Abstract: Considerable efforts to create a professional and effective rural extension service in the Republic of Moldova have been made in the last decade. Unfortunately, there are currently limited institutional connections between the components of knowledge in agriculture in Moldova and information system, for example, between institutions of agricultural research, extension and education/training. These three components work independently, while collaboration is limited to involvement of researchers and professors as consultants in short-term projects of the extension service. Therefore, the Republic of Moldova lacks a permanent platform for communication and cooperation, aimed at serving the common needs of the private sector. Agricultural science and innovative policy development should stimulate obtaining new knowledge, highly productive biological material, intensify innovation activities in agro-industrial sector, while creating conditions for absorbing local and foreign innovations through the range of measures, such as: research, development and innovation (RDI) activities focused on priority directions of the sector development; stimulating innovative scientific activities in order to create new varieties and hybrids of plants and highly productive breeds of animals, applying advanced farming and processing of raw materials; promoting the creation and implementation of a system of economic incentives for attracting and absorbing innovations in the sector; deepening economic research to ensure scientific support for the sustainable development of the agribusiness sector; modernizing the training and retraining of the staff from...
the agricultural education sector and adjustment of the quality of education to market requirements; supporting the development of technological transfer and extension network in agro-industrial sector (Government of the Republic of Moldova, 2008).

Keywords: agriculture, extension services, agricultural research, Republic of Moldova

Introduction

Development of extension services in the field of agriculture represents an important issue for the Republic of Moldova, as it involves the application of knowledge and technology transfer and scientific research for the establishment and development of the good agricultural practices in the country.

Extension services have to contribute directly and indirectly to the modernization of the agricultural sector, by informing farmers on the latest technologies, by implementing research from the laboratories in practice, by stimulating farmers to acquire new knowledge, etc.

The basic conclusion of the article is to maintain and expand the coverage of the extension network and the quality of the services provided. The service extension should further extend and diversify its services in order to cover the information needs of the whole value chain from production to the market, on the one hand, and to develop commercially based extension services, on the other.

Materials and methods

The aim of the paper is to analyse the linkage between science development, innovative ideas, their dissemination, establishment of extension services and their impact on the innovative development of the agricultural sector. As a result, solutions for expanding the coverage of the extension network, together with the diversification and improvement of its services are provided.

The primary data from key stakeholders were collected through a semi-structured interview. Secondary data were collected from official statistical yearbooks, publications of the National Bureau of Statistics of the Republic of Moldova, decisions of the Government of Moldova related to the development of the RDI activities and extension services, articles and studies developed by local and foreign experts. An important source of the secondary information was the Country report elaborated with the contribution of authors in the framework of the FP7 project “AGRICISTRADE”.

The analysis of data obtained was done using standard functions provided by the MS Excel.
Results and discussions

The status of the agricultural sector has changed dramatically during the post-privatization period, along with the disruption of production and distribution networks. The shift in production has also been accompanied by significant reductions in land productivity. This situation is directly related to lack of investments, capital and credit availability to the agricultural sector, factors that have resulted in farmers applying low yield technologies and drastically reducing their use of agricultural inputs (Moroz et al., 2015).

Nowadays the main weaknesses of the agri-food sector of the Republic of Moldova are the following:

• High anthropogenic pressure for the agriculture, that results from the excessive share of cultivated lands and a reduced share of forests that is critical for the sustainable development of this sector in the Republic of Moldova;
• Fragmented land ownership;
• Unfavorable demographic tendencies such as ageing, depopulation and mass migration that reduce the access to skilled labour force;
• High level of moral and physical depreciation of the agricultural machinery and equipment, post-harvest, food processing and market infrastructure;
• Dominance of the extensive agricultural systems and low land productivity;
• High dependence on import of agricultural inputs;
• Outdated agricultural education system, isolated extension services and weak agricultural research sector.

