

KNOWLEDGE TRANSFER THROUGH KNOWLEDGE SYSTEM IN ORGANIC AGRICULTURE

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Abstract

Organic agriculture is one of the rapidly growing production systems with high potential to address some of the biggest challenges mankind is facing today (poverty, loss of biodiversity, water pollution, climate change). On its development path, unlike many other mostly science driven agricultural innovations disseminated by top-down approach, organic agriculture emerged as informal movement and growth thanks to the knowledge of production and knowledge transfer based on social learning. In the Republic of Macedonia, organic agriculture each year recruits more producers, accumulates more knowledge and is in development stage where exchange of ideas, information and transfer of knowledge must take place. Drawing on the situation of Macedonian organic agriculture, main purpose of this paper is to propose relevant national model for knowledge transfer, as a system innovation to the existing national extension service.

In this sense, as a starting point, main characteristics and general situation of Macedonian organic agriculture and existing extension service will be presented and analyzed. Being that organic agriculture knowledge system is complex and context-specific, following part of the paper will explain its key processes, actors and knowledge devices. Third part describes participatory approach of all actors and knowledge devices for integration of organic agriculture knowledge system within the existing national extension service.

Expected outcome is to have a set of organic agriculture actors, as well as links and interactions between them, engaged in the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilization of organic agriculture knowledge and information, with the purpose of working synergistically to support decision making, problem solving and innovation in organic agriculture.

Key words: *Organic agriculture, Knowledge transfer, Knowledge system, Knowledge actors, Knowledge devices.*

1. Introduction

Organic agriculture is an original concept that brings radical change and innovation based on new values of economically, environmentally and socially sustainable agriculture. Its continuing development all over the world proves that mankind is aware of the need for transition to sustainable agro-food model. Organic agriculture is recognized and accepted both by the producers and institutions in the Republic of Macedonia. Unlike many other mostly science driven agricultural innovations disseminated by top-down approach, organic agriculture emerged as informal movement and growth thanks to the knowledge of production and knowledge transfer based on social learning (information flow, producers' experiments, farming networks, innovations and technology transfer).

In fact, researches confirmed that most of organic agriculture knowledge has not been developed through the formal education system or by conventional science [1]. In this sense, the need to transfer the knowledge through an innovative knowledge system is imminent for further development and spreading of organic agriculture. Although in its bear essence organic agriculture shares the use of naturally occurring biological processes with ancestor methods, it must be pointed out that it has capacity to absorb as much technological and science advancements, as conventional agriculture [2]. Additionally, the need to strengthen organic producers' positions among other farmers, policy makers and other food system agents, represents is other broad opportunity for science-based solutions. In this sense, the organic farming knowledge system includes many actors, its institutions and organizations and is therefore a result of an intensive social learning process.

Within the organic agricultural knowledge system, agricultural extension is the actor that is established with objective of being intermediary in knowledge transfer between the knowledge suppliers and users. Being that in the Republic of Macedonia traditionally

agricultural producers have trust and good cooperation with the public extension service, we strongly believe that it must take active part in supporting further development of the organic agriculture in the country. We thus suggest development of participatory organic agriculture knowledge system, by introducing organic agriculture as a system innovation to the existing public extension service. First part of the paper provides brief history and current situation of Macedonian organic agriculture and national public extension service. Second part deals with the actor in the organic agriculture knowledge system. The third part describes possible model for creation of agricultural knowledge system in the Republic of Macedonia.

2. Knowledge transfer through knowledge system in organic agriculture

2.1 General characteristics of organic agriculture and extension service in the Republic of Macedonia

Development of organic agriculture in Macedonia is dating back from the late 90's of the last century, started as an initiative of several farmers, supported by foreign donors. Along with the emerge of organic producers, in 1999 initial expertise has been provided for drafting the legal bases for organic production, and by the end of the year 2000, first draft Law on organic production was completed. In 2009, first Macedonian certification body was accredited. After a couple of drafts, in December 2009, Law for organic agriculture [3], valid from the first January 2010, was fully harmonized with EU Acquis [4, 5] on organic production and labeling of organic products). By the end of the year 2010, all remaining by-laws were adopted [6, 7].

