THE NECESSITY OF DEVELOPING AN INNOVATION BASED CULTURE IN ROMANIAN AGRICULTURE

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Abstract
Currently, in terms of scientific fields, the European Union is based on the assimilation of existing technologies and mass production. This attitude does not correspond to today's world, characterized by economic globalization and a strong foreign competition. To maintain its economic position in the global context EU was forced to adapt and focus its efforts towards transition to a knowledge and innovation based society. The arguments offered throughout the paper showed a growing preoccupation with economic development based on knowledge and innovation. The present situation of the knowledge transfer market in Romanian agriculture was presented, emphasizing the challenges this market is currently facing. Bottom-up innovation was proposed as a solution to mitigate these problems.
Keywords
innovation, knowledge transfer, agriculture, bottom-up innovation.

Introduction

According to a study conducted by FAO "the challenge ahead is starkly illustrated by the expectation that to feed the world, 60% more food will be needed by 2050. Fundamental resources such as water, soil and phosphorus are under pressure or have been degraded, meaning that the productivity increases of the past are unlikely to be repeated, even though most (85%) of the increased food demand up to 2050 will have to be met by improved crop yields, rather than through the conversion of more land to agricultural use" (FAO, 2012).
In addition to this challenge, nowadays the European Union is facing an economic crisis, climate changes, the necessity to maintain its international competitiveness and also a population who is ageing faster than any other region, with the number of working-age people expected to decline steadily in relation to the elderly population. To face these challenges at an european level it is given an increased interest to the concept of knowledge and innovation based economy. Knowledge transfer plays a key role in this kind of economy in which knowledge and innovation are thought to be two essential progress factors for the EU. The European Council states that Europe needs an unified research market in order to attract experts and investors. Existing gaps should be reduced quickly to create a genuine single market for knowledge, research and innovation (European Council, 2011). The importance of knowledge transfer is further underlined by the idea that innovation cannot be regarded as an isolated activity, without taking into consideration its consequences in the entire economic and social environment. At the same time, close collaboration, interaction and the exchange made among stakeholders leads to a greater impact of the innovation (Debackere et al., 2014).
Romania, as Member State of the European Union must comply to follow the directions set by the EU especially since our country is facing challenges that can be adjusted by moving towards finding innovative solutions. Also, I believe that nationally there is not a sufficient incentive to development of the knowledge transfer market, especially the transfer of knowledge in agriculture. Currently, the preponderance of small holdings without juridical personality speaks for itself about their financial capacity to support the transfer of innovative

technology and transfer of know-how by their own means. Moreover, this problem is aggravated by the lack of specialized culture and conservatism of most recipients, technological and financial risks of implementing innovative techniques and by the agro-food market volatility. All of these issues point to the need for finding new, innovative solutions and encouraging bottom-up innovation. In this kind of innovation, knowledge transfer and close cooperation of all stakeholders is essential.
This article aims to analyze the necessity of developing an innovation based culture in Romanian agriculture. To achieve this aim we used statistical and public policy data at EU level and Romania, technical data and macroeconomic data concerning the agricultural sector in Romania and also specialized articles and news related to this subject. All these references can be found in the bibliography of this study.
The main research question I want to respond to by the end of this paper is the following: can a culture of innovation in the agricultural sector in Romania bring an improvement in the whole sector?
To answer this question the paper was divided into three chapters that aim to analyze the important aspects that need to be understood for a deeper knowledge of the issue.

1. Literature review

Currently, a particular importance is given to the concepts of knowledge transfer, bottom-up innovation, innovation based economy and R&D (Research and Development). For this descriptive analysis which argues about the need of developing a culture of innovation in Romania's agriculture sector I used as reference points already published works of several authors, among which the following:

- *"Technology diffusion and organizational learning – the case of business computing"* written by Paul Attewell in which the author brings into question the concept of "knowledge barriers" and how these barriers slow down or even lead to disruptions in the dissemination of innovation;
- *"Knowledge Transfer, Knowledge Sharing and Knowledge barriers – three blurry terms in KM "* written by Dan Paulin and Kaj Suneson, members of the Department of Technology Management and Economics, Chalmers University of Technology, Gothenburg, Sweden. The research shows how the concepts of "transfer of knowledge", "sharing knowledge" and "knowledge barriers" have developed and changed over time;
- *"Boosting Open Innovation and Knowledge Transfer in the European Union – Independent Expert Group Report on Open Innovation and Knowledge Transfer"* is a report created by an independent group of experts of the European Commission. This extensive study describes and encourages the development of "open innovation" and "knowledge transfer" in the European Union.

