



Prospects for Farmers' Support: Advisory Services in European AKIS
WP 4 – AKIS ON THE GROUND: FOCUSING KNOWLEDGE FLOWS SYSTEM | Topic 2
Country Report for Bulgaria

The capability of extension and advisory services to
bridge research and knowledge needs of farmers
*Highlighting the Role of Knowledge transfer in the
agricultural sector in South-Central region of Bulgaria*

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List of acronyms

EU	European Union
MAF	Ministry of Agriculture and Food
NAAS	National Agricultural Advisory Service
RDP	Rural Development Programme

Executive Summary

The purpose of this study is to explain the mechanisms through which knowledge is transferred in the agricultural sector in Bulgaria. In order to identify these mechanisms of interaction between science and practice the existing limitations and weaknesses need to be identified.

Three scientific institutes, one experiment station and the Agricultural University were selected for the purposes of this study. These scientific organisations were selected due to their high scientific achievements, active scientific and consultancy activities with local agricultural producers and their close relations with common scientific studies between the scientific institutes and the Agricultural University. The selection of agricultural producers consists of small and large farms, utilising the scientific achievements and consultancy services of the scientific institutes, experiment stations and Agricultural University. The questionnaires incorporated open questions to understand how the knowledge transfer process towards its practical application works and the requirement of innovations and the establishment of new technologies in Bulgaria.

The current study tried to clarify the mechanism for knowledge transfer in the agricultural sector in Bulgaria. The existing limitations are determined and the weaknesses in the interactions between science and practice are established. The results of the study show that large-scale agricultural producers require specialised knowledge related to fighting diseases and pests, knowledge for implementation of new technologies offered by the scientific institutes etc., while, the small producers seek knowledge related to the production process itself and methods to reduce production costs and achieve higher yields. The knowledge transfer from the universities and scientific institutes to the agricultural producers is performed through various channels, like demonstration and commercial fields at the scientific institutes, advice provided on site, international trade companies and non-formal channels.

The difficulties that the farmers and suppliers face regarding knowledge transfer is the poor access to agricultural advice for farms located away from the district administrative centres, the lack of information about events organised by the scientific centers, the lack of proper promotion of the results from the demonstration fields and a underdeveloped system for technology and knowledge transfer towards the farms. In order to develop the system for knowledge and advisory services in Bulgaria, is the following are required: 1) strengthening the expert capacity of the NAAS; 2) integration of all scientific institutes at the regional level for knowledge transfer in the agricultural sector; and 3) establishment of dispatch centres for the distribution of information, knowledge and advisory services.

1. Introduction

The contemporary business environment in the agricultural sector is characteristically highly dynamic due to globalisation and the expansion of market competition. The above conditions very frequently create threads to the successful functioning of the agricultural farms. In such environment, the farms' managers require new means and tools for keeping the business (Yankieva, et al, 2011). In that sense, the new knowledge can contribute to the improvement of the operations and resistance to the competition pressure. But to achieve that in practice, a working mechanism for knowledge transfer that ensures the prompt and in-time knowledge implementation by the agricultural producers needs to be developed.

The purpose of this study is to explain the mechanisms through which knowledge is transferred in the agricultural sector in Bulgaria. In order to identify these mechanisms of interaction between science and practice the existing limitations and weaknesses need to be identified.

In order to achieve the aim of the study, answers to the following questions are sought:

- What type of knowledge do farmers need?
- How do the farmers search for information?
- What motivates the farmers to apply new knowledge?
- Who offers the desired new knowledge?
- How is this knowledge promoted?
- How is the connection supplier-farmer performed?
- What difficulties do the farmers and knowledge suppliers face in the knowledge transfer process?

So far, there is no comprehensive study related to knowledge transfer in Bulgaria. In 2013, a study was carried out on the need to provide advisory services to small agricultural farms by Nikolov, et al. (2013). The results revealed that the basic needs of the small agricultural farms in the field of innovations are: need for up-to-date market information and ensuring there is access to new technologies and knowledge. The farmers are particularly interested in biological production. The transfer from conventional to biological production by the small farms is limited due to the high certification costs, high prices of plant protection preparation and fertilisers that are approved for application in such production types as well as by a lack of information level related to market tendencies. Another limiting factor is the lack of experience and knowledge concerning developing biological production. According to Bashev and et al. (2010), in order to overcome these obstacles the following steps need to be adhered to: Firstly, an actual market information system (SAPI) needs to be developed, one exists currently but does not function well and it is an unpopular source of information among the farmers. Secondly, technological transfer from scientific organisations towards small farms through the NAAS (as a link between research and practice) needs to be encouraged. Thirdly, biological production as a successful form of agricultural business needs to be promoted. Fourthly, the development of local structures, mainly between universities and farms for creating and developing new products and technologies also need to be encouraged.

2. Selecting and delimiting the case-study

There are 25 scientific institutes and 18 experiment stations within the Agricultural academy and 5 Agricultural universities with their respective scientific and demonstration centres. The main purpose of these scientific institutes and universities is to transfer knowledge to students, agricultural producers and specialists in the sector. The main instances of knowledge transfer are related to new technologies, specific productions and different applications in plant growing and livestock breeding sector as well as in relation to training and participation in the measures of the Rural Development Program (RDP) for 2007-2013.

There are 6 regions in Bulgaria (NUTS 2): North-West, North-Central, South-East, South-West and South-Central (Figure 1). For this study, the South-Central region was selected, which includes 5 sub-areas of: Kardjali, Pazardjik, Plovdiv, Sloliyan and Haskovo. The main reasons for selecting this region are that this region contains multiple and diverse scientific centres and an experiment station of the Agricultural Academy and the biggest Agricultural University in Bulgaria.



Figure 1: Map of regional level of NUTS2 in Bulgaria

Source: Ministry of regional development, Bulgaria

Six scientific institutes, four experiment stations and the Agricultural University Plovdiv are concentrated in the South-Central region. These scientific institutes are: (1) Maritsa Vegetable Crops Research Institute, Plovdiv, (2) Food Research and Development Institute, Plovdiv, (3) Fruit Growing Institute, Plovdiv, (4) Institute for Plant and Genetic Resources, Sadovo, (5) Fisheries and Aquaculture Institute, Plovdiv and (6) Tobacco and Tobacco Products Institute, village of Markovo, Plovdiv. The experiment stations are (1) Tobacco Experiment Station – Haskovo, (2) Agricultural Experiment Station – Kardjali, (3) Livestock Breeding and Agricultural Experiment Station – Smoliyan and (4) Experimental Station of Irrigation. The oldest and biggest Agricultural university, which has its own experiment field and knowledge transfer demonstration centre is also located in this area.

