, promotes growth in Europe and contributes to employment.

To identify how actively the available support instruments are used and whether entrepreneurs are aware of them, the authors conducted a study by interviewing 33 entrepreneurs whose enterprises were engaged in the bioeconomic sector, i.e. in the economic activity in which an essential role is played by products and raw materials of natural origin. Enterprises engaged in the agricultural industry, the innovation system model for which was described above, also belong to this kind of enterprises. The most popular financial instruments were financing available through investment measures of the Rural Development Programme (RDP) administered by the Rural Support Service as well as bank loans and leasing services. From among the support instruments for innovation, services provided by the development finance institution Altum were popular, and one in three entrepreneurs interviewed had used it and were partly satisfied with this institution's services. However, the venture capital funds and the research and innovation programme Horizon 2020 were unused opportunities for introducing innovations, as only one entrepreneur out of all of them had used a venture capital fund and also one used the Horizon 2020 programme, while none of them had used services provided by the European Business Support Network. At the same time, when the entrepreneurs were asked what was necessary to make their enterprises grow faster and introduce innovations, their reply was

that the most important factor was the availability of finance for their business expansion and development. It means that entrepreneurs wish more financial resources for their business and they are aware that this could help introduce innovations and develop their enterprises, while at the same time they rarely use specially designed financial mechanisms intended for this purpose and are reluctant to find out more about the mechanisms.

Conclusions, proposals, recommendations

- 1) The national innovation system creates prerequisites for a favourable environment for innovation, while at regional level the system could stimulate the development of a particular industry by means of the kinds of support that are concentrated at the regional level. Under the conditions in Latvia, the national-level innovation system is more appropriate because the country's territory is not large enough to establish a separate regional system.
- 2) The set of elements integrated in the innovation systems approach model for the agricultural industry of Latvia is sufficient and optimal. However, the current approach to the creation of innovations, where the awareness of the need for innovation and the process of creation of innovations shift from fundamental

sciences and research institutions to agricultural enterprises, does not promote cooperation among agents; consequently, a new good or service might not be introduced in production and the financing attracted might be wasted.

- 3) A number of financial instruments for innovative activity are available in Latvia, yet entrepreneurs whose enterprises are engaged in the bioeconomic sector use the instruments rarely, while at the same time being aware that additional financing in particular is what could help them develop innovations at their enterprises. Formally, financial instruments are available, yet there are considerable problems in their application, which will be examined in further research studies by the authors.

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