

About Governance of Agricultural Knowledge and Innovation System. The Case of Bulgaria. Part III

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Abstract

This paper is the third part of our attempt to examine the governance, efficiency, and development of the Agricultural Knowledge and Innovation System (AKIS) in Bulgaria based on a project related to mechanisms and the modes of agrarian governance in Bulgaria. The research continues with the expert assessment on governance of AKIS in Bulgaria and the SWOT analysis regarding development strategy and intervention needs providing recommendations and actionable steps to address the identified weaknesses and enhance the effectiveness, efficiency, and inclusiveness of the AKIS governance.

It is emphasizing the approaches of comparative data and institutional analysis, gap analysis, SWOT, strategic orientation, experts' assessments to identify actors and relations, state and trends in development, assess strengths, weaknesses, opportunities, and threats, formulate adequate strategy, and specify overall and public intervention needs of AKIS in the country.

Keywords: research; training; governance; knowledge; innovation; agriculture.

JEL Classification: D83; O32; O38; Q16.

Introduction

The governance of AKIS in Bulgaria refers to the way in which policies, institutions, and stakeholders collaborate to facilitate the generation, exchange, and application of agricultural knowledge and innovations. It plays a crucial role in enhancing the productivity, competitiveness, and sustainability of the agricultural sector.

Experts may assess the adoption rates of innovative practices and technologies by evaluating the effectiveness of monitoring and evaluation mechanisms in place to assess the impact of AKIS interventions. This includes measuring the outcomes and effects of agricultural innovations on productivity, income, and sustainability.

1. Expert Assessment on Governance of AKIS in Bulgaria

Expert assessments on the governance of the AKIS in Bulgaria should involve a thorough analysis of the existing structures, processes, and stakeholders involved in agricultural knowledge and innovation activities. The assessment findings can inform policymakers, research institutions, extension services, and other stakeholders in designing and implementing targeted interventions to strengthen the AKIS governance and enhance agricultural development in the country.

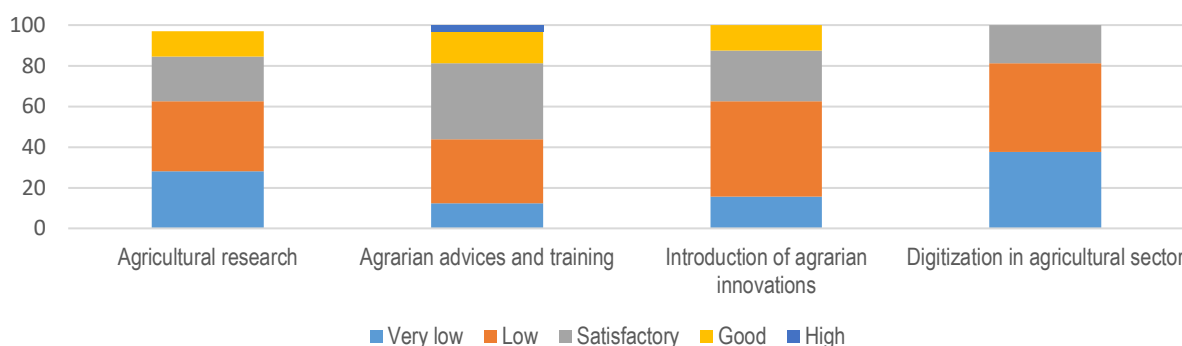
Level and Efficiency of Public Expenditures

The first group of questions to the experts concerns the level and efficiency of public expenditures and investments in the main components of the AKIS in the country. Most experts believe that the level of public

spending and investments for digitalization in the agricultural sector (81.2%), for agricultural research, for the introduction of agrarian innovations (62.5% each), and for agricultural advice and training (43.7 %) is low or very low (Figure 1). Particularly large is the consensus among experts regarding the low level of public investment in digitalization in the agricultural sector, which is far behind the current needs of society and the industry.

A relatively small number of experts consider the costs of the diverse components of the AKIS to be satisfactory, with a larger share of public expenditure and contributions to agrarian advice and training. However, none of the experts consider the level of expenditure and investment is high in agrarian research, the introduction of agrarian innovation, and digitalization in the agrarian sphere, and only a small fraction considers them to be high in agrarian advice and training. Therefore, public expenditure and investment for the development of all these important areas of the AKIS are to be significantly increased so that the main objectives of the CAP can be achieved in the next programming period.

Figure 1. Level of public expenditure and investment for agricultural research, agricultural advice and training, introduction of agricultural innovations, and digitalization in the agrarian sector, (%)



Source: Experts assessment

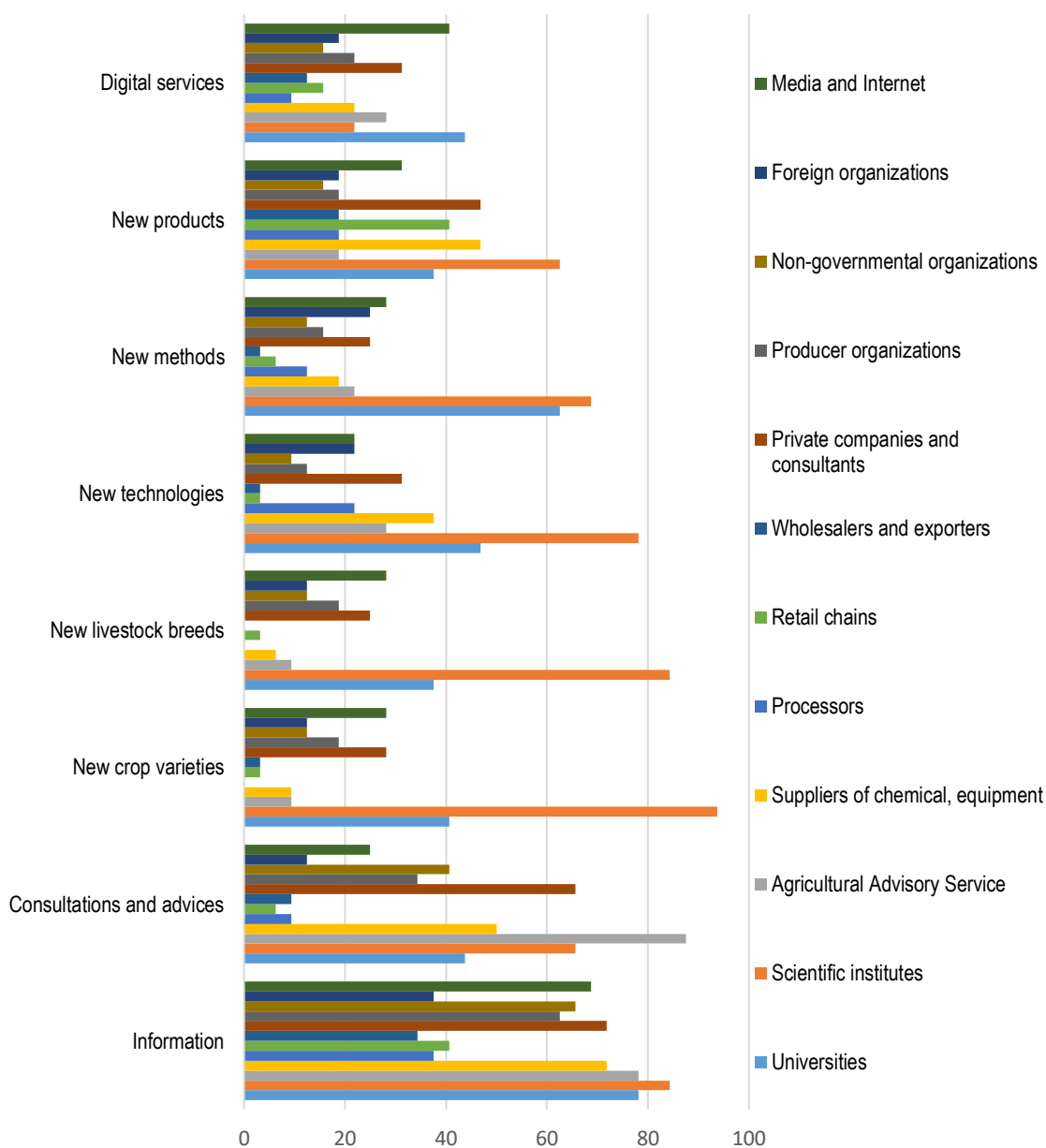
Every other expert estimates the efficiency of public expenditures and investments for agricultural research in the country as satisfactory, and nearly 19% of them as good. However, 31% of experts say that this level is low or very low. The latter shows that with a relatively low public investment in agricultural research, not bad results are achieved. However, the efforts to increase the efficiency of the significant resources put in this important area are to continue. As far as the efficiency of public resources for agrarian advice and training is concerned, the majority of experts believe that it is good or high (37.5%). This proves that the comparatively higher level of public support in this area also gives comparatively higher efficiency. At the same time, however, for a small number of experts, the efficiency of public spending and investment in agrarian advice and training is satisfactory (31.2%) or low (28.1%). Therefore, work is to be continued to raise the efficiency of public investment in this important area.

