

RESPONSIBLE INNOVATION IN AGRICULTURE: A CASE STUDY FROM NORTH MACEDONIA

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Abstract

We investigate how successful is the Responsible Innovation in the North Macedonia. In order to examine this issue in a country-specific context, a two-fold approach was used. First, a typical case of a micro-company engaged in innovative agriculture was presented. Second, data was collected with a semi-structured questionnaire through a Focus Group Discussion (2021). We applied the Innovation Spiral as a theoretical foundation to examine the practice of innovation in each of its seven phases i.e. initial idea, inspiration, planning, development, realisation, dissemination and embedding. We also assessed the development of the Agriculture Knowledge and Innovation System (AKIS) in the country with the particular case study. We have found gaps, opportunities, constraints and blind spots in the responsible innovation process related to the inclusion of the AKIS members and their interaction in the co-innovation processes.

Key words: Innovation spiral, Agriculture Knowledge and Innovation System (AKIS), responsible innovation, agriculture, qualitative research

INTRODUCTION

The basic environment for research, innovation and technology development in North Macedonia is slightly improving, generally as a result of the international support programmes and the general national infrastructure to support these processes. However, much work lays ahead for the agriculture sector in order to reach the technological developments in the EU Member States based on innovations. Innovation does not occur in isolation, but several factors play a key role, such as policy, legislation, infrastructure, funding and market developments [5], including the Agriculture Knowledge and Innovation System (AKIS) settings (i.e. the AKIS actors, their organisation(s) and the knowledge flows between them) [12].

The role of education system in North Macedonia is not significant in facilitating innovation and technology transfer to the agriculture sector, although many university professors and researchers have gained significant research experience from

participating in EU and other international projects. Even though there are structural funds such as the Instrument for Pre-Accession Assistance for Rural Development (IPARD) for enhancing the innovation and technology development process, the capacity of the agriculture sector to adopt innovations and to transfer technology is generally lacking. Individual farmers, have developed insignificant capacity to adopt innovations and new technologies. Farmers' cooperation is encouraging the transfer of knowledge, but insufficiently since there is a little number of small and dysfunctional cooperatives with limited resources. Small agri-businesses adopted innovation at some extent, but it is still below the global developments. Clusters in the country developed in their own way, but generally they have a lack of potential for innovation, new products and services development. The foreign direct investments rarely enter the agriculture sector and even more rarely as greenfield investments, and also they are still below the expectations of the public and policymakers.

For improving the general infrastructure in the country for innovation and technology development in the agriculture sector, an optimism is observed with initiating the Smart Specialisation Strategy (S3) in the country. There are other strategies that support innovations and technology transfer, but their enforcement is still relatively low.

The evidence addressing the level of development and integration of the national AKIS for fostering responsible innovation in the country is very scarce. Few technical reports exist [8], [9], [10], upon which this study builds forth on, but herein, we try to add the academic component that is missing in the previous studies. Thus, the *aim* of the research is to *investigate how successful is the responsible innovation in agriculture in post-transition settings, in this case, in the context of the Republic of North Macedonia*. Better understanding of the AKIS in different innovation phases will provide a groundwork for proposing improvements and facilitation of innovations in agriculture by designing proper research, innovation and technology transfer strategies.

In this regard, we first present the theoretical concepts that frame the research, along with explanation of the methods of data collection and analysis. Next, we present the results following a discussion. Finally, we present the conclusions and recommendations for improving the general infrastructure to support the responsible innovation development in the agriculture sector.

MATERIALS AND METHODS

Theoretical framework

The theoretical foundation for this study rests on three essential concepts: The Innovation Spiral, AKIS and the Responsible Innovation (RI)/Responsible Research and Innovation (RRI) concepts. The Innovation Spiral is applied to describe the innovation process with a given case study in the agriculture sector and to identify bottle necks, pull and push factors in the research, innovation and technology transfer. The Innovation Spiral [15] as presented in Figure 1, distinguishes different phases, such as: (i) the invention or

formation of new ideas (such as, initial idea and inspiration to innovate), (ii) innovation or conversion of new ideas into practical applications (such as, planning, development and realisation of the innovation), and (iii) diffusion or the spread of new applications across the potential users (such as, dissemination and embedding of the innovation).