Three scientific institutes, one experiment station and the Agricultural University were selected for the purposes of this study. These scientific organisations were selected due to their high scientific achievements, their current scientific and advisory activities with local agricultural producers and close relations with common scientific studies between the scientific institutes in the area and the Agricultural University.

The selection of agricultural producers consists of small and large farms, utilising the scientific achievements and advisory services of the scientific institutes, experiment stations and Agricultural University. A list of agricultural producers was provided by the Institutes and the University. The agricultural producers were selected randomly and interviews with them were performed in the field and over the phone. The only selection criteria for choosing agricultural producers with whom to carry out the interviews is to have representatives from both groups, from small and large producer groups.

The developed questionnaires incorporated open questions to understand the knowledge transfer process works in practice and to understand the demand for innovations and establishment of new technologies. The questionnaires for the experts of the Scientific Institutes and the University related to the type of knowledge that is provided by each scientific institution and their contribution for the maintenance of the ecological environment. Special attention was paid to the methods for scientific products demonstrations, the locations of demonstrations and how these products are promoted among the producers. Problems related to knowledge transfer as well as recommendations for improving the cooperation between science and business were highlighted.

Interviews were carried out with agricultural producers who highlighted problems in their operations and the type of innovation products that they need. The agricultural producers also shared their experiences cooperating with the scientific units, the benefits they receive as well as the difficulties they face. The agricultural producers shared their opinions on how to improve the operations of the scientific centres in order for them to respond more promptly to the innovation needs of the producers.

3. General description of the case study

The South-Central region includes five districts – Pazardjik, Plovdiv, Smoliyan, Haskovo and Kardjali (Figure 2). The region occupies 20% of the total area of Bulgaria and 20% of the total population. The average population density is 66.1 people/sq. km. The district of Plovdiv has the highest share of Utilised Agricultural Area (UAA) – 45% of the UAA of the region, followed by Haskovo – 31%, Pazardjik – 13%, Kardjali – 6% and Smoliyan - 5%. Only 20% of the region’s area is used for agricultural production and the share of the utilised agricultural area out of the country’s total UAA equates to 12%. 7.47% of GDP for the area is in the agricultural sector, which is a significantly higher level compared to the country’s average level of 4.84%.

29.6% of all farms in the country operate in the South-Central region. 106,054 of farms are with UAA and they operate on 12.3% of the UAA for the country. The average UAA for the farms of the region is 4.20 ha, or it is 58.6% smaller than the average UAA for the country, which is 10.13 ha. 98.8% of the farms in the region are represented by individuals natural persons and they operate 51.6% of UAA of the region, with an average area of 2.19 ha, an average value for the country of 3.43 ha. The other 1282 farms are

represented by legal entities and they operate 48.4% of UAA in the region. The commercial companies form the highest number – 734 with 26% of the UAA of the region and with an average land area of 155.3 ha. 157 co-operations operate in the area and they have the highest average land area – 406.6 ha and operate 14.4% of UAA (MAF, 2012).

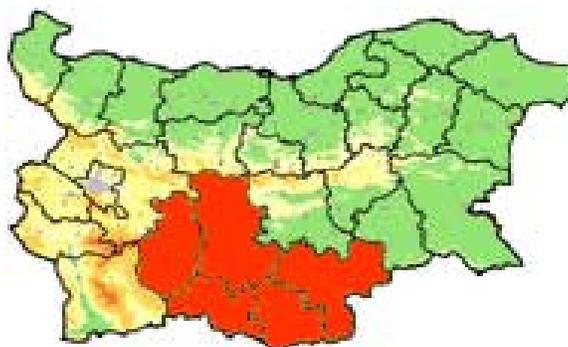


Figure 2: Map of South-Central Bulgaria
Source: bg.guide-bulgaria.com

The South-Central area is the biggest vegetables producer in Bulgaria – 48% of the country’s areas are located in this region. The biggest contribution of the region is in the production of peppers – 73% and tomatoes – 65% (Figure 3). 33% of the vineyards and 55% of the tobacco growing areas in Bulgaria are located in the region. The favorable soil and weather conditions of the area are a prerequisite for growing peanuts, rice, rye, cotton, oil-bearing rose, lavender, mint and other cultures that are not grown elsewhere (MAF, 2012).

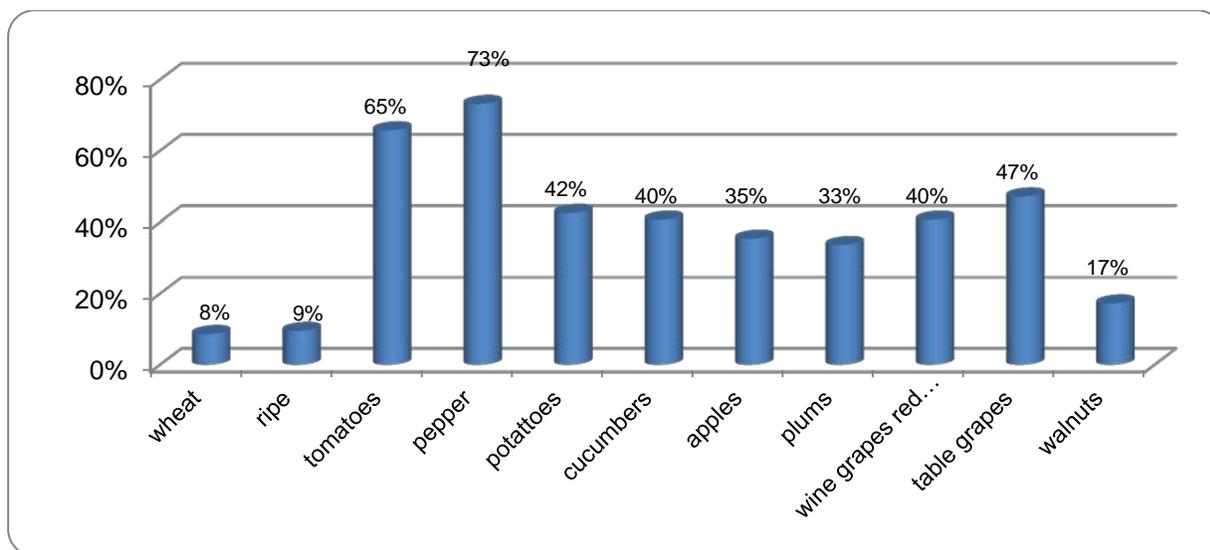


Figure 3: Contribution of South central region to Bulgarian agricultural production in 2012
Source: Ministry of agriculture, Bulgaria