According to the majority of the experts (43.7%), the efficiency of public investments for the introduction of agrarian innovations is low or very high. However, a significant proportion of them rates the efficiency of this type of public support as satisfactory (34.4%). Moreover, for almost 22% of the experts, public spending and investments for the implementation of agrarian innovations are of good or high efficiency. The latter indicates that limited investment in this area is of high efficiency and is to be increased, as there is a great potential for improving efficiency through additional investment. Half of the experts evaluate the efficiency of public spending and investments for digitalization in the agricultural sector as low or very low. However, one in four panel lists believes that the payback in this area is satisfactory, and for the remaining quarter, it is good or high. The latter proves that, despite the extremely low amount of public investment in this area, their social efficiency is relatively high. Therefore, investments in this area are to be expanded to realize the existing high potential for improving efficiency.

Importance of Individual Participants in AKIS

The next question for the experts is related to the identification of the most important organizations, which provide the farmers in the country with the necessary information, consultations, diverse innovations, and digital services. Experts are largely unanimous that the most important "providers" of new information to farmers are research institutes (84.4%), universities and NAAS (78.1% each), private companies and consultants (71.9%), the media, and Internet (68.8%), non-governmental organizations (65.6%) and producer organizations (62.5%) (Figure 64). A considerable number of experts also believe that important suppliers of new information to farmers are retail chains (40.6%), processors (37.5%), foreign organizations (37.5%), and wholesalers and exporters (34.4%).

Figure 2. The most important organizations providing agricultural farms with information, advice, innovations and digital services (%)



Source: Experts assessment

The experts are also almost unanimous that the NAAS is the most significant provider of consultations and advice for Bulgarian farms (87.5%) (Figure 2). Other important organizations for providing consultations and advice to producers in the sector are research institutes and private companies and consultants (65.63% each). Every second expert also believes that suppliers of chemicals, equipment, etc. are among the most active in providing the necessary consultations and advice to their actual and potential clients. For a good number of experts, the universities (43.8%), non-governmental organizations (40.6%), producer organizations (34.4%), media, and Internet (25%) are among the most important organizations providing agricultural consultations and advice in the country. The importance of other types of organizations is less in providing farmers with consultations and advice.

Concerning new plant varieties, the vast majority of experts (93.8%) identify research institutes as the most important organizations providing this type of innovation to agricultural farms (Figure 2). Many experts also identify universities (40.6%) as major suppliers of new plant varieties to farmers. A relatively large proportion of all experts (28.1%) also consider that private companies and consultants, and the media and internet are important in providing information on/or supplying new varieties of plants. Concerning new breeds of animals, the situation is similar to that of new plant varieties, with experts ranked as the most important research institutes, followed by universities, the media and Internet, and private companies and consultants (Figure 2). A considerable number of experts (18.8%) also consider that producer organizations are among the most significant suppliers of new breeds of animals to farmers.

Regarding the provision of new technologies to the farms, research institutes are again ranked by the majority of experts (78.1%), followed by universities (46.9%), suppliers of chemicals, machinery, etc. (37.5%), private companies and consultants (31.2%), and NAAS (28.1%) (Figure 2). A considerable proportion of experts (21.9%) also place foreign organizations, the media, and the internet among the most important in providing information, assistance, or direct supply of new technologies. According to the majority of experts, the most important organizations providing new methods of production and management for farmers are research institutes (68.8%) and universities (62.5%) (Figure 2). A relatively large proportion of experts also place the media and Internet (28.1%), private companies and consultants, foreign organizations (every fourth), and the NAAS (22.9%) among the most significant organizations in providing information on /for new methods of production and management in the sector.

The most important for the presentation to the farmers of new products are scientific institutes (62.5%), private companies and consultants (46.9%), suppliers of chemicals, equipment, etc. (46.9%), retail chains (46.9%), and universities (37.5%), (Figure 2). A significant number of experts also put media and Internet (31.3%), NAAS, processors of farm produce, wholesalers and exporters, producer organizations, and foreign organizations (18.8% each) as important in product innovations. With regards to digital services and innovations, the universities (43.8%), and media and Internet (40.6%) are pointed by the majority of experts as most important to farmers' organizations (Figure 64). For a good number of experts, among the most significant providers of digital information and services, are also private companies and consultants (31.2%), NAAS (28.1%), scientific institutes, suppliers of chemicals, equipment, etc., and producers' organizations (21.9% each).