Along with adaptation of the national legislation, in 2007 Government of the Republic of Macedonia launched a program to financially support the development of organic agriculture. Measures of this program provides increased financial support of 30% for organic production compared to regular production, as well as additional support for the processing and trade of organic products, followed by coverage of 50% of the cost of certification (Figure 1).

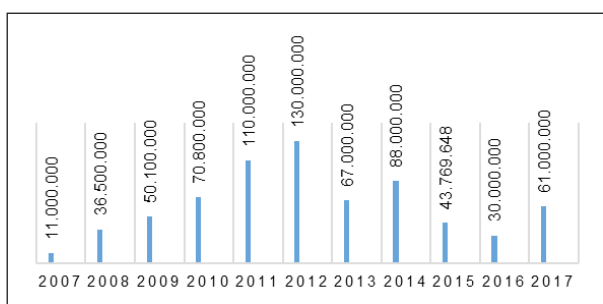


Figure 1. Financial support for organic agriculture in the Republic of Macedonia for the period 2007 - 2017, (in Macedonian denars, MKD)

As can be seen in Figure 1, in the period between 2007 and 2012, from year to year, Government was practically dabbling the amount of financial support for Macedonian organic producers, reaching its record amount of 130.000.000 MKD in 2012. Financial support was reduced to 67.000.000 MKD in 2013, than quite unstable in the next three years, while projected support for 2017 is 61.000.000 MKD.

In terms of certified production area under organic agriculture and number of organic agricultural producers in Macedonia, from modest 4 - 5 producers in 1998, up until 2007 there were 50 organic farmers and 266 ha certified organic production area. Macedonian organic agriculture reached its peak in 2011, with maximal 780 certified organic producers and 6.580,92 ha under organic production. In the years to follow, we can notice declining trend, settled by 481 certified organic producers, cultivating 2.631,96 ha of certified production area in Macedonia in 2015 (Table 1).

Table 1. Total arable land (ha) and number of organic operators in the Republic of Macedonia in the period 2005 - 2015

Year	Total certificated production area/ha	Number of operators
2005	266.00	50
2006	509.42	102
2007	714.47	150
2008	1.029.00	226
2009	1.373.83	321
2010	5.228.00	562
2011	6.580.92	780
2012	4.663.08	576
2013	3.167.85	400
2014	2.359.49	344
2015	2.631.96	481

Regarding the structure of Macedonian organic sector, most dominant are cereals and organic fruit production. There is also substantial progress in the development of organic livestock production, especially cattle [8].

From all presented data regarding development of organic agriculture in the Republic of Macedonia, we can say that it is following the trend of the Governmental financial support. This acknowledgment is rather unfortunate since the financial support is an integral part of the national agricultural policy, which is in direct connection with the budget capacity and can be subject to changes. Additionally, on the part of agricultural producers, such situation is suggesting insufficiency of commitment and inability to accept organic production a "modus vivendi", rather than temporary or part-time activity. Regarding the structure, it is evident that it is not well diversified, since in organic plant and animal production in the Republic of Macedonia, we have one dominant representative (cereals and cattle), while other types of production show little, or no progress.

Regarding the Macedonian extension service, it is dating back from 1960s, as a part of former Yugoslav federation agricultural knowledge system (AKS), when was primarily aimed to transfer scholarly work on agricultural advice and extension. That system was driven by centralized agricultural policy, intended to coordinate knowledge and innovation transfer in order to accelerate development and modernization of Macedonian agriculture. The result was strong integration of public research and education, and extension bodies were mainly coordinated and controlled by the Ministry of Agriculture. That knowledge system was highly functional, and indeed, up until late 80s of the last century, contributed greatly to development of Macedonian agriculture, especially in transferring knowledge about new production, crop rotation and crop protection techniques, animal welfare and use of mechanization. In the early 1990s, the country become independent and went through economic transition that caused rather drastic changes of the agricultural sector, including the AKS. Namely, research, extension and education in Macedonian agricultural sector have undergone a deep restructuring, transformed by the trend towards liberalization, accompanied also with the large scale introduction of computers.