Each phase prioritises other activities, and usually involves other actors. The shape of the spiral shows that the idea usually starts off small and spreads to involve more actors as the process of innovation progresses. Furthermore, knowledge processes and innovation are rarely linear, which explains why the model is shaped like a spiral. The phases can even be repeated more than once.

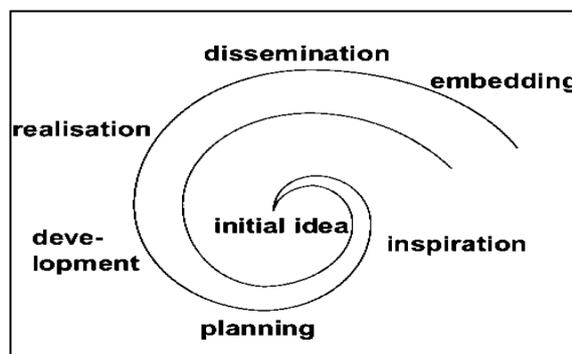


Fig. 1. Innovation Spiral
Source: Wielinga et al. (2008) [15].

The concept of AKIS is used to identify and assess the capacities of the agriculture innovation actors involved in the research, innovation and technology transfer in North Macedonia. It is a useful concept to describe a system of innovation, with emphasis on the organisations and stakeholders involved, the links and interactions between them, the institutional infrastructure with its incentives and budget mechanisms [4].

AKIS is the combined organisation and knowledge flows between persons, organisations and institutions who use and produce knowledge for agriculture and interrelated fields, as represented in Figure 2.

AKIS actors use and produce knowledge for agriculture and interrelated fields (value chains, rural actors, consumers, etc.). Although different components of AKIS,

extension/advice, education and research, are often stressed, it is important to realise that there are many more actors in the food chain which directly influence the decision making of farmers and their innovations.

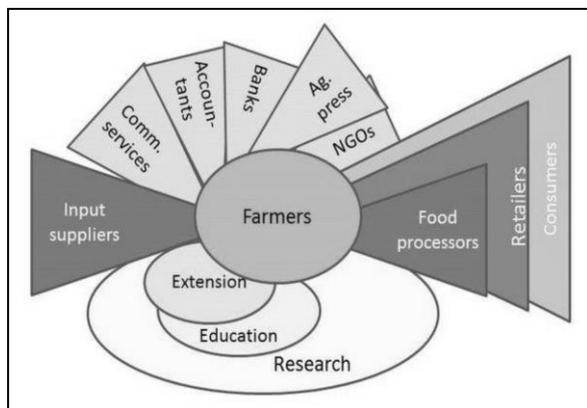


Fig. 2. Agricultural Knowledge and Innovation System
Source: SCAR AKIS (2021) [4].

Finally, Responsible Innovation (RI) and Responsible Research and Innovation (RRI) are two concepts or interlinked discourses that have emerged in parallel in the European research and innovation policy [14]. These concepts present a system of making new technologies that work for society without causing more problems than they solve. They consider a balance of economic, socio-cultural and environmental aspects in innovation process [1]. Inspired by Gremmen et al. [11], we use these concepts to investigate how successful is the country in contemplating the Green Agenda for the Western Balkans [2]. We also strive to find out the epistemology of the innovation of the given case study i.e. is it more aligned with RI or RRI concept.

Data collection methods

First, a typical case of a micro-company engaged in innovative agriculture was presented using a desk research method. A Content Analysis [13] included review of several online sources, including media, fan pages and official pages. The content analysis provided enough data to present the case study in the framework of the Innovation Spiral. Second, a Focus Group discussion with the AKIS actors was organised during 2021, to elaborate the selected case study. A semi-structured questionnaire was used to guide the discussion. The questionnaire was

designed in the framework of Innovation Spiral and AKIS, in order to identify the gaps, opportunities, constraints and blind spots in the innovation process, including the (un)functionality of the national AKIS.