4. Methods and data collection, local stakeholders

Descriptive analysis and personal interviews were used in the study. The descriptive analysis is applied to determine the potential of the scientific centres to provide innovations to the agricultural producers. Through this method the main direction of scientific work of these centres and the areas with scientific achievements were determined. In order to gather detailed information related to the knowledge transfer process personal interviews with the heads, and internal experts, of the scientific centers were carried out. With the help of the interviews the specific problems hindering interactions with agricultural producers and possible solutions for facilitating the process were determined. In order to acquire feedback related to the information provided by the experts, interviews with agricultural producers using the services of the scientific centres at of the South-Central region were carried out. All the interviewees were eager to share their experiences of the knowledge transfer process and to express their satisfaction with the beneficial cooperation with the scientific centres and their wish to continue working with them.

The average duration of the interviews was about 60 minutes and the main subject areas were determined in advance: 1) consulting activities; 2) innovations; 3) social capital – events, fairs, seminars etc.; 4) cooperation with other institutions; 5) public resources. All of the interviews used open questions and different methodological techniques in order to acquire the appropriate information. The flexibility of the method allowed us to acquire detailed information about the concerned questions, and when required, additional questions were asked in order to clarify each individual case. The respondents were informed that there were no right or wrong answers and that we hoped to have an open conversation where they could freely express their views. It was also explicitly stated, that the both positive and negative opinions on the subject discussed were equally important.

The interviews were carried out in the following manner: 1) short introduction to the project; 2) clarification of the outline of the conversation; 3) clarification of the respondent's tasks; 4) proper implementation of project techniques. Use of this method established trust between the respondents and the interviewer, which is a guarantee for the quality and reliability of the information gathered. A characteristic feature of the interviews was their evolutionary type. All interviews were concluded with recommendations related to the facilitation of the knowledge transfer process with regards to the agricultural producers in the country and the practical application of knowledge.

5. Results

The results include short characteristics of the actors and the scientific fields they work in (6.1), the processes and methods of knowledge transfer used by scientific institutions are described (6.2), the demands for knowledge shown by the agricultural producers and their work with those scientific institutions and experiment stations are described (6.3), the role of the advisory services provided by the scientific institutions and experiment stations is shown (6.4), a graphic model of the knowledge flow between the scientific units and the agricultural producers is illustrated here (6.5).

5.1. Actors and source of knowledge: where the knowledge comes from?

There are several scientific centres located in the South-Central region related to the agriculture with national significance as they are the only such centres in the country. They are: Agricultural University - Plovdiv, Fruit Growing Institute - Plovdiv, Institute for Plant and Genetic Resources - Sadovo, Vegetable Crops Research Institute - Plovdiv and Experimental Station of Irrigation - Pazardjik (Figure 4). Each of these scientific institutions specialises in a particular field and provides advisory services to farmers in specific thematic areas. Between them, there are no hierarchical links and they operate as separate units. However, their main competitors are commercial companies importing seeds, fertilisers and pesticides, which also offer advisory services to farmers on the production process. The farmers are the end-users of the products and services offered by the scientific centres and only occasionally are they involved in the creation of knowledge.

Agricultural University - Plovdiv

The Agricultural University is the only specialised state-funded university in Bulgaria within the area of agricultural and life sciences. The major structural units of the Agricultural University are the four faculties – Faculty of Agronomy, Faculty of Horticulture with Viticulture, Faculty of Plant Protection and Agroecology, Faculty of Economics, scientific fields and a demonstration centre. The university works in close collaboration with scientific institutes and practice in the South-Central Region and in the country. The key activities of the university are: (1) Teaching and training highly qualified specialists for the agricultural sector building upon secondary level education towards and granting higher education levels degree qualifications; (2) Upgrading the qualifications of specialists in the agricultural sector; (3) Preparing the professionals needed for the development of higher education; (4) Carrying out scientific, research and development activities and applying the outcomes to agricultural science and practice; (5) Surveys, designing, consultancy, expertise and extension services; (6) Research, production, creative and other activities related to the mission of the Agricultural University Plovdiv.

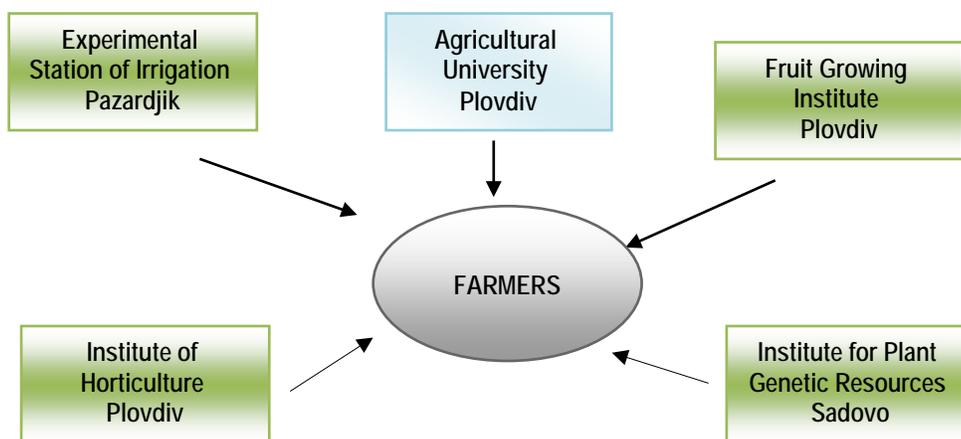


Figure 4: Main actors and source of knowledge in South Central Region in Bulgaria
Source: Inventory report for Bulgaria, Dirimanova, V. (2014)

Fruit Growing Institute - Plovdiv

The institute has 160 ha of agricultural land and most of it is used for scientific experiments. For this purpose, the institute has orchards for the production of fruits, and cultivated plants for the production of seedlings (saplings). The research activity is concentrated in two departments: (1) breeding, genetic resources and biotechnology and (2) fruit growing technologies. The total number of scientists is 21. They have scientific degrees and titles in seven scientific areas: Fruit Growing, Breeding and Seed Production of Cultivated Plants, Land Reclamation (Irrigation and Drainage), Agrochemistry, Agricultural Mechanisation, Economics and Marketing. The institute maintains a germ-plasma collection of 1741 local and introduced accessions of the main fruit species. The Fruit Growing Institute-Plovdiv produces and offers varieties of certified planting material of the main fruit species including virus free rootstocks for 6 stone-fruit and 12 fruit-seeds species, as well as a range of 38 stone-fruit and 23 fruit-seeds cultivars. The Fruit Growing Institute-Plovdiv offers fruit planting material for the following species: sweet cherries, peaches and nectarines, apricots, plums, apples, pears, walnuts, hazelnuts, almonds.