Nowadays official approach toward public extension and advisory services is represented by two existing service providers; Ministry of Agriculture, Forestry and Water Economy (MAFWE) regional offices, and the National Extension Agency (NEA).

The MAFWE has overall responsibility for the provision of agricultural extension and advisory services to the agricultural producers, no matter whether they are provided by public or non-public service providers. The Ministry comprises several departments including one for agriculture and another for rural development.

NEA is a public institution affiliated with the MAFWE, but enjoying substantial autonomy. NEA, whose headquarters are located in Bitola, is responsible for providing extension and advisory service to the Macedonian agricultural producers. NEA's organizational structure comprises three levels, i.e. Directorate, Regional Centers (6), and Work Units (30), with a total of over 130 employees in the whole country. The organizational structure and field activities of the agency are based on specialized sectors of production that include: crops cultivation, livestock breeding, vine and fruit growing, vegetable cultivation, and agro-economics. NEA's funds for staff salaries and basic operations come from the Ministry, but almost all the donor-funded projects in rural and agricultural development in Macedonia have involved and supported NEA in various capacities.

The NEA provides agriculture-related services to meet needs and demands of individual agricultural produc-

ers and sole proprietors. In the past, the agency's primary focus was production, but in view of the trade liberalization policy and for meeting the requirements for accession to the European Union, the NEA is also advising agricultural producers on marketing and quality standards. NEA implements measures in line with the Agriculture Support Development Program and other activities upon the requests received from the Ministry. It maintains and upgrades the Farm Monitoring System - a source of information on profitability and economic efficiency of agricultural production within the advisory service, and also to meet information needs of other interested institutions. NEA organizes farmer field days, and provides technical/economic packages for different agricultural patterns. The agency also organizes training programs and consultations in various specialized areas with the aim of developing technical capacity of its field advisors.

Having on mind these remarks, we can say that development stage of Macedonian organic agriculture enters a critical point where exchange of ideas, information and knowledge must take place. Therefore, we are confident that within the evolving role of NEA organic agriculture must be introduced as a system innovation.

2.2 Actors involved in organic agriculture knowledge system

Simplified to maximum, we can say that agricultural, including organic production, knowledge system is a collection of actors, involved in production, research, education and advice services, with almost equal importance and role. Agricultural knowledge system has five main actors with an interest in developing organic agriculture [9]:

- Organic producers
- Research
- Extension services
- Education and training
- Support systems.

Although all elements of one system are equally important, in the case of organic agriculture knowledge system, role of organic producers is particularly stressed. By engaging themselves in organic production, producers are constantly experimenting new techniques, followed with investing efforts in different labor time and space management, adapting and refining solutions to change, comparing different options with producers that have similar conditions, and making right choices. Generated new knowledge that will benefit all producers needs to be circulated. Establishment of knowledge system is instrumental in helping organic producers to transfer the knowledge and become stronger and more independent. In addition, knowledge-exchange provides a critical mass and sets

an end to the isolation, stimulating various forms of co-operation and information exchange between organic farmers. Strong argument that justify producers central role in organic farming knowledge system is the fact that organic sector, especially in developing countries, is represented by small (individual) producers. Major reason they converted to organic production in most cases is because it does not require drastic change in their farming practice, and offers options for risk reduction, especially regarding market risks. This implies that they are still not very educated or informed and that any help is more than welcomed.