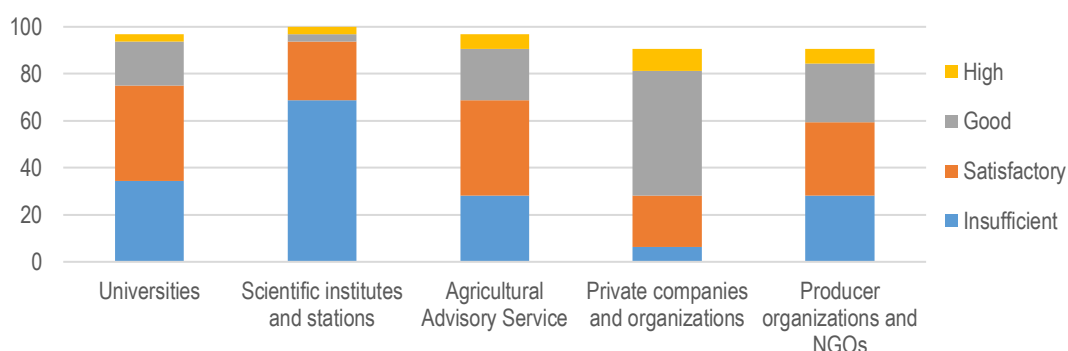
Financial, Personnel and Material Endowment of AKIS

The next group of questions to experts relates to the endowment with financial resources, personnel, and advanced equipment for agricultural research and consultations in the major organizations in the AKIS, as well as their potential for modern research and consultations. The highest financial endowment of agricultural research and consulting is in private companies and organizations, where, according to nearly 63% of experts, it is good or high (Figure 3).

At the same time, the financial endowment of agrarian research and consultancy at scientific institutes and stations is estimated by almost 69% of experts as unsatisfactory. The latter shows that the profit-oriented private sector invests more in financial resources in these important activities compared to the public scientific institutes that dominate in the sector. Therefore, the financial support to public research institutes is to be increased to reduce the existing imbalance with the private sector. The majority of experts believe that the endowment of research and consultations with financial resources in the universities and NAAS is satisfactory (40.6%). Moreover, a considerable number of experts evaluate that these activities of the NAAS and the universities are with good or high financial endowment - 28.1% and almost 22% respectively.

The financial support for agrarian research and consultations of the non-profit-making producer organizations and non-governmental organizations was rated as satisfactory (31.2%) or unsatisfactory (28.1%) by most experts.

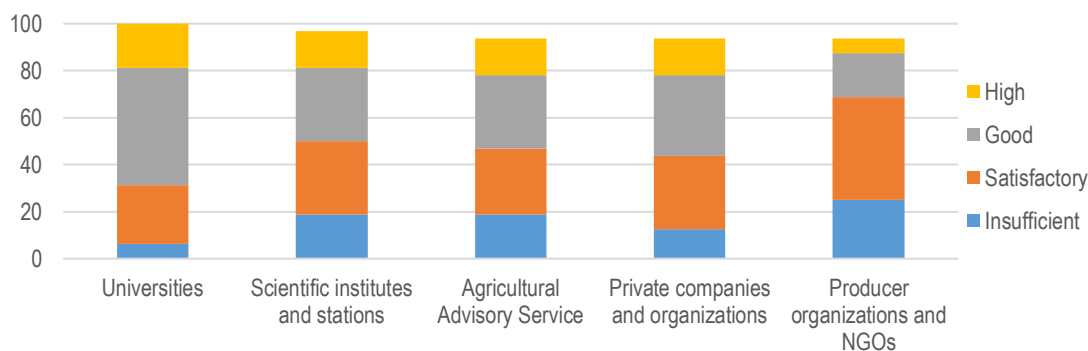
Figure 3. Financial endowment of agrarian research and consultations in the main organizations of AKIS (%)



Source: Experts assessment

Universities are with the best staff endowment for agrarian research and consultancy, where, according to nearly 69% of experts, it is good or high (Figure 3). Every second expert also believes that staffing for research and consultations of NAAS, and private companies and organizations are good or high. At the same time, the majority of experts estimate that the staffing of agricultural research and consultancy in scientific institutes and stations is satisfactory or good (31.2% each), and that of producer organizations and non-governmental organizations as satisfactory (43.8%). This calls for urgent measures to improve the incentives to attract new staff and to improve the skills of existing staff in the state and non-governmental agrarian research and consultancy sectors.

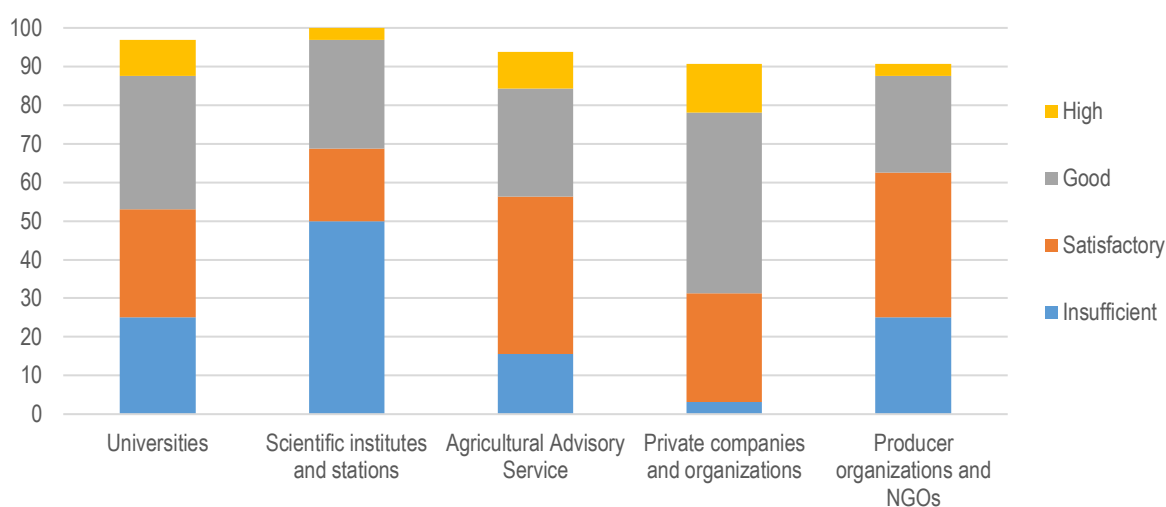
Figure 4. Staff endowment of agrarian research and consultations in major organizations of AKIS (%)



Source: Experts assessment

There is also considerable differentiation in the availability of advanced agricultural research and consulting equipment in different types of organizations (Figure 5). While in private companies and organizations it is good or high (59.4%), in scientific institutes and stations every second expert rates it as unsatisfactory, and only 31% as good or high. This proves the need to significantly modernize the equipment of the public scientific institutes that dominate the sector. The majority of experts believe that the availability of modern equipment in NAAS is satisfactory (40.6%), and not many rates it as good or high (37.5%). The material endowment of this type of activities of the producer organizations and non-governmental organizations was evaluated by the majority as satisfactory (37.5%). At the same time, however, every fourth expert thinks that it is either unsatisfactory or good. The latter indicates the different material capacities of the individual non-profit-making organization, and the need to take public action to support those lagging behind.