Institute for Plant Genetic Resources - Sadovo

The institute is located in the town of Sadovo, situated in Central-South Bulgaria and 15 km from Plovdiv. The institute has 270 ha of agricultural land, out of which 155 ha are used as experimental fields and 115 ha for seeds production base. The institute has National seeds genetic bank, botanic garden, herbarium, computer centre and specialised laboratories in: seed science, plant protection, biochemistry, plant physiology, agro-chemistry, plant bio-technologies and seeds quality. Twenty-six scientists are working in the Institute for Plant Genetic Resources and the main scientific areas are: (1) the collection, study, preservation and usage of plant genetic resources; (2) the maintenance of the National genetic bank, quarantine and botanic garden of plant species coordinated with FAO; (3) implementation of selection programmes for the basic cultures for the country and development of competitive varieties of wheat, triticale, oats, rye, peanuts, sesame, peas, chickpea, tomatoes, peppers, aubergine, lettuce etc.; and (4) application of contemporary plant bio-technologies.

Institute of Horticulture – Plovdiv

The Institute of Horticulture is a centre of wide-ranging scientific and research activities in the field of vegetables production. It is located in the Thracian Plain – the biggest vegetables production region in Bulgaria. Twenty-six scientific workers work at the Institute, in two scientific departments: "Selection, variety preservation and introduction" and "Technologies in the vegetables production". For 80 years 300 varieties and F1 hybrids for tomatoes, pepper, cucumbers, onions, cabbage, garden beans, green peas, leeks, potatoes etc. were developed here. The Institute has a production and experiment base of 180 ha of open areas, 1.75 ha of steel-glass greenhouses and 0.35 ha of plastic greenhouses. The Institute offers the following scientific services to the agricultural producers: (1) advice on vegetable production; (2) experimental station; (3) training; (4) open days; (5) plant protection monitoring; (6) soil analysis and fertilisation recommendations; and (7) preparation of projects for vegetable production. The work of the experts at the Institute is targeted towards the support of the vegetable producers by expert advice, contemporary ecological technology for growing new and existing varieties of vegetable cultures and development of projects funded by EU funds.

Experimental Station of Irrigation – Pazardjik

The station was created in 1947 to establish the irrigation regime, irrigation norms, the methods and intervals for irrigation as well as the appropriate equipment for irrigation. The station has 128 ha of state land, its own irrigation feelers, a farmyard with a big warehouse and meteorological station. Since 2008 the station has been registered in the Trade register as state enterprise with 100% of its shares owned by the state. The station is self-supporting and does not receive subsidies for its operations. Thus, the station is forced to be used mainly to serve the market, but not for scientific purposes. Financial funding for the operations is achieved through contracts between the station and scientific institutes for performance of field experiments as well as through selling seeds to the farmers of the region. The operations of the station are hindered due to the fact that its status has changed. On one hand, it is a scientific unit of the Agricultural academy, and on the other, it is a trade company. This situation creates managerial difficulties, because there is a controversy from the normative point of view, for example for the participation in projects or acting as an individual company. The experiment station works in two directions – science and production. The scientific activities are focused on: (1) the study of agro-technical operations system for effective transfer to ecological agriculture – with utilisation of the waste biomass such as for organic fertiliser and the mechanical treatment of the soil as a means of fighting pests; (2) the study of the elements of the integrated fight against weeds included in field crop rotation; (3) the development of ecological agricultural systems which require irrigation; and (4) the demonstration of the biological and economic qualities of the varieties and hybrids that the farmers in the area demand. The production operations are aimed at the production of high-quality seeds with a small reproduction coefficient, like wheat, rye, rice, corn, sunflower etc. The experiment station also develops technologies for the growing of vegetables in dry areas and in irrigated conditions.

5.2. Processes and methods to exchange knowledge

The processes and methods of knowledge transfer are organised and applied differently in the institutions described and analysed. Briefly, we present the process of knowledge transfer of the university and scientific and research institutions and we summarise the results in tables.

The Agricultural University Plovdiv present new technologies in agriculture through its demonstration centre of 1.2 ha, funded by "America for Bulgaria" Foundation and through experiment fields (68 ha). It is organised as an individual unit in the structure of the University. The centre provides opportunities for the academic society and the companies, offering technologies and equipment for the agricultural sector, to present their latest achievements in front of a wide audience of students, teachers at different universities, experts at the national and local levels and agricultural producers. Its purposes are: (1) to present the latest technological achievements in the agricultural sector in front of the widest audience possible; (2) to strengthen the existing and establish new relations between the companies offering modern agricultural technologies and equipment, universities and agricultural producers; (3) to provide objective judgment of the technologies presented and in such a way so as to assist a better understanding and utilisation. The location of the Centre in the Campus of the Agricultural University was selected in order to provide easy access for the presenters, agricultural producers and students. The main task of the Centre is to provide complete technological solutions to the farmers, including seeds,

fertilisers, preparations and equipment required for the implementation of a specific type of production. At this stage, the Centre demonstrates the innovations in the agricultural sector and the commercial benefits go to the companies presenting their products. Also, in near future, the Center will try to offer thematic events connected to specific innovative solutions, according to the needs of the farmers and involving consultants as well as organising training sessions for both the farmers and consultants. A large number of the faculty staff offers consultancy services for specific productions to the farmers, specialised consultancy services related to plant protection and fertilisation, business plans development, consultancy services on the field, development of new technologies on the experimental fields of the University etc.