In addition to the works mentioned above, I used other documents which are relevant for the documentation and execution of this study. Wherever I used information from additional sources, it can be found entirely in footnotes and bibliography.

2. Developing an innovation based culture

2.1. The basic concepts used in an innovation and knowledge based economy

For better understanding the characteristics of an innovation and knowledge based economy an explanation of the following concepts is needed: innovation, open innovation, co-creation, R&D (research and development), knowledge transfer and knowledge sharing.
First of all, it should be mentioned that although a clear definition of these terms is essential for the development of the field, the concept of an innovation and knowledge based

development is still relatively new. So far there are many definitions and interpretations for each of these notions.

One of the best known definitions of innovation is found in the Oslo Manual. The definition reads: *"an innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations. The minimum requirement for an innovation is that the product, process, marketing method or organizational method must be new (or significantly improved) to the firm"* (OECD, 2005).

However, I consider that the most accessible and concise definition of innovation is offered by Inge Van Oost. He defines innovation as "*ideas put into practice with success"* (Courtney et al., 2013). Although brief, this definition clearly explains both the concept of innovation and an important characteristic of it: an idea is considered to be innovation only when it becomes mainstream when it becomes a main direction of an activity.

Starting from this characteristic it is very easy to understand the concept of open innovation. A report made by an independent expert group explains that *"open innovation moves from bilateral transactions and collaborations towards networked, multi-collaborative innovation ecosystems. It means that a specific innovation cannot be seen as an isolated activity without considering the consequences for its entire economic and social environment"*(Debackere et al., 2014). The same report provides a definition of co-creation. Thus, *"co-creation refers to the joint development of knowledge through relationships with specific partners. Relationships can be consortia of competitors, suppliers, customers as well as universities and PROs (Public Research Units). Cooperation is usually characterized by a profound interaction between parties/partners over a longer period of time"*.

A fair definition of research and development is found in the Frascati Manual. This study defines R&D as *"creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications"* (OECD, 2003).

Professor Gabriel Popescu defines knowledge transfer as *"a process which responds to a growing social need to highlight the results of the research by their rapid integration into practice or in policymaking. In essence, the transfer or the knowledge transfer are processes that help to optimize information flow by ensuring its continuity. The social need which is met by the knowledge exchange reflects the economic peculiarities of information"* (Popescu, 2007).

Dan Paulin and Kaj Suneson (2012) emphasize the blurriness regarding the terms knowledge transfer and knowledge sharing. As the authors state "in many cases, the authors use central terms interchangeably and without making a distinction between them and sometimes without sufficient explanation of from which perspective the terms are used". However, the two conclude that the notion of knowledge transfer is used especially when departments, organizations or even businesses are in focus. On the other hand, sharing knowledge is used more frequently by the authors that focus on the individual level.

From all the definitions given above it can be observed that all the basic concepts of the knowledge and innovation based society are interconnected and closely linked. As a general idea, it appears that this new type of society is very much based on creating new information, but a key element of success is represented by dissemination of newly created information especially clearly exacerbating the role held by the social dimension.

2.2. Innovation and knowledge based economy – a resource with an integrative role for the European Union

Given the fact that Romania is part of the EU and must comply with the directions set by it, I considered it to be needed a description of the importance given to innovation at European level.
Over the last 60 years, the EU has chosen various resources with an integrative role and which were thought to represent an effective response to the most pressing problems the European area was facing at the time. These resources have always had the common aim of developing labor force employment and improving living standards of citizens. Furthermore, it was permanently aimed the development of commercial exchanges between Member States and maintaining European Union's global competitiveness.
Resources with an integrative role used in the past were coal, steel and agriculture. However, although boosted European integration at all levels, CAP objectives have been achieved until the 80s, and the European Coal and Steel Community no longer exists since 2002, because it was established over a period of 50 years. So, given this situation, it was necessary for a new resource with an integrative role to be found that meets the needs of the present and that resource is a knowledge and innovation based economy.
"Europe 2020 is the European Union's ten-year jobs and growth strategy. It was launched in 2010 to create the conditions for smart, sustainable and inclusive growth. In a constantly changing world, the EU wants to become a smart, sustainable and inclusive economy. These three mutually reinforcing priorities should help the EU and the Member States deliver high levels of employment, productivity and social cohesion." (EC, web).
The strategy focuses on developing and encouraging an knowledge and innovation based economy and most of the initiatives that will be implemented are targeting these areas. A good example is the initiative called "Innovation Union" which is proposing a policy shift in research, development and innovation but also aims to strengthen all the links in the innovation chain, from research to commercialization. Among the novelties brought by Europe 2020 include fostering a new kind of growth - smart, sustainable and inclusive - through various means such as: encouraging research and innovation; increasing competency level on and strengthening lifelong learning; more efficient use of smart grids and the digital economy; modernization of industry; promoting more efficient use of energy and resources.
The importance of innovation is recognized both in agriculture and rural development. A proof in this respect is the fact that the current reform of the Common Agricultural Policy regards innovation as a key tool for a sustainable agriculture and rural development. Following 2013 the second pillar of CAP will be more focused on competitiveness and innovation, climate change and environment.
These being said, it is obvious that the European Union is making considerable efforts encouraging the development of this new type of research and innovation focused economy. Given that Romania is part of the Union and must comply with the directions set by it, I thought a description of the situation at European level was highly needed for a better understanding.