In particular, it was discussed how the given case study compares with opportunities for cooperation and interaction between different entities of the agricultural research, development and knowledge-based system in the country (i.e. governance arrangements, mechanism of collaboration and interaction, solutions to overcome gaps and issues in the collaboration etc.); how it compares with the most relevant domain/fields of technology and innovation potential in the agriculture sector where the country has comparative advantage; how it compares with opportunities to improve green and clean technology and innovation transfer in the domestic agriculture sector, and how it compares with other countries in regard to responsible innovation in agriculture.

Data analysis methods

The study is based on a qualitative analysis, which is heavily dependent the researchers' analytic and integrative skills to examine the collected data. The emphasis in this research is to understand the responsible innovation process within a given AKIS settings, as an important issue in the implementation of the Green Agenda for the Western Balkans. The collected data was examined to find patterns and draw conclusions in response to the research aim in line with the synthesis method. Finally, the SWOT analysis provided a good framework to summarise the internal strengths and weaknesses and external opportunities and threats of the responsible innovation in a country-specific context.

RESULTS AND DISCUSSIONS

Agriculture in the country is considered as very traditional, mainly characterised with a low productivity. Innovations are necessary for creating added value in agriculture. The gross value added of agriculture in North Macedonia is just one third of the European average [3]. There are different actors in the

national AKIS that could play an important role in the responsible innovation process. It is of essential importance to identify bottle necks, pull and push factors in the research, innovation and technology transfer and to identify and assess the capacities of the innovation actors involved in the process so to understand the current situation and thus, to propose measures for improvement of the innovation processes in agriculture. This section first presents a showcase of a responsible innovation process (i.e. where does it occur and how it develops, as well as which actors are included in the process). The section further develops in addressing stakeholders' opinions on if the given case study is typical example of responsible agriculture innovation and which conclusions could be derived from the given case study to improve the AKIS settings and responsible innovation process in the national agriculture. The section at the end summarises important notions on the AKIS structure and necessary interactions to support responsible innovation in agriculture.

The case study results: What are AKIS settings for responsible innovation?

This case study is a showcase of a typical agricultural innovation in the country involving a micro-company engaged in modern agriculture and responsible innovation. The case study is analysed through the each of the phases of the Innovation Spiral [15]. Akvaponika was one of the 130 domestic companies or consortia supported by the Fund for Innovation and Technology Development (FITR), within the first public call of the Economic Growth Plan of the Government of the Republic of North Macedonia (Public Call of 28.04.2018 – 11.06.2018), and the eleventh project in the agricultural field. The company received two funding supports in 2018 and 2020. This micro-company received the monetary assistance to develop a business model for green salads production in glass houses and for introducing a bio-coal into the production of baby green salads [6]. The owners of the company had developed a business model of "seed to shelf" and they truly believe that their

business will be sustainable both in economic and environmental terms. Yet, without the governmental support, their concept of developing domestic branded organic vegetable products would have remained to be just an interesting idea. The innovation process of this particular case study is presented through the innovation spiral (Table 1).

Table 1. Innovation process for the “Akvaponika” case study – the innovation spiral phases