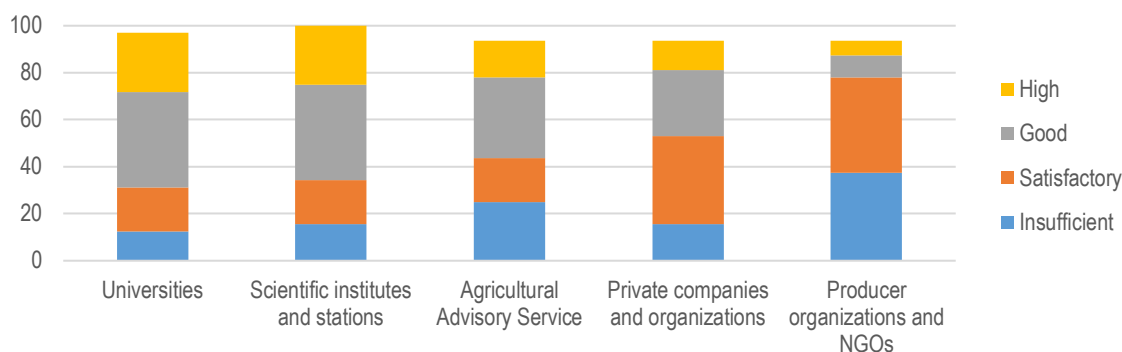
Figure 5. Endowment with modern equipment of agrarian research and consultations in major organizations of AKIS (%)



Source: Experts assessment

Despite the inadequate and quite diverse endowment with financial, human, and material resources, the public agricultural research, and consultation system demonstrates high potential for modern agricultural research and consultations. According to the majority of experts, the potential of universities, research institutes, and stations, as well as the NAAS for modern agrarian research and consultations is good or high - 65.6%, 65.6%, and 50% respectively (Figure 6). This indicates that public organizations in agricultural research and consultations will continue to dominate in the future and have to receive increasing public support. On the other hand, the potential for modern agrarian research and consultations in the private sector has been identified as satisfactory - by 37.5% of experts for private companies and organizations, and by 40.6% for producer organizations and non-governmental organizations. Along with this, however, nearly 41% of the experts believe that the potential of profit-oriented private companies and organizations for modern agricultural research and consulting is good or great. This shows that with effective public support and regulation, the role of the private sector in agricultural research and consultations will be expanded in the future and has to be a priority.

Figure 6. Potential for modern agrarian research and consultations in major organizations of AKIS (%)

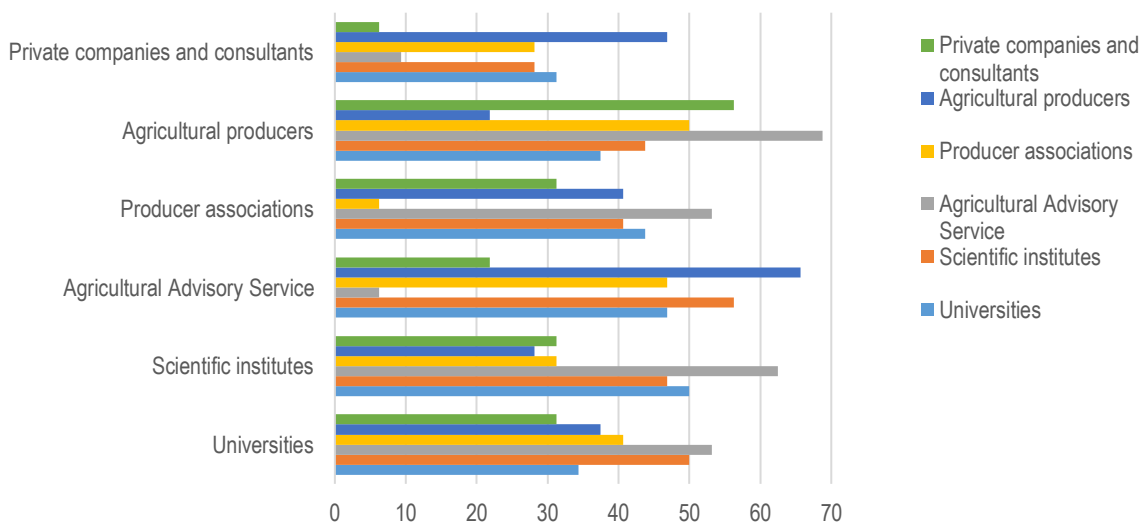


Source: Experts assessment

Efficiency of Links between Agents in AKIS

The next question to the experts is about the efficiency of the links (relations) between the main actors in the AKIS at the current stage. The majority of experts regard the links between the universities and scientific institutes, scientific institutes and NAAS, NAAS and farmers, NAAS and producer associations, producer associations and agricultural producers, private companies and consultants, and farmers as highly effective (Figure 7). At the same time, some important links for the development of the AKIS are not identified as effective by experts - between individual universities, universities with farmers and private companies and consultants, scientific institutes with farmers and private companies and consultants, NAAS with private companies and consultants, producers' associations among themselves and with private firms and consultants, between private firms and consultants, and between farmers themselves. Also, only 46.9% of the experts are convinced that the links between the scientific institutes themselves are highly effective, which is not a good indicator of the degree of integration and coordination of the activities of the various scientific institutes in the country. To improve all these critical links for the development of the AKIS, effective measures are to be taken immediately from the leadership of the public sector organizations, as well as adequate incentives for participants and public support introduced through state funding, tax relief, logistics, assistance, regulations, networking, etc.

Figure 7. Efficiency of links between organizations in AKIS (%)

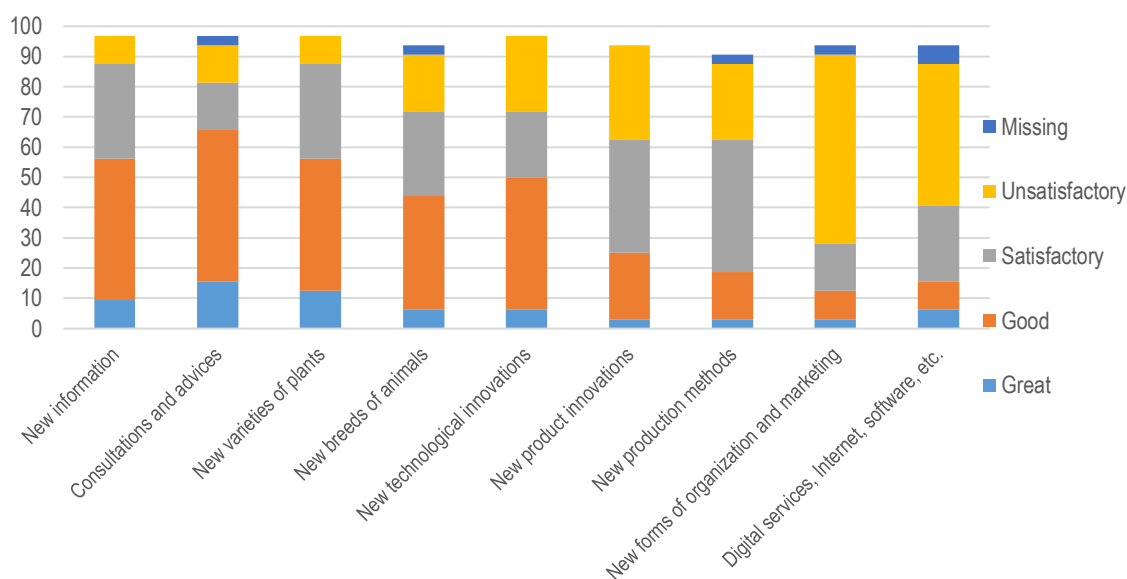


Source: Experts assessment

The next group of experts' assessments relates to the extent to which farmers have access to information, advice, innovations of different types and digital services, and the extent to which different types are innovations are introduced in farms. According to a large part of the panel of experts, farmers in the country have good or great access to new information (56.3%), consultations and advice (65.6%), new plant varieties (56.3%), new breeds of animals (43.8%) and new technological innovations (50%) (Figure 8). Therefore, in these areas, the existing AKIS works relatively well and serves farmers effectively. At the same time, however, the majority of experts assess that producers' access to new product innovations and new production methods is satisfactory (37.5% and 43.8% respectively) or unsatisfactory (31.3% and 25%). The most unfavourable situation is the access of farmers to new forms of organization and marketing, which is estimated by a significant number of experts as unsatisfactory (62.5%).