3. The current state of knowledge transfer market development in Romanian agriculture

In order to highlight the need of developing a culture of innovation in the agricultural sector in Romania is very important to present the current level of development of the knowledge transfer market in this field.

3.1. The knowledge supply

The knowledge supply on the agricultural market in Romania is represented by structures that carry out research in this area, with the purpose of transferring the results of these activities into farmers practice. This transfer consists in providing new varieties of seeds for orchards, viticulture or forestry, genetic material for livestock and fisheries and also consultancy actions. At the same time, the teaching segment of academia represents another part of the supply, without conducting research.

In innovation and introduction of technical progress there isn't an actual specialized technological transfer network. This is done through research, development and innovation in the public network, through marketing departments of agricultural inputs suppliers and to a small extent through agricultural advisory services and mass-media (ASAS, 2011).

At national level, the National Authority for Scientific Research develops, manages and implements policies, strategies and instruments through which the Romanian state supports scientific research as well as transferring its results to the socio-economic environment (ANCS, web).

The academic environment is one of the leading suppliers of informational input for the agricultural sector through two components: the educational segment and the R&D segment. The first one provides training for new agricultural specialists through the creation and dissemination of specialized knowledge. The latter is represented by the departments or science units of the agricultural and biological universities. However, these activities involve the engagement of a higher consumption of resources and lower incomes. Because of that most research activities are carried out in specialized institutions.

The Romanian agricultural research system in characterized by the existence of about 60 R&D units which study, develop and innovate in the public interest. They manage a patrimony of about 30.000 hectares of land (ASAS, 2011).

Most of the agricultural research system in Romania is managed by the state, the private sector having a reduced share in research. The farmers still need to pay for the services provided regardless of whether they come from public or private sectors. So instead of creating a mutual help between them they create competition which is not beneficial to the development of agriculture. In Romanian economy, this problem is compounded by an already existent lack of people involved in R&D activities. Also, given that the European Union strives to increase the amount of money destined for research and development to a threshold of 3% of GDP, according to input provided by Eurostat, Romania was in 2013 the country with the lowest proportion of GDP allocated to this activity (0, 39%).

3.2. The knowledge demand

The knowledge demand is represented by potential users of research, development and innovation conducted in agriculture. These users consist of leaders of agricultural holdings, specialists from product chains and local and central public administration.

According to data extracted from Romanian Statistical Yearbook 2014 (INS, 2015), at the end of 2010, the agricultural area of Romania was valued at 3.859.043 agricultural holdings. According to the same sources, 99.2% out of them were agricultural holdings without legal personality - individual holdings, freelancers, sole proprietorships and family businesses.

Therefore, there are two types of holdings – large and small – and there are significant differences between their dimensions. 0.8% of the total holdings hold 40% of the utilized agricultural area. In 2010, the average size of a holding with legal personality was 190 hectares and a peasant household was 1.95 hectares. The small areas of these holdings prevent them from being performing and thus being economically viable.

Although in recent years we can see a downward trend in the numbers of agricultural holdings, Romania is the country with most holdings in the European Union, meaning

approximately 30% of all farms in the EU. Although this decline translates into increased average size, in our country this value is still among the lowest in the Union.
In 2010, most holdings were those who had between 2 and 5 hectares, followed by some smaller ones (1-2 hectares). Meanwhile, there were 28 times more farms with less than 0.1 hectares than holdings which had over 100 hectares. These figures confirm that land fragmentation is still a problem for Romania. However, the general trend is to decrease the number of small farms and increase the number of holdings which have over 100 hectares.
At the end of 2011, the Institute for Quality of Life in collaboration with the Ministry of Agriculture and Rural Development drew up a fieldwork in which they interviewed 794 agricultural entities in Romania, and the results were made public in the seminar "Farmers Associations and forest compossessorates - key actors of social economy in rural areas". The relevant aspects regarding the rural population were:

- 75% live in substandard housing;
- more than 36% have professional status of freelancers;
- 37%, meaning over a million citizens are unremunerated family workers, people living and working in peasant households, without having any remuneration as salary or payment for the agricultural activity they carry out (Agroinfo, web).