Following three element: researches, extension and educational organizations, are regarded as classical actors of the knowledge system, and are pretty much stable. Here, special contribution should be done by the extension service since it is the only actor in the entire system that is established with objective of being intermediary in knowledge transfer between the knowledge suppliers and users. This is especially true for the extension service to more complex new collaborative extension systems and platforms, which require the adoption of new configurations and organizational structures, open to multiple actors. In the context of organic agriculture knowledge system, extension service needs to have sustainability paradigm as underlying framework.

Particularity of the organic agriculture knowledge system are the support systems, as they can be highly fragmented and subject to a dynamic process of emerging new structures and actors [10]. Within this broad group of actors, it is inevitable to mention local NGOs and private sector. In fact, most pioneer organic projects were initiated by local NGOs or the private sector. One of the great strengths of this actor is the personal motivation and expertise of key individuals. A common conclusion of local NGOs is that they can achieve a lot on their own, but sooner or later they realize that it is desirable to establish links with local and national government, that are of crucial importance for the accurate knowledge system.

Other actors in the organic agriculture support system are the organic entrepreneurs and SMEs, mainly in rural tourism, local resource based activities (wood, water, etc.), organic food processing and social services. Actors in this group are among the major drivers of innovation, because they have to adapt their internal organization and technologies to comply with rules and standards of organic production.

Another major conduit for the flow of knowledge and information are cooperatives and organic producers associations. As actors in the knowledge support system they often provide inputs, input-related technical advice as well as advice related to products.

The media and journalists (professional journals and, increasingly, web-sites) are important for the exchange

of information and ideas in, and about organic agriculture. The mass media shapes food discourses in society at large and mobilizes consumers' attitudes in terms of food quality and safety, values, alternative food networks and environment protection, so they are also valuable supportive actors in the organic agriculture knowledge system.

Also commercial service providers (veterinarians, plant and soil laboratories, brokers in the land market, providers of farm management software) and especially (fiscal) accountants and banks can be important actor on providing sources for know-how on certain aspects of the organic agriculture related to knowledge and innovation [11].

Other actors who probably will be intensely interested in the development of organic agriculture and environmental issues are future generations. Clearly, they do not have a voice yet, but their rights must be taken into consideration and circulated into the knowledge system.

Last, but not least, it must be pointed out that biological diversity in agriculture is of immanent importance for the existence, primarily because it meets the basic needs for food. With evolution and society development, new types and species with better quality has been created and many types and breeds as genetic resource were destroyed. In this sense, we must bear on mind that there are other "silent actors" in the organic knowledge system. They are represented by a number of species of plants and animals, that have moral right to survive and exist and not to be destroyed and eradicated, and therefore their characteristics and specifics have to be researched, studied and shared within the society.

2.3 Model for creating organic farming knowledge system in the Republic of Macedonia

As it was elaborated earlier, Macedonian organic agriculture is strongly supported by the Government, and therefore, we believe that organic agricultural knowledge system should be integral part of the national agricultural knowledge system (AKS), and its extension services, as its *modus operandi*. Main idea is organic agriculture as a system innovation to the existing public extension service, to be supplemented by advisors specialized in organic agriculture and with participatory approach to it.

As seen in the model presented below (Figure 2), agricultural extension service is one of the four crucial sets of actors that act upon the knowledge of agricultural producer and generate solutions and innovations in response to problems and opportunities, desired outcomes, system drivers and regulative policies and institutions. By introducing organic agriculture into the public extension service, Macedonian organic producers will gain visibility by and easy access to other three sets of actors.

Figure 2 also suggest that when knowledge is created outside the organic agricultural production, producers' learning capacities can be only linked to their speed of adaptation to change and to their capacity of making strategic alliances with the right input providers [12]. As a general rule, the model suggests that knowledge system for organic agriculture link institutions with people (the end users of knowledge and information, who are organic producers) to promote learning. In fact, this model proposes generating, sharing and utilizing organic agriculture-related techniques, knowledge and information in a strategically aligned system. For Macedonian organic agriculture this integration is needed now more than ever, as budgetary support is unstable and reduced and the organic agriculture is facing substantial changes.