Therefore, public measures are to be taken to support and encourage the participants in the AKIS to improve the supply and market development of diverse types of innovation in the country. The situation with the farmers' real access to digital services, the internet, software, etc. is also unfavourable. Just over 53% of the experts consider this access to be inadequate or non-existent, with one in four assessing it as satisfactory. Cardinal public support measures (investments, training, incentives, partnerships with the private sector, etc.) are to be also undertaken in this important area to overcome the lag in the digitalization of the agricultural production and rural areas of the country.

Figure 8. Extent of access of agricultural producers to information, consultations, innovations, and digital services (%)

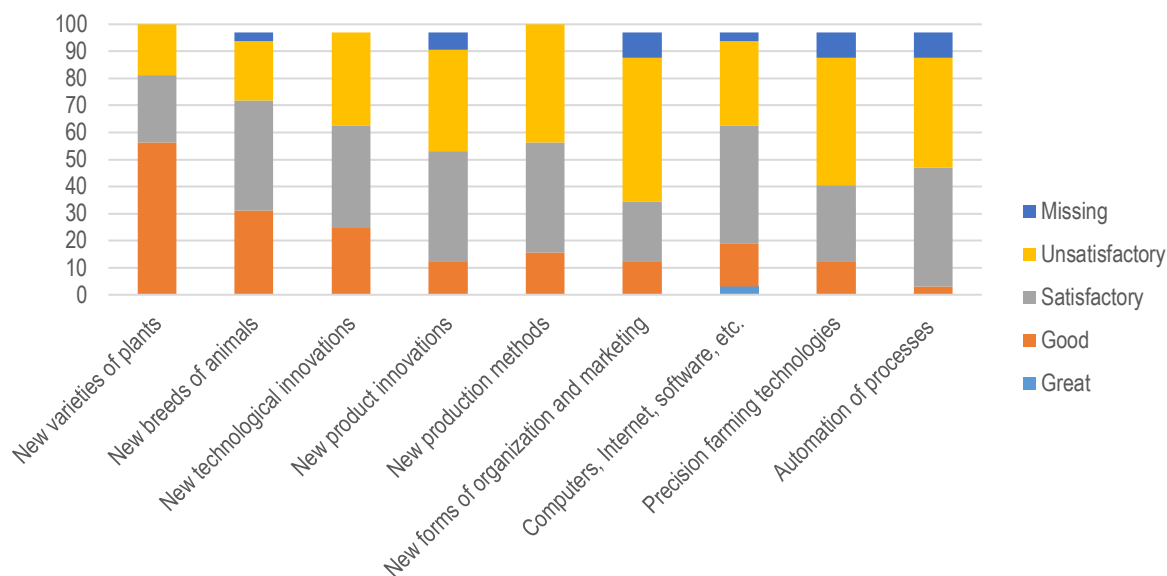


Source: Experts assessment

There is also a great variation in the degree of the introduction of different types of innovations in Bulgarian agriculture (Figure 9). New varieties of plants are considered to be with the highest extent of introduction, where a considerable part of the experts think that it is good (56.3%). The majority of experts evaluated as satisfactory the degree of the introduction of new breeds of animals (40.6%), new technological innovations (37.5%), new product innovations (40.6%), new production methods (40.6%), computers, Internet, software, etc. (43.8%), and automation of processes (43.8%). At the same time, a considerable part of the expert panel believes that the degree of the introduction of whole classes of innovations such as new methods of production (43.8%), new forms of organization and marketing (53.1%), technologies of precision agriculture (46.9%) and process automation (40.6%) is unsatisfactory. For some types of innovation, many experts even think that such implementation is lacking - as is

the case with new forms of organization and marketing, precision farming technologies, and process automation. Therefore, adequate public support, incentive, partnership, etc. measures are to be undertaken to exploit the great unrealized potential for organizational, technological, and product renewal of the industry.

Figure 9. Extent of introduction of diverse type of innovations by agricultural producers in Bulgaria (%)



Source: Experts assessment

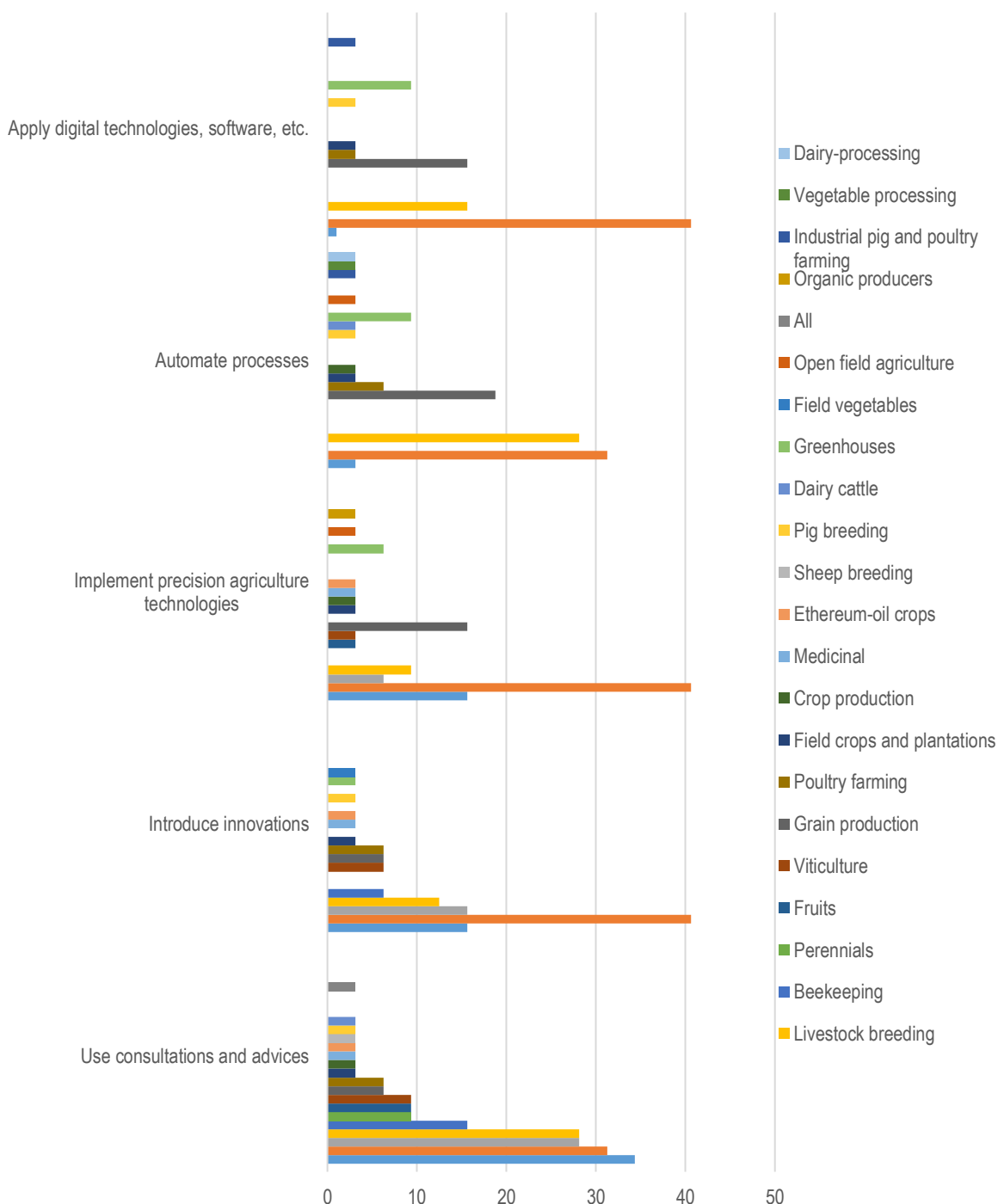
Extent of Utilization of Advices and Introduction of Innovations in the Sector