These realities highlight again the lack of financial capacity of agricultural land exploiters who have small size farms to sustain the transfer of innovative technology and transfer of know-how from its own capital. In these conditions, there is no possibility for them to resort to elements related to research and development because most of their production goes to their own consumption and most farms (99,2%) are individual subsistence farms. In these farms they do not seek to gear production to the market and farmers are not aware of the way they could improve results.

4. A new approach to innovation, research and knowledge transfer for the Romanian agriculture

Paul Attewell (1992) brought to attention the notion of "knowledge barriers" and defines them as being a "lack of knowledge". Because the newly created information cannot be understood or interpreted and because a non-sufficient existent knowledge in certain subjects a disruption and an inefficient dissemination of innovations is created.
Also Gabriel Szulanski (2003) highlights that knowledge transfer depends on several factors, namely:

- the receptor's level of expertise prior to the knowledge transfer;
- how well the method transmitted through transfer is understood;
- the ability to unlearn and learn new practices;

To all these factors we can add motivational factors, cultural and individual characteristics and the receiver's ability to absorb information.
All these barriers are added to already market-specific knowledge transfer barriers in the Romanian agriculture, as evidenced in the situation described in the previous paragraphs. All these issues point to the need of changing the approach in relation to innovation and knowledge transfer in this area, in order to achieve better results which are easier to put into practice.
There are two categories of approaches used to facilitate the knowledge transfer among rural producers. These are grouped around the starting point of the information underlying the establishment of operational structures:

- "top-down" approaches issued from the central level, meaning the information is sent from the research center to farmers;
- "bottom-up" approaches which leave from the rural realities of local knowledge to the research centers.

The drawback of the first approach is that it limits the involvement of farmers in the knowledge transfer. Researchers expand their activity into finding solutions for the problems they consider important, but in some cases the study separates from the need of masses, represented by farmers with limited resources. The second approach involves farmers in the research process and focuses more on their actual needs.
In the concept of knowledge transfer, setting examples and promoting good practices are of particular importance. The regionalization of issues is another feature that the European Union tries to reduce. However, in the knowledge transfer in agriculture, the example of farmers from other areas is particularly important. Innovation starting from the "bottom-up" concept is characterized by accessibility and is focused on the actual need of producers. Therefore, it is more likely that farmers from different parts of the European Union to be interested in this type of innovation, much closer to their needs.
Another argument in favor of innovation through knowledge transfer and knowledge transfer is that these are effective ways by which the gap between academic research and the actual need of the producers can be reduced. Furthermore, by involving farmers in the innovation process they become co-owners of the newly founded solutions, making them more inclined to put it into practice.
Enhancing the application of these concepts bears a double advantage by bringing closer the two essential elements of the knowledge market: demand and supply of knowledge.
Basically, if the research centers are being connected to the real needs of farmers, they will be able to guide research toward finding the right answers for the farmers' actual problems. In this way, their work will be more efficient because they would have created an output that will be purchased.
At the same time, farmers will be encouraged to collaborate with research institutions to help them find solutions to the problems they face and lead to low productivity.
This new approach to innovation does not minimize in any way the research institutes role, but points out a better way of streamlining their activity. Applied research and even experimental research can also be performed by farmers and by the concept of open innovation they are encouraged to intensify such concerns. However, fundamental research, an activity without commercial purpose and without a specific application, remains in charge of research structures.

Conclusions

The main research question I wanted answer through this research is the following: can a culture of innovation in the agricultural sector in Romania bring an improvement in the whole sector?
Starting with the example set by the European Union, which relies on economic development through research and innovation as a solution to the problems it is currently facing, and highlighting the current challenges the knowledge transfer market faces in Romanian agriculture, I reasoned why open innovation and bottom-up innovation represent real solutions to our country's agricultural sector.
This proposed approach to innovation is intensively encouraged at an European level, quotes from studies conducted in this regard being found throughout this article. To actually visualize the impact and effectiveness of these proposed concepts, additional research on existing examples is encouraged, in which the involvement of farmers in the modernization process resulted in better utilization of innovations. Therefore, a further research in which practical examples are analyzed could strengthen or at least render more clearly the impact of the innovation culture in the Romanian agricultural sector.

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