Innovation phase	Description of the innovation process at certain phase
Initial idea	The owners considered that the problems with the conventional agricultural production should be overcome with modernization of the agricultural production and with building a new business model with considering the environmental impact of the production and in establishing close relationships to consumers .
Inspiration	Support by the FITR : -First public call of the Economic Growth Plan of the Government of the Republic of North Macedonia (Public Call of 28.04.2018 – 11.06.2018). -Another financial support by FITR within the programme Action for Positive Climate Change (Public Call of 06.03.2020 – 20.07.2020), for introducing a bio-coal into the production of green salads.
Planning	A three years of practical experience and learning of the processes for aquaponics growing of plants and fish in a small greenhouse, designed for domestic purposes within the close family members to the company's founders that was exclusively funded by owners' capital.
Development and realization	- New production line of organic baby salads (arugula, lettuce, spinach and chard) whose leaves are not larger than 10 centimetres , and which are immediately washed and packed after being harvested (on the fields). -The products are promptly distributed , and by shortening the value chain , this market channel provides traceability and brings the freshness from the fields to the consumers' plates (in this way, a maximum quality is achieved, but also the confidence of the customers in organic production is increased). -The company started to develop an online shop to respond and adapt to the changing behavior of consumers caused by the COVID-19 pandemic (also supported by FITR within the programme COVID-19 measures: Organic online-green antivirus shield COVID-19, Public Call of 29.05.2020 – 03.07.2020).
Dissemination	-The company now cultivates 1 ha of arable land , which is just below the average farm size in the country. -The organic products are sold in the largest cities of the country , mainly through supermarkets (such as, Tinex, Reptil and Markt), as well as through the online shops (Paket.mk, Domato.mk etc.). -The company is in the process of developing own online shop .
Embedding	- Positive example that should encourage other farmers to think about responsible innovation , including organic agriculture production and new business models within short supply chains. -Increasing the awareness of the consumers in encouraging their healthy eating habits . -Developing consumers' habits of a greater responsibility for the environment .

Source: Results from the research, 2021.

In regard to the main actors included in the innovation process, the micro-company has collaborated with the FITR that provided financial support (on three instances), predominantly in the initiation and development phase of the innovation. However, FITR is not responsible to monitor the innovations it finances, and does not keep record on projects' performance. On the other hand, there is a media coverage on how FITR considers and promote this project to be successful. In regard to the interaction between the micro-company with consumers, the company is directly selling to consumers if they visit the farm near Skopje (the capital of the country), establishing close relations with customers. In addition, the micro-company is developing a trade mark under the name 'Green Republic'. With the development of the online shop, the micro-company may reach a wider network of customers and become more recognised in the country.

Encouraging the growth of small companies is very important for the development of the national economy, and Akvaponika is a notable example of how the state should support a family owned businesses in agriculture. Nevertheless, in this case, the process of innovation involves an insufficient number of actors necessary for successful implementation of all phases of the innovation process (Table 2).

Besides the micro-company that is the key actor in the innovation process, the following actors also appear. FITR, whose role is to serve as a leading government institution in supporting start-ups and innovative companies, including those engaged in agriculture. Balkan Biocert is a certification body that was the first of a kind accredited and authorized Inspection and Certification body in Macedonia by the Institute for Accreditation of the Republic of Macedonia and the Ministry of Agriculture, Forestry and Water Economy of the Republic of Macedonia (MAFWE). The final actor is the consumers that are not only the final value chain actors, but were also active participants in the development of the business model of

this micro-company, especially for developing of the online marketing strategy.

Table 2. Key actors involved – a reflection of the Innovation Spiral and AKIS

Name of the actor	Actor type	Representing sector	Role of the actor in the innovation process
Akvaponika Ltd.	Micro-company	Private	Came up with the idea for the innovation, and implemented the innovation. Participates in changing the traditional agricultural practices, and raising the consumers' awareness and habits on sustainable environment and healthy eating habits.
FITR	Governmental institution that supports innovations	State	Financially supports innovations.
Balkan Biocert	Certification body	State	Issues certificates for organic production.
Consumers	Final users	Private	Final chain actors in the value chain, consulted in the process of creating a marketing plan and developing the online shop.

Source: Results from the research, 2021.

Although there are different actors involved in the innovation process, still this representation reflects the imperfect settings and interactions of the national AKIS.

Finally, the case study is analysed within the framework of the SWOT analysis (Table 3), which reflects the innovation process in different phases along the AKIS.

According to the SWOT analysis, the case study exhibits more positive than negative internal factors that affect the responsible innovation process.