There is considerable differentiation in the degree of use of advice and consultations, and in the introduction of innovations of different kinds in individual sub-sectors of agriculture, in farms of different legal types and sizes, and different regions of the country. According to the experts, the widest advice and consultations are used in vegetable production (34.4%), field crops (31.3%), fruit growing (28.1%), and animal husbandry (28.1%) (Figure 10). At the same time, only a small number of experts believe that the other sub-sectors of agriculture benefit greatly from the advice and consultations provided by various public and private organizations. With regards to the introduction of innovations, the majority of experts believe that it is done in the field crops sector (40.7%), and a relatively smaller proportion in vegetable and fruit growing (15.7% each) (Figure 10).

According to the experts, innovations in the rest of the agricultural sub-sectors are not very much introduced. The latter requires specific public measures and incentives to accelerate the introduction of innovations in lagging productions so that the great potential for raising the technological level of agriculture can be realized. A relatively large proportion of the experts believe that precision farming technologies are most widely applied in field crops (40.7%) and a smaller proportion of them in vegetable and grain production (15.7% each) (Figure 10). At the same time, most experts do not consider that precision agriculture technology is implemented to a large extent in other sub-sectors and productions. A relatively large number of the experts estimate that the greatest extent the processes are automated processes in the field crops (31.3%), animal husbandry (28.1%), and grain production (18.8%) (Figure 10). Other sub-sectors and productions do not automate the processes to a great extent at this stage of development. Thus, special measures of public support and stimulation of all participants in AKIS are to be taken to extend the use of technologies of precision farming and automation of processes in all types of productions. In this way, the great existing potential in this respect for raising the quality of production and labour, productivity and labour productivity, etc., could be realized. Concerning the degree of application of digital technologies, software, etc. the biggest number of experts suggest that it is done in field crops (40.6%) and a

smaller proportion of them in cereals and livestock (15.6% each) (Figure 10). Other subsectors are lagging far behind in terms of implementation of digital technologies, software, etc. The latter requires the implementation of specific measures to expand digitalization of the production and management in lagging sub-sectors.

Figure 10. Extent of utilization of advices and consultations, and introduction of innovations of various type in individual subsectors of Bulgarian agriculture (%)

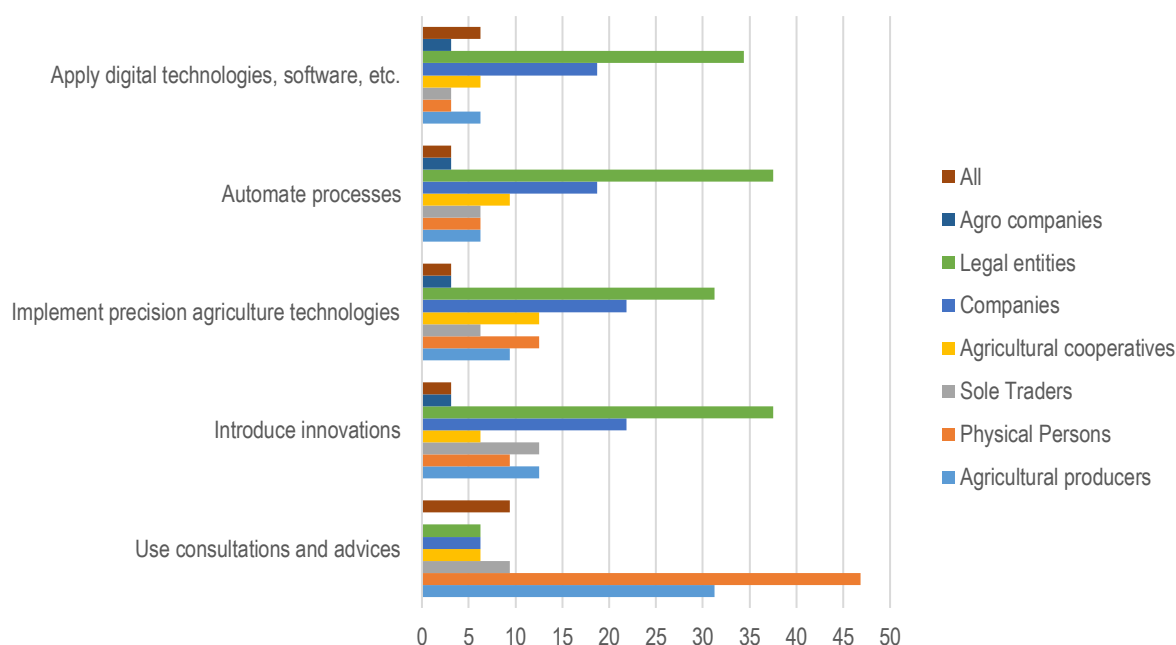


Source: Experts assessment

There is also a great variation in the extent to which advice, consultations, and innovations are introduced on farms of different types. According to the majority of experts, Physical Persons (48.9%) use to the greatest extent advice and consultations (Figure 11). Just over 31% of the experts also indicated that advice and

consultations were widely used by agricultural producers. According to the majority of the experts' panel, other juridical types of farms make little use of the advice and consultations provided by various public and private organizations. Most experts identified as the largest adopters of innovations the legal entities of different types (37.5%), followed by the companies of different types - OOD, AD, EOOD (21.9%) (Figure 73). For other legal types of farms, only a small number of experts identify them as major innovators. Therefore, effective measures for public support introduction of innovations by other types of farmers are to be taken to elevate the overall technological level and increase the efficiency of the sector. Concerning the application of precision agriculture technologies, process automation, and the implementation of digital technologies, software, etc. most experts also believe that this is done predominantly by the legal entities (31.3%) and companies (21.9%), while other categories of holdings are not active in these important areas (Figure 73). The latter requires the introduction of specific public measures to stimulate and support innovations in these new areas by all types of farms.