The lack of horizontal and vertical coordination of supply chains is another reason behind the low competitiveness of the agricultural sector. Such problems as underdeveloped wholesale markets, low bargaining power, changing quality of produces, lack of distribution channels, poor infrastructure and limited access to foreign markets are the major reasons for currently occurring low producer prices. The value chain deficiencies that lead to large gaps between farm-gate and consumer prices resulted in low incomes, low investments, and persistent low quality of agricultural raw material at the farm-gate level. In Moldova the downstream industry of buyers, including intermediaries, processors, exporters, food retailers and other players has not yet managed to establish long-term relationships with suppliers of raw material, by recognizing the farmer as a key business partner. Most of the downstream players still prefer to buy on the spot market and pay the lowest price possible to the farmers, while food retailers choose to largely import food products needed to satisfy domestic consumption. These market deficiencies have, therefore, so far prevented efficient transmission of market signals down to the farm level, and delayed farmers’ integration into vertically coordinated supply chains. Moldova’s underdeveloped producers’ organizational structure hinders market access for farmers. The lack of institutional arrangements for farmers in form of voluntary membership associations aimed at improving their market access is another area of unsolved problems. Agricultural producers in Moldova –
and this is particularly the problem of small producers – generally lack group power needed to ease their market integration through increasing supplies, setting better prices with buyers, or jointly owning post-harvest facilities. The Moldovan government is currently undertaking measures to encourage establishment of producer groups by offering financial incentive for association and engagement with markets (Government of the Republic of Moldova, 2014a).

All these problems lead to the necessity of strengthening efforts to promote further reforms of agricultural research, education and the rural extension services in the agri-food sector.

The brief analysis of the economic situation of the Republic of Moldova reveals that the national economy is marked by limited production capacities, demand being largely satisfied by the import of goods and services. The current model of growth, based on remittances and consumption, proves to be unfavourable for the country’s sustainable development. Moldova is lagging far behind other European countries in terms of innovation and sophistication factors and especially in such fields as: capacity for innovation (the 115th position out of 140 countries), quality of scientific research institutions (124th position), company spending on R&D (135th position), university-industry collaboration in research and development (123rd position), government procurement of advanced technological products (134th position) and the 132nd position for the availability of scientists and engineers (Schwab, 2015).

The new model of economic growth, assumed by the Government of the Republic of Moldova aims to change the country’s development paradigm from a consumer-oriented economy to an economy based on investments, competitiveness, so that the national economy creates highly qualified and well-paid jobs and that the whole society and every individual citizen benefit from the effects of significant, organic and balanced economic growth. Achieving this goal involves increasing the share of science-intensive products obtained as a result of research and development activity (Government of the Republic of Moldova, 2014b).

In response to the vulnerabilities inherent in the remittance-driven model, the Government of Moldova has made a committed decision to develop a strategy of export-oriented economic growth. The national development strategy “Moldova 2020” is centered around the need to transition to a dynamic economic model based on investment and the development of goods- and services-exporting industries. Putting this model in place requires substantial increases in domestic investment and Foreign Direct Investment (FDI), and enhancing knowledge and innovation, in order to increase efficiency and competitiveness. Therefore, the “Moldova 2020” strategy is built around seven priorities amongst which the business environment, access to finance, education and infrastructure were defined as critical areas along with the judicial sector, energy consumption and the pension system (FAO, 2012).
Nowadays, there are several players in the field of extension services in the Republic of Moldova responsible for the transfer of knowledge and experience from the research and education sector to the field of agricultural production. Among the most important, one can mention the Agency for Consulting and Scholarship in Agriculture (ACSA), the National Federation of Agricultural Producers “FARM” (former “AGROinform”), the Republican Union of Associations of Agricultural Producers (UniAgroProtect) and the National Farmers Federation of Moldova (NFFM). All these organizations are involved to a different extent in providing extension services.

The Agency for Consulting and Scholarship in Agriculture (ACSA) was created in 2002 based on some regional extension offices that activated before, under the framework of various institutions such as the Institute of Management and Rural Development¹, AGROinform and some other farmers’ associations. At the initial stage of its activity, the ACSA was financed by the World Bank, the Swedish International Development Cooperation Agency (SIDA), other foreign donors and, to a very small extent, by the state budget. The self-financing was almost absent in the ACSA activities. In 2013, the financial support of donors ended, and the Government took over full funding of the extension network.