In fact, the owners succeeded to realise the responsible innovation resulting in innovative agriculture production and innovative business model that may inspire other people to get involved in sustainable agriculture production and short-supply chain with innovative business approach.

The final beneficiaries are the consumers that would get healthy products and clean environment.

Table 3. SWOT analysis of the responsible innovation case study – a reflection of the Innovation Spiral and AKIS

Strengths	Weaknesses
-Realisation of a business idea into a micro-business, involving in innovative agriculture production and business model. -Inspiration to other people to get engaged in agriculture, and modernise the agriculture production in a sustainable manner. -Inspiration of a short-supply chain developed, with developing close customer relations. -Consumers' benefiting from the healthy food with no harm to the environment.	-The business had not produced sufficient profit to cover its expansion and adapting to the needs of the changing market without further support by FITR. -There are just few external actors/stakeholders involved in the innovation process.
Opportunities	Threats
-Available financial support from a public institution (in this case FITR) that supports innovations and technology development during different phases of innovation development (initial businesses development, improvement of the businesses, adaptation of the businesses to the changing environment due to internal and external factors etc.). -Development of a trade mark. -Reach more customers with the online shop and thus, further develop the business.	-If the projects' selection by FITR (or other public institutions) is not done on objective basis (under true merits of the applicants), this selected case study and other supported projects are doomed to failure, and many other prospective projects may be financially hindered to progress.

Source: Results from the research, 2021.

On the other hand, a major weakness is that this innovative investment is not self-sufficient from the initiation phase and after and requires constant external support to cover the investment expansion and adaptation to the changing market and new circumstances. Another drawback is that not many actors were involved in the innovation process and key AKIS actors were missing, such as interconnections with the scientific institutions.

In regard to the external factors, this particular case study benefited from the opportunities offered by the FITR i.e. financial support during different phases of innovation development. However, it should be taken into consideration that these funds are available only for registered companies and not to individual farmers. This macro-company develops a trade mark, which will help the company to get exclusive rights to use the mark, preventing others from using the same or similar mark. Protecting the

intellectual property rights of the responsible innovation is creating comparative advantage of the business. Another business opportunity created by this innovative company is the inception of its online shop, which is intended to expand the business and reach different segments of customers. This initiative also shows how this company is adapting to the changing market and circumstances, considering that the online shop was initiated during the COVID 19 pandemic. Considering that this kind of responsible innovation investments in agriculture require initial support funding and that the country is not corruption-free, the major threat occurs if the projects' selection by FITR (or other public institutions that supports agriculture innovation investments) is not done on objective basis i.e. under the true merits of the applicants. Hence, this selected case study and other supported projects are doomed to failure, as well as many other prospective investments may be hindered to be initiated since initial funding support is not available to them.

The SWOT analysis presented here shall serve in future national policy planning in regard to responsible innovation, by emphasizing the strengths, fixing the weaknesses, taking advantage of the given opportunities and avoiding the threats.

Focus Group discussion results: Is AKIS supporting responsible innovation?

The Focus Group discussion conducted in 2021 [7] aimed to learn about the organisation of and interactions between agriculture research capacities, advisory/extension services and the business sector. This knowledge allowed evaluation of the extent of innovation and knowledge transfer in the agriculture sector. The discussion was lead with a semi-structured questionnaire, covering issues on: (i) How the presented case study in the previous section compares with opportunities for cooperation and interaction between different entities of the agriculture research, development and knowledge-based system in the country? (ii) How the presented case study compares with the most relevant domain/fields of technology and innovation

potential in the agriculture sector where the country has comparative advantage? (iii) How the presented case study compares with opportunities to improve green and clean technology (responsible innovation) and innovation transfer in the agriculture sector in the country? and iv) How the case study compares with other countries in regard to responsible innovation in agriculture? The summary of the discussion of the Focus Group has resulted in the following.

How the case study compares with opportunities for cooperation and interaction between different entities of the agriculture research, development and knowledge-based system in the country?