Fruit Growing Institute - Plovdiv. The experiment fields, in the Institute, are used for the development of new varieties and technologies as well as for demonstrations. The scientific products of the Institute are consistent with fighting climate change which is considered to be the biggest challenge in the work of the scientific teams. The development of varieties that meet the requirements of a changing climate and environment and new ecological methods for fighting diseases and pests are among the main activities and directions of the Institute. The staff of the Institute also have a history of working together with agricultural producers and implementing tests of new varieties or technologies in their fields. At a later stage, the results of these tests are presented on the farm fields to attract the attention of other local farmers. Usually the tests are performed in small farms with a low level of specialisation. The Institute, also organises Open Days during which the visitors get acquainted with the results of the scientific activities of the Institute and observe demonstrations organised by the Institute. The open days are thematically arranged towards a specific production – for example, cherry day, peach day etc. The Institute maintains a database containing the contact information of farmers who participate in the open days. The events are promoted through the website of the Institute. The Institute offers agricultural producers the opportunity for a soil analysis to determine the appropriate orchard varieties for the given soil type and consultancy services related to the diseases and pests of the orchards. These services are performed according to a predetermined price list and each producer can request for a specialist advisor according to his/her needs relating to a specific problem. The Institute organises training for students and farmers, mainly according to RDP measures. It is common for the institute staff to be invited as lecturers by outside organisations. The Institute advertises its scientific achievements through the local television channels, in the specialised agricultural exhibition AGRA and local events, and through the sector organisations. Problems that accompany the transfer of knowledge in the Fruit Growing Institute, are not of a specially assigned structure (unit or center) that would deal with the organisation and coordination of these activities and lack of transparency of the work of the Institute's staff. Recommendations for the improvement of the transfer of knowledge is through establishing a dispatcher centre to connect the farmers with the appropriate specialist with the skills and knowledge required to solve any specific problem. An additional benefit of such a centre would be that it could accumulate information about the real problems of the farmers and the need for innovative solutions.

Institute for Plant Genetic Resources - Sadovo. The Institute is a leader in South Bulgaria in the field of wheat and peanuts, the Institute is the only organisation working with these products and the farmers of the region are very active and look for information in these fields. The laboratory tests and analyses for specific productions make up a big proportion of the range of services offered. The results of the

Selection and genetic department of the Institute are designed for use by the farmers. These are new varieties and new growing technologies. The peanuts farmers are using seeds produced by the Institute and are continuously looking for advice from the Institute staff. These producers are concentrated in the region of the Institute, so the interaction is relatively easy. The Institute organises seminars are designed for agricultural producers who specialise in this type of production and for which the Institute can offer innovations. As an example, the Institute frequently organises seminars for the producers of peanuts and sesame. The Institute for Plant Genetic Resources promotes their activities through the Institute website, specialized exhibitions such as annual international agricultural exhibition AGRA and external structures. The Institute cooperates with farmers who offer their own land for the development of demonstration experiments. Such an experiment for mechanical collection of sesame was performed in an area with the necessary soil and climate conditions to allow for such production. The problems accompanying the knowledge transfer for the Institute are a lack of knowledge regarding the Institutes' products and a lack of a well-organised database with farmers' contacts. A recommendation for the improvement of the knowledge transfer is to develop a national policy regarding the protection of the agricultural science against importers of seeds, fertilisers and preparations. The commercial companies have high advertising budgets and perform mass campaigns that are met with strong responses mainly among small agricultural farmers. These companies are also able to provide all the materials that a farmer would need in order to grow in a given culture (seeds, fertilisers and preparations) and guarantee buy-back of the production, which lowers the risk for the farmers and stimulates them to work with them.

Institute of Horticulture – Plovdiv. The Institute shares the opinion that the successful knowledge transfer is based on two principles – knowledge of the product and trust by the farmer. The researchers are focussed on the development of alternative plant nutrition systems through the application of biological resources in order to maintain and improve soil fertility without the usage of synthetic fertilisers and with the purpose of growing safe and high-quality production. We develop systems for the biological growing of vegetables and propose bio-seeds of their own selection. The farmers are looking for varieties and technologies that would allow them to be first on the market, which will be a warranty for the higher price for their production. The Institute annually organises open days during which one vegetable culture is presented. The work of the Institute is presented on their demonstration fields and demonstration fields organised by the farmers. The experts of the Institute mainly perform consultancy services related to plant protection and the fertilisation of vegetables and assist in the selection process of appropriate varieties that are consistent with the specific soil and climate conditions. The Institute regularly participates in the international agricultural exhibition AGRA and the Exhibition of Innovative Products in Sofia. In order to promote the products, they actively work with local structures (regional NAAS, associations of vegetable producers and educational organisations) in the region where the vegetables are grown. The good cooperation with such organisations increases their number of customers, who are mainly small vegetables producers. The Institute has a local shop, where seeds and seedlings for the vegetable producers are offered. The shop also offers literature related to growing of vegetables. In the case of a request presented by the farmers, the scientists who work on the development of a given variety visit farmers in their fields and provide information about its characteristics and specifics for growing. This process is beneficial for both parties because for the Institute it provides the opportunity to enrich its knowledge and the companies receive a certificate

which is required for selling the product in the marketing. The Institute is met with serious competition from the input trade firm of seeds produced in the Netherlands and Serbia, which offer a comprehensive set of services in the field of vegetables growing.

Experimental Station of Irrigation - Pazardjik. The station has the scientific potential to perform activities that are outside the capabilities of the individual farmers or organisations of the sector. There is strong interest from the farmers towards the work of the station due to its long-term connections with the farmers and good regard as a station amongst the farmers. The station mainly works with small agricultural producers, who are typical for the region, and often visit them in the field. Large farms in the area prefer to work with commercial companies, but turn to the station when they require documents for specific administrative requirements. The station organises open days during which a demonstration of the results of its scientific activities is performed. These are organised several times per year and have specific themes – wheat, corn, rice, pepper. They also organise lectures on the subjects of the open day led by specialists from other scientific institutes. The consultancy services are a burden for the experiment station as they do not generate income. Due to this reason methods of funding need to be implemented that would stimulate that process. The station is unique with its capabilities of providing knowledge and advice related to the agricultural equipment for rice production, but currently, the demand of such knowledge is highly limited because of the reduction of volumes of the rice production in Bulgaria. The knowledge transfer from the station to the farmers would be facilitated if there was a comprehensive vision on the development of that process in the Bulgarian agriculture and if the Station improved its interaction with the NAAS. The Ministry of Agriculture and Food (MAF) should regulate this process because it is principal to both structures.

5.3. The knowledge contents addressed by experimental station and scientific institutions

Agricultural producers and knowledge transfer

In order to study the knowledge transfer process within the agricultural sector 15 agricultural producers from Plovdiv were interviewed. The interviewed individuals develop each grow more than two varieties which requires a wider knowledge base. The agricultural farms are between 2 and 1750 hectares which allowed the researchers to identify the differences with regards to knowledge transfer between small and large producers. All farms have been in business for more than 5 years and therefore we can assume that the results that are achieved are typical of well-established business structures with good professional experience. Generally, the small agricultural farms do not work on projects funded by RDP but mainly rely on funding for production amount per hectare for instance or for the type of products. On the other hand, the large producers are actively participating in various funding programmes, direct payments per hectare and RDP measures.