Nowadays, the ACSA is a non-governmental organization with the mission to contribute to the sustainable development of rural communities through the establishment and development of a professional network of information, advice and training providers for agricultural producers and rural entrepreneurs. The ACSA ensures the access of the rural population to knowledge, experience and skills in a wide range of areas oriented towards the economic development of Moldovan villages. Currently, the ACSA manages a network of 35 service providers, employing about 425 consultants, among which are 75 regional consultants and 350 local consultants working in rural localities. Rural extension services are provided annually to about 340 thousand agricultural producers, which cultivate about 670 thousand ha of agricultural land. Services are provided to all types of agricultural enterprises, including large corporate enterprises, medium-sized commercial farms and small subsistence farms, which form the largest group of customers. However, over 77% of them are subsistence farmers, while large scale corporate farms account only for 0.5% of the total number of farms covered by the national network of extension services (ACSA, 2017). This proves the orientation of the national extension services provided by the ACSA mainly toward small and medium-scale subsistence and semi-subsistence farms. Advisory services are provided to farmers free of charge, while the institution itself is very dependent on the state and other funding. At the same time, the large-scale commercially oriented farms often employ qualified advisors from the country or abroad. Most of the advice offered relates to production technologies (over 50% of services in 2011), while other consultancy areas include marketing (18% of services),

¹ Former faculty of the State Agricultural University of Moldova.
business (15%) and legal advice (13%). Based on the results of some recent surveys, the clients' satisfaction with the service quality is rather high. Thus, over 90% of farmers assess the impact of extension services on their businesses as beneficial. It has been estimated that one lei invested in extension services has led to gross value added creation of about 3.3 lei (IFAD, 2016).

The National Federation of Agricultural Producers from Moldova “FARM” (former “AGROinform”) is a network of regional non-governmental organizations aimed at supporting the Moldovan agricultural producers, by granting them information assistance and professional consulting services. The Federation was created in 2000 with the idea of providing agricultural producers with the necessary information and consultancy in such fields as technological issues, land relations, farm management, access to credits, farmers’ cooperation and marketing. FARM is a non-governmental organization that joins 15 regional NGOs with more than 4500 members. The Federation is a decentralized structure, where the regional organizations have an independent legal status and are very flexible in reaching the farmers’ needs.

The main mission of the Federation is to support the sustainable economic development of rural communities by providing complex assistance in business development and marketing, advanced technologies implementation, as well as representing the interests of its members by promoting policies for sustainable rural environment development (AGROinform, 2017).

The Republican Union of Associations of Agricultural Producers (UniAgroProtect) includes 17 Agricultural Associations, bringing together 2238 medium-sized enterprises and about 24 thousand small-scale farmers. They cultivate about 800 thousand hectares that is about 50% of the total agricultural land in the Republic of Moldova. The objective of the UniAgroProtect is to provide information and consultation to its members; attract investment and implementation of new technologies; promote members’ image in relation to potential investors, marketing development; and strengthen efforts to negotiate product prices.

The National Farmers Federation of Moldova (NFFM) is a non-governmental organization set up in 1998. The aim of the NFFM is to improve the welfare of the population in rural areas by realizing and protecting civil, economic, social and cultural rights of all landowners and of those who practice agricultural business and services. At present, the NFFM has 11 regional organizations, 9 information and consultancy centers, over 700 local organizations and encompasses over 27 thousand farmers.

Institutionally, the Ministry of Agriculture, Regional Development and Environment coordinates all structures providing rural extension services through the Service for science, education and rural extension. The main objectives of the current rural extension network are as follows:
a) Providing assistance and information services to agri-food producers in such fields as business planning, investment, legislation, organizational, marketing and financial management;
b) Promoting best production practices among farmers;
c) Facilitating farmers’ access to advanced technologies and markets by providing information about service providers, buyers and sellers;
d) Facilitating access to information by organizing seminars, training courses, field days and various demonstration activities, collecting, systematizing and distributing the necessary data;
e) Identification of problems faced by agricultural producers, and their settlement at local, regional or national level;
f) Collaboration with all the structures involved in the rural extension system.