However, as the left-hand side of Figure 2 shows, problems are not simply given by the context. Rather, they are framed in different ways by specific paradigms. The same is true of material inputs and knowledge, which are also shaped by paradigms. Such differences are important in defining research priorities, societal choices and public accountability.

The emphasis in this AKS is introducing organic agriculture both as economic, social and environmental innovations into the model and is influenced by paradigm shifts (that parallel those that are occurring in research and innovation policies) towards network driven multi-actor innovations.

Expected outcome is to have a set of organic agriculture actors and/or persons, as well as links and interactions between them, engaged in the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilization of organic agriculture knowledge and information, with the purpose of working synergistically to support decision making, problem solving and innovation in organic agriculture [13]. This approach should also enable existing exten-

sion services to propose and develop practical ideas to support innovation, knowledge transfer and information exchange between actors in organic agriculture. In fact, it will introduce operational techniques that will reflect the manner in which development and innovation in organic agriculture actually occurs today: often through diffuse networks of actors who are not necessarily focused on traditional research and development. This will enable the extension service to encompass and influence the complexity of knowledge and innovation processes in the organic agriculture sphere and will help organic producers to become more compatible with broader sustainability goals. Additionally, having the organic agriculture as a "system innovation" will for sure help the advisors to address the more complex reality of modern agriculture, as well as the emergence of a new paradigm based on sustainable development rather than on productivity agriculture. The benefit for the system is that organic producers will bring knowledge and innovations generated by actors previously not included in the system. Namely, the two-ways arrows from and to agricultural producer, show that this model does not necessarily imply a top-down approach and this is very much true when we look at support systems for organic agriculture. Thus, by introducing the organic agriculture as a system innovation to the existing public extension bodies, the process of knowledge generation will be truly emphasized and will include new actors outside the research, education and advice sectors. And finally, it is widely accepted that knowledge transfer involves not only knowledge regarding production process, techniques and technology, but also implies a social dimension. Hopefully, trough social learning, environmental sustainability of organic agriculture will become one of the values and objectives transferred within the knowledge system.

3. Conclusions

- Considering its climate and soil conditions, Republic of Macedonia has a significant agro-ecological potential for development of organic agriculture. This has been recognized and supported by the Government, both in terms of subsidies and legal framework. Due to the budgetary constraints and unpopularity of purely government-driven initiative in democratic societies, the state support to Macedonian organic agriculture should shift towards more participatory models, in this case, innovation of the national public extension service and creation of efficient knowledge system. Namely, modern agriculture, or even better, agribusiness is much more diverse than in the past and is often combined with other activities. New knowledge is generated by producers, researchers and private companies. The old model of knowledge transfers just between scientist, agriculture advise and extension

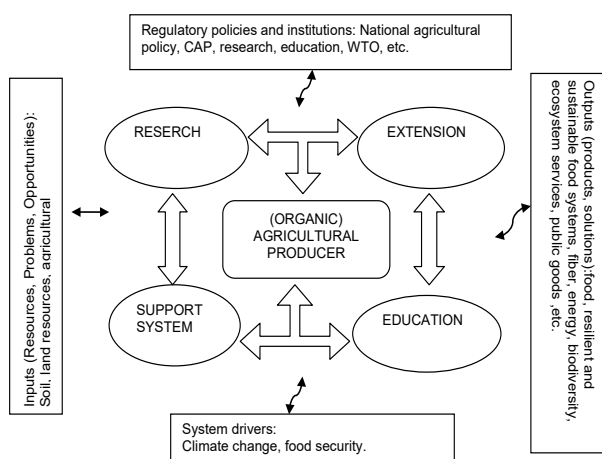


Figure 2. A model of an organic agriculture knowledge system [4]

and producers (top down) is therefore outdated and should be replaced by an interactive model of networking systems, which integrate knowledge production, adaptation, advice and education.