Summarized results of the big agricultural farms

Large agricultural producers are those who are mainly participating in different measures of the RDP and they frequently use consultancy services. They are mainly looking for advice related to the preparation of business plans for the RDP, consultancy services related to investments in their production, specialised advice for their production and consultancy services related to implementing new types of products. The

biggest problem for the large agricultural producers, as they highlighted themselves, is disease and pests on their produce which determines the requirement of appropriate consultancies with specialists in the area. They frequently use the consultancy services of the Agricultural University Plovdiv experts and scientific institutes in the region. Some of the farms are in active cooperation with the scientific institutes and have contracts for seed production. They have access to the full scientific potential of the institute so they do not have technological problems. The farmers of the region regularly attend the specialised events for the demonstration of agricultural innovations. One has even organised the demonstration of mechanical gathering of sesame in his fields for other farmers, which was developed together with the Institute of Genetic Resources Sadovo. The farmers definitively state that there are many benefits gained from participation in events related to knowledge promotion and some benefits are related to the acquisition of useful information, opportunity for contacts with fellow farmers or identifying a solution to a specific production problem. These are major motives behind the farmers' participating in knowledge distribution events. Formal contracts for the delivery of seeds and preparations and consultancy services are concluded during the events. Large agricultural farms have worked successfully with the scientific institutions for several years but believe that if the institutions receive higher target budgets for knowledge promotion then more farmers are going to use their scientific products.

Summarised results of the small agricultural farms

The farmers that own small farms identify three major issues for their operations – high production costs, problems with production and the use of low quality seeds. Because of these issues, they are looking for knowledge that would help them to reduce the production costs and would provide higher yields and quality of their production. The farmers are interested in innovations in agriculture and they are getting their information mainly through personal contacts, specialised issues, television and occasionally the Internet. They also state their desire to visit specialised events related to agricultural innovations demonstrations but identify some issues that are prevent them to attend all of the events they are interested in. They identify poor advertisement of these events as the main issue - the information about the date, location and subject of the events is not available early enough so they can plan their participation. They frequently learn about a scientific institute or the Agricultural University organized event from the other agricultural producers in the area. Most frequently their participation is hindered due to the following reasons: remoteness of the location of the event or high transactional and financial costs. These costs are the second issue that stops the farmers participating in knowledge transfer events. The farmers definitively state that they gain many benefits from participation in such events and some related to the acquisition of useful information, the opportunity of contact with fellow farmers or finding a solution to a specific production problem. In fact, finding a solution to a specific production problem is the main motive for the participation of farmers in knowledge distribution events. The farmers are looking for information on where to obtain high quality seeds and solutions for fighting diseases and pests on their products at these events. The farmers also establish informal contracts for the delivery of seeds and preparations and advisory services during the events. The farmers recommend more frequent knowledge transfer events and that the locations of these events are closer to their farms or in nearby demonstration farms. In such a way more farmers would have the opportunity to participate and acquire the required knowledge.

Table 1: *Difference between small scale farms and large scale farms*

Features	Small scale farms	Large scale farms
Production problems	- high production costs; - problems with implementing production; - low quality seeds.	- diseases and pests on produce types
Implemented innovations	- new varieties	- new methods to fight diseases and pests
Purpose of the applied innovations	- higher yields	- better quality of the production
Information sources	- friends and acquaintances	- specialised events and literature
Type of the innovation contracts	- informal	- formal
Benefits from participation in demonstrations	- useful information and contact with fellow farmers	- establishment of contracts and implementation of innovations
Problems with participation in demonstration days	- high transaction costs; - lack of advertising.	no problems
Recommendations for the improvement of the knowledge transfer by the scientific institutes	- to be organised close to the agricultural producers or on demonstration farms	- more frequent demonstrations and training; - events on demonstration farms.

Source: own table based on the interviews

Table 1 summarizes the differences between the small and large agricultural producers according to the following criteria: production problems; implemented innovations; purpose of the applied innovations; information sources etc.

5.4. The role of the advisory service

The demand for advisory services has grown over the last couple of years. The advice that is currently provided are in the specialized fields of plant growing and maintaining the soil in a good agricultural and ecological state. *The problem for the provision of equal access for smaller agricultural producers to expert advice in the field of agriculture lies in the insufficient financial resource that creates difficulties for the consultants to serve mountain, hilly and border territories that are with difficult access.* The consultants of the scientific centres organise a wide range of informational events – seminars, lectures, discussions, themed meetings, workshops and participation at international and national exhibitions. Specialised consultations are also offered to ensure the effective and successful implementation of the approved projects according to the RDP measures. The provision of such consultancies is performed through visits, inspections and evaluations of the farms and through the provision of recommendations for implementation of the cross-compliance requirements. In that sense, the farmers who use such services are very rarely sanctioned on direct payments.

The agricultural producers (large or small) also get professional assistance for the management of their farms. The management consultancies include development of marketing analysis, provision of information on how to organise and manage a farm, requirements for a farm, requirements for bookkeeping in agriculture, opportunities for the agricultural producers to participate in producers' organisations. In the field of plant growing and livestock breeding, the guidance includes production

technologies, guidance for fertilising, organisation of plant protection events, irrigation for the plant growing farms and technologies for breeding and feeding animals, hygiene standards and humane treatment of the animals and veterinary issues.

The small-scale farms are finding it difficult to fund the consultancy services they require and thus look for alternative free consultations. While, on the other hand, the large scale farms work successfully with private consultancy organisations and scientific institutes. They are mainly using specialised advisory services (for example to fight diseases and pests, soil and other analyses and the application of new technologies offered by the scientific institutes) and economic and accounting services (for example business plans for the RDP, monthly and annual accounting reports etc.). Large farms have been working for years with the same consultants, while the small farms look for advice from various sources. The consultants of the scientific institutions do not have the financial budget to distribute the scientific results achieved among the farmers. Thus the provision of a target budget for development and promotion of knowledge would improve the knowledge transfer process and the volume of the consultancy services provided.

Currently the provision of advice for the new programme period 2014–2020 is active and the agricultural producers expect the activities of the advisors to be widened through improvement of their mobility to enable the farmers to acquire the necessary advice promptly and on time. During the new programme period, the experts of the scientific centres recommend the establishment of dispatch centres that would gather requests for consultancies and direct them to the appropriate consultants in order to gain better support for the farmers.