The Strategy for the development of rural extension services for the period of 2012-2022, approved through the Government Decision No. 486 from 5 July 2012, foresees a rapid transition to a modern model of organization of rural extension services, that should generate high added value, based on knowledge and innovation, oriented towards continuous improvement of the life quality in rural areas (Government of the Republic of Moldova, 2012).

The research and innovation in agriculture is currently represented by eight scientific institutes, including the State Agrarian University of Moldova. At the same time, there is a number of research institutes that develop topics closely related to agricultural production. Research institutes are subordinated to both the Ministry of Agriculture and to the Academy of Sciences and are funded, basically from the state budget.

Taking into account the outdated research equipment, insufficient financial resources and aged staff, the existing research institutes are in a state of survival. There is no clear and transparent procedure of selection for research topics that should be targeted to the real sector demands. Therefore, it is important to create closer connections between research and development sector and the agri-food business needs. At present, the research and innovation system in agriculture is not oriented towards the private sector and is relatively isolated, which makes it vulnerable. At the same time, the agricultural knowledge generation and transfer have quite small shares in the GDP (Fig. 1).

A brief outlook in the history of agricultural research in the Republic of Moldova shows that during the period of 1950-1990s, an impressive number of agro-industrial research institutes were established, thus ensuring the large-scale implementation of scientific results in the production process. From 1990 to 2001 there was a considerable decrease (by 42%) in the number of researchers employed at the scientific institutions in the agri-food sector as well as of the number of agricultural research institutions. At present, about 900 researchers are working in 12 research institutes that develop researches in fields related to agricultural production. The researchers are mostly approaching the retirement age, making it harder for institutions to maintain their ability to assess, expand and transfer technology to local and foreign innovations.
In the meantime, the agricultural education system has become less receptive and flexible to the requirements of the rural employment market. As a result of the insufficient partnership relations amongst education institutions, agricultural producers and processing industry businesses, education plans related to all specializations are not updated, as well as the learning curricula, education method and teaching techniques aimed at achieving a formation-developing, competences based education system.

The demographic decline leads to the continuous decrease of the population included in the educational process and generates problems of over-dimensioning the network of universities and other educational institutions, including those in the field of agricultural sciences. The number of students in agricultural sciences and veterinary medicine was constantly decreasing during the period of 2009-2016. Thus, the number of students in agricultural sciences decreased from 2039 to 1595 or by 28%, while those of students in veterinary medicine from 295 to 260 or by 13%, at the same period (Fig. 2).

Similar to the situation in the education sector, the agricultural research and innovation system has not yet managed to effectively break with the past and adequately reconnect with the private sector and still operates in relative isolation and is rather weak.

Struggling with dilapidated inventories and inadequate resources, insufficient funds, aging of the staff (due to low salaries), the existing research institutes are in a difficult position to compete with private research structures. There is no mechanism established on consulting the selected research topics with the end-users of the research, i.e. representatives of the farming and business community.
The risk of irrelevance appears particularly critical as long as the research institutes continue to operate in isolation from the private sector and from the international research and development (R&D) system. Therefore, it is important to create and develop links between agricultural R&D and the needs of the agri-food business. Presently, some of the research institutes are involved in production and commercial activities that are not public domain and are better handled by private operators. Apart from research activities, some institutes are also involved in seed and seedling production, multiplication and commercialization. These activities bring additional extra-budgetary revenue to these institutes, but the drive for marketing of research products leads to the present unhealthy situation where commercial and research interests/activities are closely intertwined. In many European countries, private companies who are recognized to be better at the business of business relations carry out this type of activities. A clear separation between these two concepts needs to be made, and privatization of commercial activities considered. It has to be mentioned that some scientific institutions have already developed public-private partnerships, which are expected to lead to an improved and modern scientific-innovative domain. Recognizing the low capacity of the under-funded domestic research institutions to compete with international R&D, it is important to create an open regime for the easy and quick import of the latest technologies into the country so that Moldovan farmers can stay competitive. It is needed to speed up the inflow of the most competitive varieties of agricultural crops developed in other countries into the Republic of Moldova.