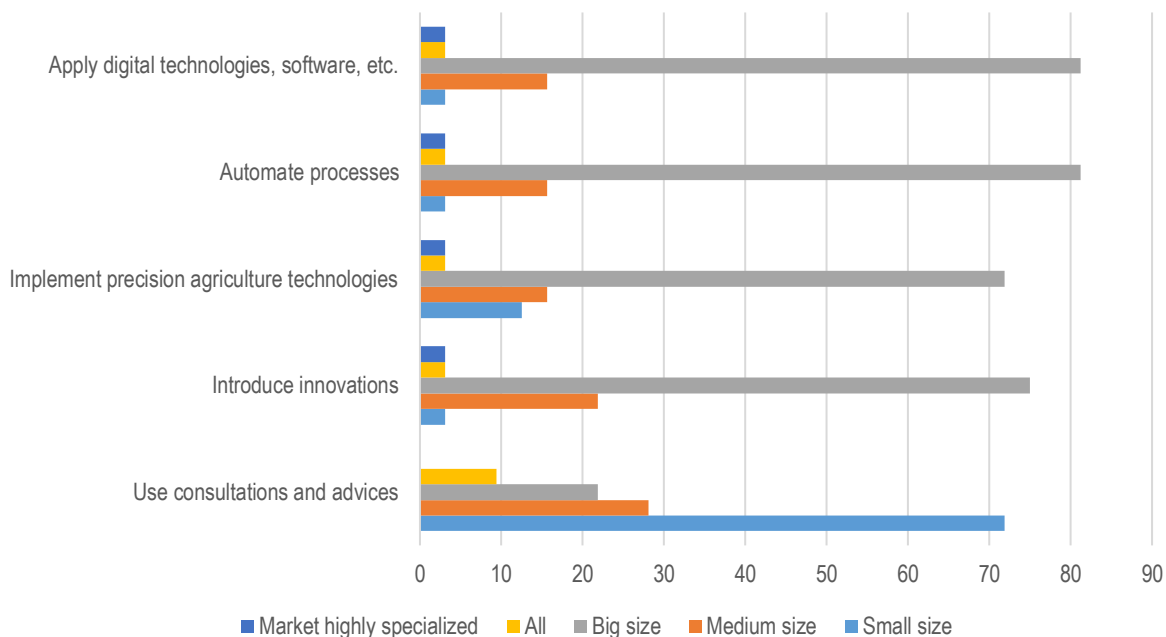
Figure 11. Extent of usage of advices, consultations, and introduction of various kind of innovations in agricultural farms of different juridical type (%)



Source: Experts assessment

There is also a great differentiation in the extent of utilization of advice and consultations, and the introduction of innovations in farms of different sizes. A significant number of experts consider that small farms use the most advice and consultations (71.9%), while other categories of producers use less “external” advice and consultations (Figure 12). On the other hand, the vast majority of the experts believe that large holdings mostly innovate, apply precision farming technologies, automate processes and apply digital technologies, software, etc. - 75%, 71,9%, 81,35, and 81,3% respectively. A relatively smaller number of the panel of experts believe that innovations generally and in the above-mentioned new areas are introduced by the medium-sized holdings. Therefore, public support and incentive measures are to be undertaken to extend the introduction of innovations in farms of all legal types and sizes to reduce the wide disparities in this regard.

Figure 12. Extent of utilization of advices and consultations and in the introduction of innovations of various type in agricultural farms of different sizes (%)

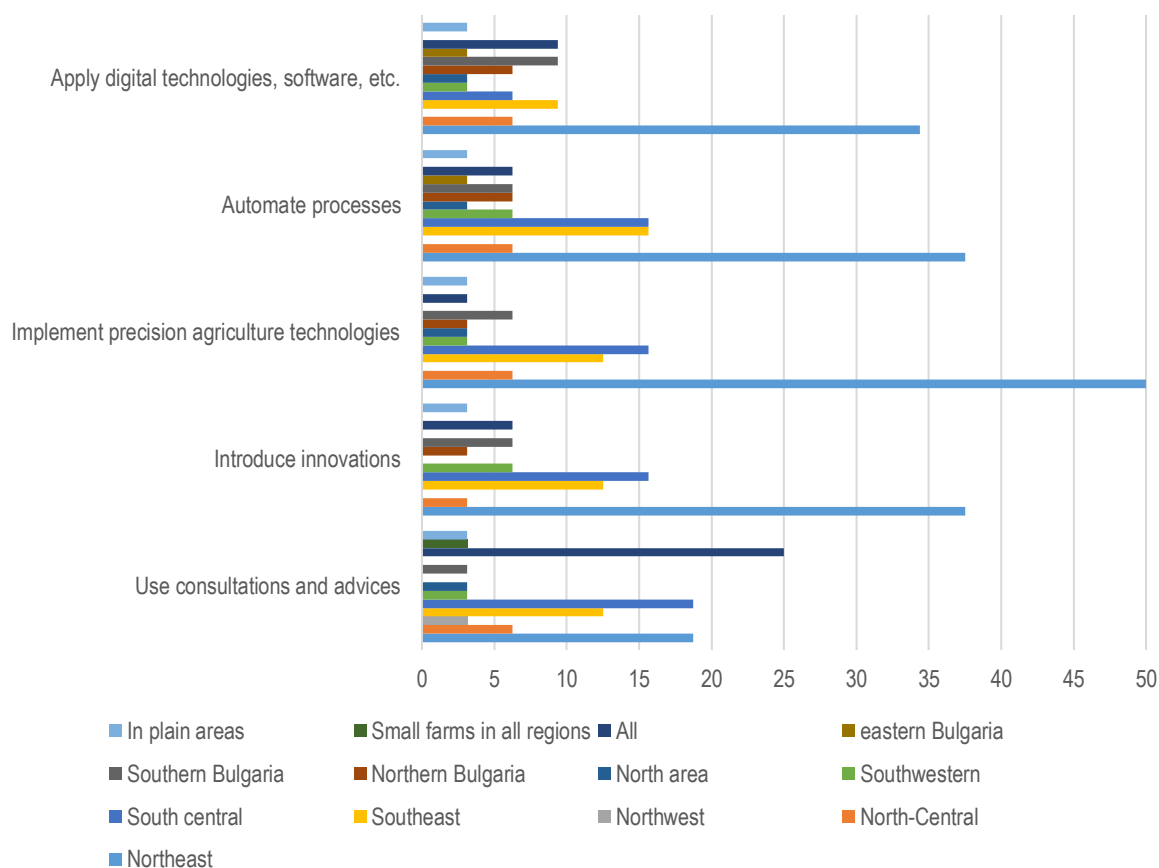


Source: Experts assessment

Finally, there are differences in the degree of use of advice and consultations, and the introduction of different types of innovation in different geographical regions of the country. According to one in four experts, advice and consultations are used evenly throughout the country (Figure 13). A considerable number of experts also point to the North-East and South-Central regions of the country (18.8% each) as the largest users of advice and consultations.