The focus group participants emphasised that the case study is very interesting, however it has a weak network of actors included in its process of development so to provide its sustainability. Therefore, the discussants questioned the sustainability of the innovation project and viewed the project in reflection to many other cases in the country that were initiated and established because there was an external funding available, in this case, the FITR.

All the discussants agreed that what is missing for innovation projects to be sustainable is an inclusion of all relevant actors and segments in the entire innovation process. In this regard, the representative from the National Federation of Farmers (NFF) stressed that it is important for this firm (Akvaponika Ltd.) to establish strong relations with other actors in the chain, such as: other farmers producing same or similar products (salads in this case), farmers' associations (to support their networking activities), advisors (to provide advices on the possible opportunities and risks), experts from academia and other consultants (for developing of sustainable business plans), funding partners (Governmental grants are often the easiest source of funding, with the least control of realisation). In conclusion, the representative from the MAFWE emphasized the need of the country to establish a system for collaboration and connection of the stakeholders in the

entire innovation spiral in order to build sustainable innovation projects.

How the case study compares with the most relevant domain/fields of technology and innovation potential in the agriculture sector where the country has comparative advantage?

Considering that the country has a comparative advantage for organic production, introducing new technologies and innovations in this production is expected to bring success in creating competitive agriculture. However, considering many weaknesses that the country experiences at institutional level, the supply of the organic products is often limited to the domestic market. In this regard, all discussants agreed that for this particular case (and similar cases to it), there is a risk that at one point, the supply may overreach the market demand.

How the case study compares with opportunities to improve green and clean technology (responsible innovation) and innovation transfer in the agriculture sector in the country?

The selected Macedonian case study was perceived by the discussants as a positive example in improving green and clean technology in the country. However, on the other side, the case study was perceived as a weak example in regard to innovation transfer, considering the low number of stakeholders included in the project. The discussants emphasised that it is important that successful cases should be used as positive examples and inspiration to other farmers. However, the representative from the National Extension Agency expressed his concern in the difficulty to inspire a large mass of agriculture producers in rural areas because they are casted out from the modern markets. But, the representative from the National Federation of Farmers expressed optimism to use positive innovation examples for increasing the visibility of the innovation to generate possibilities and opportunities for innovations even in the urban areas.

How the case study compares with other countries in regard to responsible innovation in agriculture?

The discussion was continued with comparison of the Macedonian case study with a Serbian and EU case studies in responsible innovation so to benchmark the innovation position of the Macedonian case. The same questions were used for the follow-up discussion using the case studies from Serbia and EU countries. In summary, the discussants pointed out that compared to the Macedonian case, the Serbian case have a more developed system and network for innovation. However, it should be considered that Serbian farms are much larger. Even in the case of Serbia, it has been evident that in order for a larger innovation development processes to take place, there is an inevitable need for inclusion of much more stakeholders. All of the discussants agreed that it is important that these stakeholders come from different fields of expertise, as in the EU's case, where each stakeholder contributed and played a certain role in providing expertise or funding. It was agreed that participation of many stakeholders from the private sector is one of the missing links, which is essential in supporting larger innovation breakthroughs. However, there is always a risk of coordination and information asymmetries when larger number of different actors are involved. This could result in braking the trust. Lack of trust and social capital in the country is often pointed out as impediments of joint investments. Finally, all discussants agreed that the country is far behind the EU countries and other Western Balkan countries in regard to developing innovations in the agriculture sector.

Gaps, opportunities, constraints and blind spots in the innovation process

Innovations in the country are initiated and established only when supported by external founding (in this case, FITR) and sustainable only upon duration of the project. There is a missing inclusion of all relevant AKIS' actors and segments in the innovation process. However, successful cases may be used as positive examples and inspiration to other farmers, taking into consideration the risk of supply overreaching the demand for such innovation at certain point of time since the

country is very small. The presented responsible innovation through the case study is actually not eligible under the current IPARD settings in the country. FITR, so far, is the only institution to financially support innovations, including the agriculture sector. However, FITR do not support smallholders since they are not registered entities.