A major effort has been put, over the last decade, into building a professional and far-reaching extension service in Moldova. Thus the agricultural extension service network was created in 2002 with the support of the World Bank. Unfortunately, few institutional linkages exist today between the components of the Moldovan agricultural knowledge and information system, i.e. between its agricultural research, extension, education and training institutions. These

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**Figure 2. Number of students in agricultural sciences and veterinary medicine, 2009/2010 – 2015/2016, persons**

*Source: elaborated by authors based on data from the National Bureau of Statistics (2017).*
three components have pretty much their own agenda, and the collaboration is limited to involving researchers and/or university professors as short-term consultants in various projects of the extension service. A regular platform for communication and cooperation aimed at jointly serving the private sector needs does not seem to be fully functional in Moldova.

There are no mechanisms put in place by which the extension service can influence the agricultural research agenda. The Strategy for the rural extension services highlights the need to keep and extend the coverage of the extension network, along with further diversification and improvement of its services. This strategy aims at increasing, in a decade, the coverage by 25%, the number of beneficiaries by 20%, as well as the incomes of beneficiaries by 15% annually. To achieve this, the extension service should seek to increase its competencies by broadening and diversifying its services to cover the whole value chain information needs (from production to the market), on the one hand, and develop the commercial side of its service provision, on the other. To strengthen the rural pillar of the network, new services will be added focusing on entrepreneurship and diversification of rural economic activities, as well as family-targeted social services. It is important for the extension network to benefit from public funding in order to achieve its medium and long-term goals.

The Strategy states that development of rural extension services in Moldova will contribute to the development of rural economy and increasing agricultural productivity, enhancing the competitiveness of the agri-food sector. Although the success of this strategy will depend on adequate public funding, the fact that it works with measurable objectives is certainly an advantage compared to the other strategies elaborated before.

The rural extension service in the country tends to be in line with the principles of a modern system of consulting services such as value chain approach, which brings knowledge and information at all levels, from producers to the market, and, on the other hand, the market demand and the commercial orientation of the services rendered. The rural extension network must provide the knowledge and information requested by clients at all levels of agri-food production starting with agricultural production and ending with the final consumers (Government of the Republic of Moldova, 2012).

The consumer demand driven agricultural production leads farmers constantly to new requirements alongside the value chain and subsequently to new challenges. The main function of the extension services is to assist agricultural producers in facing these increasing requirements by providing more qualitative services. Moreover, extension services have to improve constantly the processes of technology transfer from scientific research institutions to end users of these technologies.
Conclusions

1. A large part of the problems faced by agricultural sector of the Republic of Moldova originates from poor links between the agricultural research, education, rural extension services and agricultural production.

2. The existing agricultural extension networks provide their services largely for small-scale subsistence farmers that have a very insignificant share in commercial production of agricultural and food production. At the same time, many large-scale commercial agricultural producers meet an increasing demand in specialized high-quality extension services that cannot be offered by local providers.

3. Advisory services are provided to farmers free of charge, while institutions involved in providing these services are very dependent on the state funding.

4. The major problems in the field of R&D and extension services can be formulated as follows:
   • Lack of the inflow of qualified specialists in the field of agricultural research
   • Existing research infrastructure in agriculture is outdated and does not meet requirements of this specific area.
   • Research projects are formulated based on the existing capacities and less on the needs of real sector that denotes a poor connection between research institutions and the main actors in agricultural production and processing. Partners from the civil society as well as those from the central public authorities and local public authorities have a low involvement in the process of setting priorities and objectives, but also in evaluation of results of the RDI and extension systems.
   • Research projects are focused on local objectives that a priory creates conditions for a limited utilization of the results achieved. Moreover, financing of the agricultural researches through international programmes is rather limited.
   • Financing of the research projects is based on covering the operating expenditures and not on the performance indicators.

5. The existing network of extension services and research institutes from Moldova have to be considerably changed in order to satisfy increasing demands of the agricultural producers in specialized and highly qualified knowledge transfer system.