- Proposed model for innovating national extension service with organic agriculture accentuate the changing role of science and advice that support development of organic agriculture, recognizes knowledge process as social category and considers communication as a form of social interaction. In this sense, this model stress that knowledge is social phenomenon that takes place in the complex interaction of diverse social actors. Thus, we expect that the organic agriculture will trigger change by making its knowledge, techniques and information available and putting these into socially and economically productive use. Scientific knowledge that comes from academy is an important, but for sure not the only input for development to happen and there are multiple sources of knowledge, including the innovative capacity of organic producers. One source for inputs for sure is extension service.

4. References

- [1] Sumner J. (2008). *Protecting and promoting indigenous knowledge: environmental adult education and organic agriculture*. Studies in the Education of Adults, 40, (2), pp. 207-223.
- [2] Ingram M. (2007). *Biology and beyond: The science of "back to nature" farming in the United States*. Annals of the Association of American Geographers 97(2): pp. 298-312.
- [3] Ministry of Agriculture, Forestry and Water Economy. (2009). *Law for organic agriculture* (in Macedonian). MAFWE, Official Gazette No. 146/2009.
- [4] European Council. (2007). *Regulation (EC) No 834/2007 on organic production and labeling of organic products*. <URL:http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32007R0834:EN:NOT. Accessed 25 December 2016.
- [5] European Council. (2008). *Regulation (EC) No 889/2008 on detailed rules for implementation of Council Regulation (EC) No 834/2007 on organic production and labelling of organic products with detailed rules on production, labelling and control*. <URL:http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008R0889:EN:NOT. Accessed 25 December 2016.
- [6] Ministry of Agriculture, Forestry and Water Economy. (2010). *List of ingredients that were not produced by organic agriculture principles* (in Macedonian). MAFWE, Official Gazette No.162/2010.
- [7] Ministry of Agriculture, Forestry and Water Economy. (2010). *Rules on the manner and procedure for expert control in organic farming; Rules of procedure for the production of organic processed food; Rules on the issuance of authority to control / certification bodies for performing expert control and to expert scientific institutions or other entities for performing analyzes and super analyzes in organic farming, the necessary documentation, the form, content and manner of records keeping; Rules of procedures for organic production of vegetables; Rules on the form, content and manner of records keeping and databases for entities and for organic seeds and seedlings; Rules on the form and content of the certificate, the manner of its issuance, and the procedure for collection, packaging, transport and storage of organic products; Rules on the form and color of the national label for organic products and the national label for products in transition* (in Macedonian). MAFWE, Official Gazette No.163/2010.
- [8] Kendrovski V. (2010). *Report on Organic Sector in Macedonia*. In: Renko N., Renko S., Butigan R., Vuletic A., Schaer B., Berner N. (Eds.), National Report per Country on the Organic Production on the Basis of Bibliography and Data Collection, pp, 90-113.
- [9] Dockès A., Tisenkopfs T., Bock B. (Eds.). (2011). *WP1 Reflection paper on AKIS*. Collaborative Working Group Agricultural Knowledge paper on Innovation Systems Institute for Rural Development Research at Johann Wolfgang Goethe University, Frankfurt, Germany, pp. 36.
- [10] Darnhofer I., Schermer M., Schneeberger W. (2008). *Continuity and change in organic farming-Philosophy, policy and practice*. International Journal of Agricultural Resources, Governance and Ecology, 7, pp. 1-4.
- [11] Niggli U., Slabe A., Schmid O., Halberg N., Schlüter M. (2008). *Vision for an Organic Food and Farming: Research Agenda to 2025 - Organic Knowledge for the Future*. Technology platform ORGANICS, IFOAM EU Group.
- [12] Aeberhard A., Rest S. (2009). *Transdisciplinary co-production of knowledge in the development of organic agriculture in Switzerland*. Ecological Economics, 68, (4), pp.1171-1181.
- [13] Röling N. (2005). *AKIS model* (5th Ed.). New York Free Press, New York, USA, pp. 63.