5.5. The knowledge flows

The transfer of knowledge from the scientific centres to the agricultural producers is performed through various channels. Each centre uses a combination of several channels according to the nature of the innovation proposed. These channels are:

Demonstration fields at the scientific institutions. The experiment stations offer mainly seeds, seedlings and production technologies. In order to provide these, demonstration fields at the scientific centres are used as well as exploring the option of using the farmers' land for innovations demonstrations. Thus it is expected that by shortening the distance between the farmers and the institutes a wider audience would be reached.

Points of sale at the scientific institutions. The seeds and seedlings are offered through points of sale established at the scientific centres and during the participation of agricultural exhibitions (AGRA exhibition). No external commercial companies are used which leads to limitations of the distribution of such products and the farmers are expected to play a more active role to get the required seeds and seedlings.

Advice the field. The agricultural producers rely on the scientific centres to get advice for fighting diseases and pests on their produce. As every case is specific, the visits on site are an effective means to satisfy this issue. In order to find effective solutions for such problems, the laboratories for analysis of the scientific centres are used.

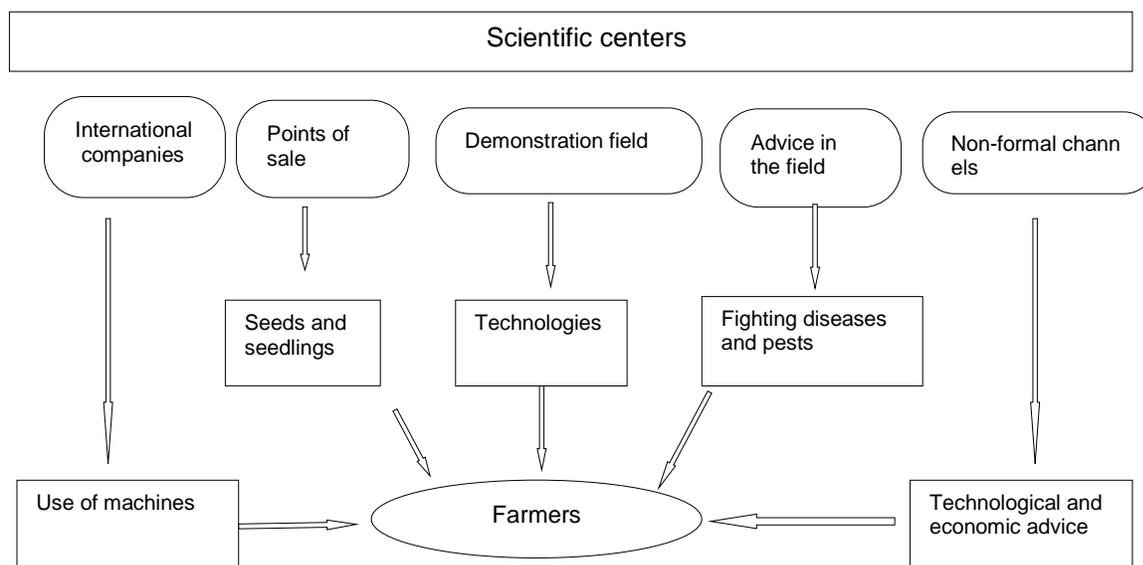


Figure 5: Knowledge flows from scientific centres to farmers
Source: own figure

International trade companies. In order to implement new machinery and get it being used by the agricultural producers, we rely on international trade companies who import equipment. Only the Agricultural University Plovdiv organises demonstrations of equipment but in such demonstrations, the companies play the leading role in the realisation of such innovations. These events have a commercial purpose. The economic benefits are that the international companies and the experts, farmers and students get the opportunity to become acquainted with the most modern equipment available on the market.

Non-formal channels. The agricultural producers frequently suffer economic problems with their production operations as well as with finding appropriate, and the services, of the markets. In order to solve such problems, they look for information provided by informal channels. They are not keen to pay for such advice. For example, the agricultural producers buy seeds and seedlings and frequently get free advice on the implementation of new technologies. The advice on economic matters is generally provided as additional service on top of the most highly demanded advice.

We can summarise that the scientific centres have established good practice in the transfer of technology towards the agricultural manufacturers. But we should keep in mind that their potential for promoting scientific products is very limited which does not allow for a huge impact on the market. The transfer of knowledge is mainly performed with active input from the agricultural manufacturers themselves who are also seeking solutions to their own problems. The farmers rarely provide their farms for demonstrations of knowledge to scientific institutions. The lack of long-term contractual relations between the farmers and institutions is due to the desire of the farmers to have more freedom for choosing their advice providers. Before making final decisions, the farmers check various alternative

sources for obtaining knowledge and also make connections with other farmers, who recommend particular advice providers.

6. Discuss and assess the performance of the knowledge flows and identify best-fit practices for advisory services

Characteristics of the knowledge and innovation transfer in the agricultural farms

The following practices are used for the development of knowledge transfer and stimulation of the implementation of innovations in Bulgarian agriculture:

- The promotion of innovative technologies and production methods, projects of the Agricultural Academy with the participation of agricultural producers (demonstration projects, information sharing events) and organisation of training by the regional agricultural advisory offices;
- Active implementation of specialised advisory services for small-scale farms (for example soil analysis, advices, related to plant protection etc.);
- The participation of large farms in the projects of the scientific institutes, which are targeted to the implementation and transfer of new technologies;

The integration of the targets of preservation and restoration of the environment, economic usage of resources and adaptation to climate changes are performed through:

- Support of projects that have minimal impact on the environment and strict control for the enforcement of the active legislation;
- Encouragement of the implementation of production methods and practices that are environmentally friendly and preserve water, energy and other natural resources;
- Encouragement and support of investments in farms that develop activities related to sustainable agriculture, e.g. the creation of new electrical power sources, waste utilisation, pollution reduction etc.

The weak points in the field of knowledge transfer are characterized by limited demand and usage of outside services and information and they have negative impact over the introduction of new technologies, growth of productivity and effective usage of production resources. The main weak points of the knowledge transfer are as follows: 1) Low usage and demand for information, consultancy services and training by the agricultural producers; 2) Difficult access to agricultural advices for farms that are located away from the district administrative centers; and 3) Underdeveloped system for technology and knowledge transfer towards small agricultural farms.