There is a lack of inspiration and weak capacity for planning in the innovation process, which along with lack of finance, are main obstacles for starting a project with a sound idea. Even when initial ideas and inspiration are present, the innovation process still underperforms in the development, realization and embedding of the innovation phases, which are perhaps the weakest parts in the spiral. It is also necessary to connect all the phases and find means to motivate AKIS actors for a more active involvement in research and innovation. The initial idea, inspiration and planning should be two-folded i.e. from the bottom-up or coming from the producers and processors, and from the top-down or coming from the Government to the related stakeholders/actors. Responsible innovation in agriculture in the North Macedonia should be also further stimulated by supporting young people during their high-school education, and preferably in primary and pre-school education.

AKIS in the country is not a formalized system, but there are different levels and layers of formalization and completeness. Cooperation and interaction between the component parts of the AKIS system like the advisory services, the research community, the private sector and the policy makers in the field of innovation, research and technology transfer, present deficiencies. Links between science, advisory services and the private sector exist, but the interactions and cooperation are not sufficiently coordinated.

The enhancement of responsible innovation requires initiatives for coordination to join together fragmented and isolated actions. The research and education system involved in AKIS lacks encouragement and reward system. The IPARD programme speeds up investments in agriculture but needs to be

further utilized, with more targeted measures for smallholders to get engaged in responsible innovation. The lack of infrastructures and weak financial support of research, technology and innovation are key problems for responsible innovation development.

As a post-transition country, North Macedonia is far behind the EU countries in regard to developing responsible innovations in agriculture. The adoption of the Smart Specialisation Strategy that helped other post-transition countries to strengthen their innovation position brings optimism for the country to enhance the responsible innovation in agriculture.

CONCLUSIONS

Following the *aim* of the research, which was to *investigate how successful is the responsible innovation in agriculture in post-transition settings*, we have found gaps, opportunities, constraints and blind spots in the responsible innovation process related to the inclusion of the AKIS members and their interaction in the co-innovation processes.

Although there are different actors involved in the innovation process, still this representation reflects the imperfect settings and interactions of the national AKIS. All relevant actors need to be included in responsible innovation projects and strong relations with other actors in the chain need to be established, such as: other farmers producing same or similar products (salads in this case), farmers' associations to support their networking activities, advisors (advices on the possible opportunities and risks), experts from academia and other consultants (for developing of sustainable business plans), the responsible governmental institutions (MAFWE as the key actor for setting the appropriate policy environment), funding partners (Governmental grants are often the easiest source of funding, with the least control of realisation) etc.

Lack of inspiration and weak capacity for planning are obstacle for starting responsible innovation projects. Even when initial ideas and inspiration are present, the responsible

innovation process still underperforms in the development, realization and embedding of the innovation phases, which are perhaps the weakest parts in the spiral.

The results and conclusions of this paper shall serve further for creating national strategies for improving the responsible innovation in agriculture, following three strategical issues, such as:

(i) A good implementation of the spiral of innovation needs a *better functioning AKIS structure* and institutional interventions at the critical phases of the innovation spiral like the development and realization phases;

(ii) A *better collaboration between all actors in the responsible innovation process* could be achieved if the EU's IPARD measure for innovation and knowledge transfer is accredited and implemented, and if there is a programme under the FITR to support innovations in a small-scale agriculture, and

iii) A proper education is needed to generate ideas and stimulate innovation.

Similar experiences are expected in other Western Balkan countries. Thus, the method of presenting certain case studies can contribute in determining the knowledge base on factors affecting the responsible innovation processes, important for development of the agriculture sector in the region.

Moreover, the methodological approach developed here, has been proven as an effective mean for representation of the phases in the responsible innovation process, which may have a wider applicability in other related researches.

Successful cases may be used as positive examples and inspiration to other farmers to innovate in responsible manner.

Creating a culture and effective system for innovation in a country-specific context is an investment that enhances productivity, well-being and a sustainable path for the future.

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