Stimulation of the knowledge and innovation transfer in the agricultural farms

The increased demand on food leads to increased pressure on the natural resources. The transfer of knowledge and innovations in agricultural production is becoming the strongest long-term solution to these challenges. The solutions should be sought in the following areas:

- *Increase in the education and qualifications opportunities of the individuals working in the agricultural sector*

The labour productivity in Bulgarian agriculture is 30% of the average EU numbers (Popov, 2013). The reasons for this are complex, but they include the low level of knowledge and skills of the individuals working in the agricultural sector. The reasons for relatively low professional and qualification levels of the individuals working in the agriculture differ. The levels are partly due to the low standard of living in rural areas that leads young and qualified people to look for work in the cities and abroad. The levels are also partly due to weaknesses in the education system. Finding solutions to these two issues should be sought through providing opportunities for training and the acquisition of new knowledge. In this regard, the governmental institutions – MAF, State Fund of Agriculture, universities and scientific institutes can organise training systems that are able to cover the entire professional life of the individuals working in the agricultural sector.

- *Development of the knowledge distribution system and consultancy services*

Modern agriculture requires a comprehensive knowledge of the production technology, economics and company management, agricultural equipment, administrative knowledge etc., especially from the managers. Knowledge should consistently be updated due to the development of agricultural science in the fields of productivity improvement and adaptation to climate changes etc. All of these underline the need for a strong, effective and functioning system for knowledge distribution and advisory services. The National Agricultural Advisory Service (NAAS) is the institution in the system of MAF which performs these functions. However, currently this service does not have the capacity to cover the enormous volume of work related to the knowledge distribution as well fulfilling the requirements for information access of the multiple agricultural producers. Bearing this in mind, the requirement for the establishment of the Development Agency as a coordinating or integrating unit that combines the capacity and efforts of the district and municipal offices of MAF, the professional high schools, universities and research institutes, as well as the sector and non-government organisations in the knowledge transfer in the agricultural practice is obvious. Due to its nature, the system for knowledge distribution and consultancy services should be developed at the municipal level. The development of information and communication technologies provided new opportunities for knowledge and the distribution of good practices but Internet access needs to be improved in the rural areas for this to be fully utilised.

- *Development of scientific studies*

The agricultural scientific studies are mainly carried out in the institutes of the Agricultural academy and the universities. Generally, the integration between institutes and universities in research and teaching activities is not intensive enough. This state can be improved if normative changes are accepted, and namely: 1) acceptance of new legislation providing a higher autonomy of the scientific institutes from the Agricultural academy; 2) new legislative base dealing with funding for the research activities to create the required conditions for improved incomes from the scientific products and services; 3) access for the scientific institutes to the structural funds of EU for implementing innovative projects.

- *Strengthening of the relationships between agricultural producers and scientific and research activities*

No doubt the weak connections between the research centres and agricultural producers limits the market competitiveness of the sector. The development of a mechanism to provide a specific solution to the issue is required. Practically, this means to integrate the producers, research institutes, consultancy companies and financial institutions for establishing concrete projects. This will facilitate the distribution of results among the agricultural producers. The support of such an initiative can be performed in the new RDP programme period.

7. Conclusions

The current study clarified the mechanism for knowledge transfer in the agricultural sector in Bulgaria. The existing limitations are determined and the weak points in the interaction between the science and practice are established. In the beginning questions that concerning the processes and methods of knowledge transfer between the scientific institutions and the producers in South-Central region were asked. The studied subjects were 3 scientific institutes, one experiment station and one university offering innovations and new technologies in agriculture. In addition, the interviews with 15 agricultural producers (both small and large) were analysed.

The results are summarised below as answers to the overall research questions of the study:

- 1) Large agricultural producers require specialised knowledge related to fighting diseases and pests, knowledge for the implementation of new technologies offered by the scientific institutes etc., as well as organisational and managerial knowledge (for example, methods for management of their farms, preparation of monthly and annual accounting reports etc.), while, on the other hand, the small producers seek knowledge related to the production process itself and methods for reducing their production costs and achievement of higher yields.
- 2) Small agricultural farms are interested in innovations in the agricultural sector and they get information from various sources such as personal acquaintances, informal contacts, specialized issues, television and rarely, Internet. Whereas, large agricultural farms get information from consultants with whom they work for long time.
- 3) The universities and scientific institutes offer knowledge and specialised information. The knowledge transfer from these centres to the agricultural producers is performed through various channels, such as demonstration and commercial fields at the scientific institutes, advice provided on site, international trade companies and non-formal channels. Each centre uses a combination of several channels according the nature of the innovation or desired knowledge.
- 4) The knowledge is promoted through organised events and seminars by the scientific institutes and the university, both individually or together. Also, participation in international and national exhibitions and demonstration events are widely used.
- 5) The difficulties that the farmers and suppliers face in knowledge transfer is hindered access to agricultural advice for farms that are located away from the district administrative centres, the lack of information about events organised by the scientific centers, the lack of proper

promotion of the results achieved in the demonstration fields and non-developed system for technology and knowledge transfer towards the farms. In Bulgaria, the farms are not effectively using the existing options for technology transfer as they have limited human and financial resources and have difficulties in realising the benefits for the farm development when modern production methods are applied.

In order to develop the system for knowledge and consultancy services in Bulgaria the following elements are required: 1) strengthening of the expert capacity of the NAAS; 2) integration of all scientific institutes at the regional level for knowledge transfer in the agricultural sector; and 3) establishment of dispatch centers for the distribution of information, knowledge and the available advisory services.

- Is there still a role for advisory services or is it bypassed in this new configuration of the knowledge system?

The advisory services have a major role in the transfer of knowledge from research centres to the farmers. The research centres in Bulgaria are recognised as institutions that can meet the needs of knowledge. Due to the limited financial resources and the institutional issues, their scientific capacity cannot be fully utilised. This allows trade companies to work more closely with the farmers.

- The results could be to highlight, what functions of advisory services play (or do not play) in integrating farmers' needs (and social ones) and in organising feedback loops for research?

The results show that the advisory services meet the needs of farmers' knowledge, but also the public expectations for the conservation of natural resources. Thus, they facilitate the adaptation process of the farmers to follow the requirements of implementing the new institutional environment. Unfortunately, we cannot generalise that advisory services provide reliable feedback to the researchers, which constrain the scientific work and the transfer of knowledge to the farmers. This is due to the lack of long-term cooperation among advisory providers and scientific experts.

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Institute of Horticulture, Center of transfer of technology – Plovdiv: <http://www.tto-maritsa.org/>

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