According to the majority of experts, the largest adopter of innovations is the Northeast Region (37.5%), which is also a leader in the application of precision agriculture technologies (50%), process automation (37.5%), and the implementation of digital technologies, software, etc. (34.4%). A relatively smaller proportion of the experts also identify the South Central and South-eastern regions as intensive innovators (15.6% and 12.5% respectively), the application of precision agriculture technologies (15.6% and 12.5%), and process automation (15.6 each). According to the large majority of the experts, the degree of the introduction of innovations in general and in the application of modern technologies for precision agriculture, process automation, digitalization, etc. in other parts of the country is small. That requires the introduction of specific measures for public support and partnership, for intensifying the introduction of innovations in general and in the newest directions such as modern technologies of precision agriculture, automation of processes, and digitalization in other parts of the country. In this way, it will be possible to overcome the great imbalance in the development of the individual regions of the country.

Figure 13. Extent of utilization of advices and consultations and in introduction of innovations of various type in different regions of the country (%)



Source: Experts assessment

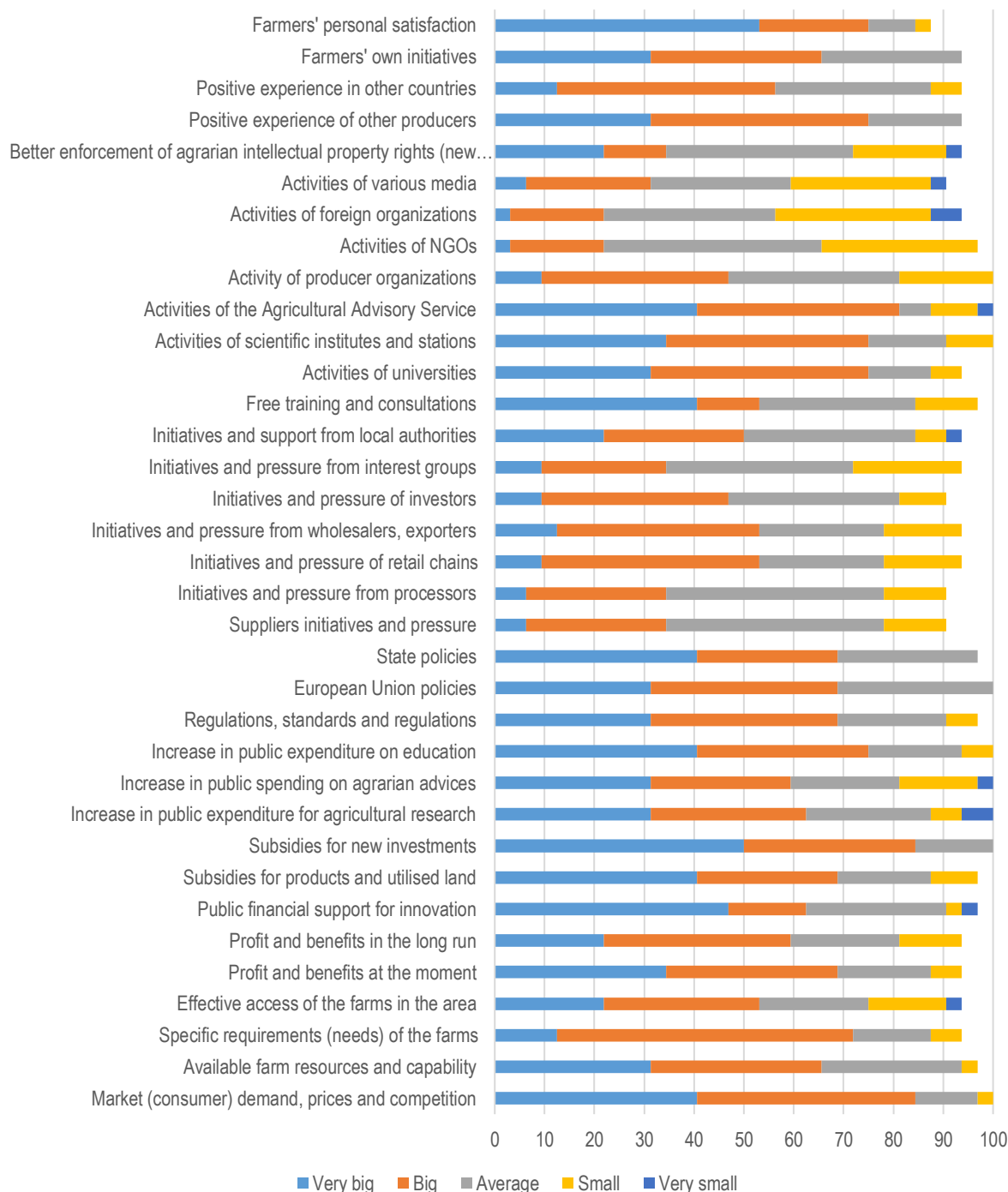
Factors and Prospects for Improving Dissemination of Knowledge and Innovations

The next question for experts is the importance of the various factors for improving the dissemination of knowledge, innovation, and digitalization in agriculture and rural areas in Bulgaria. Experts are very unanimous that the most important factors (of great or very great importance) for improving the dissemination of knowledge, innovation, and digitalization in agriculture and rural areas of the country at this stage are: market (consumers) demand, prices, competition, and subsidies for new investments (84.4% each), as well as the activity of the National Agricultural Advisory Service (81.3%) (Figure 14). Therefore, the support for market development is to be extended as well as the public support (subsidies) for consultations and training, and the private investments in the area. Three-quarters of the experts also believe that the increase in public spending on education, the activities of universities, the activities of scientific institutes and stations, the positive experience of other producers, and farmers' personal satisfaction, are important factors for improving knowledge dissemination, innovation, and digitalization in agriculture and rural areas.

A large number of experts also estimate that the specific requirements (needs) of the farms (71.9%), and the profit and the current benefits, subsidies for products and used land, regulations, standards and regulations, EU policies and policies of the state (68.8% each) are decisive for improving the diffusion of knowledge, innovations, and digitization in agriculture and rural areas. The majority of experts also give a high rank to the available resources and capability of the farms, and the farmers' own initiatives (65.6% each), as well as to the public financial support for innovations, and the growth of public expenditure on agricultural science (62.5% each), the long-term profits

and benefits, and the rise in public spending on agrarian advice (59.4% each), the positive experiences in other countries (56.3%), and the effective access of farms and in the region, the initiatives and pressure of the retail chains, the initiatives and pressure on wholesale traders and exporters, and the free training and consultancy (by 53.1%) for improving the situation in this respect. All these factors for improving the existing state are to be taken into account in the process of amelioration of the public support for the development of AKIS in the next programming period.

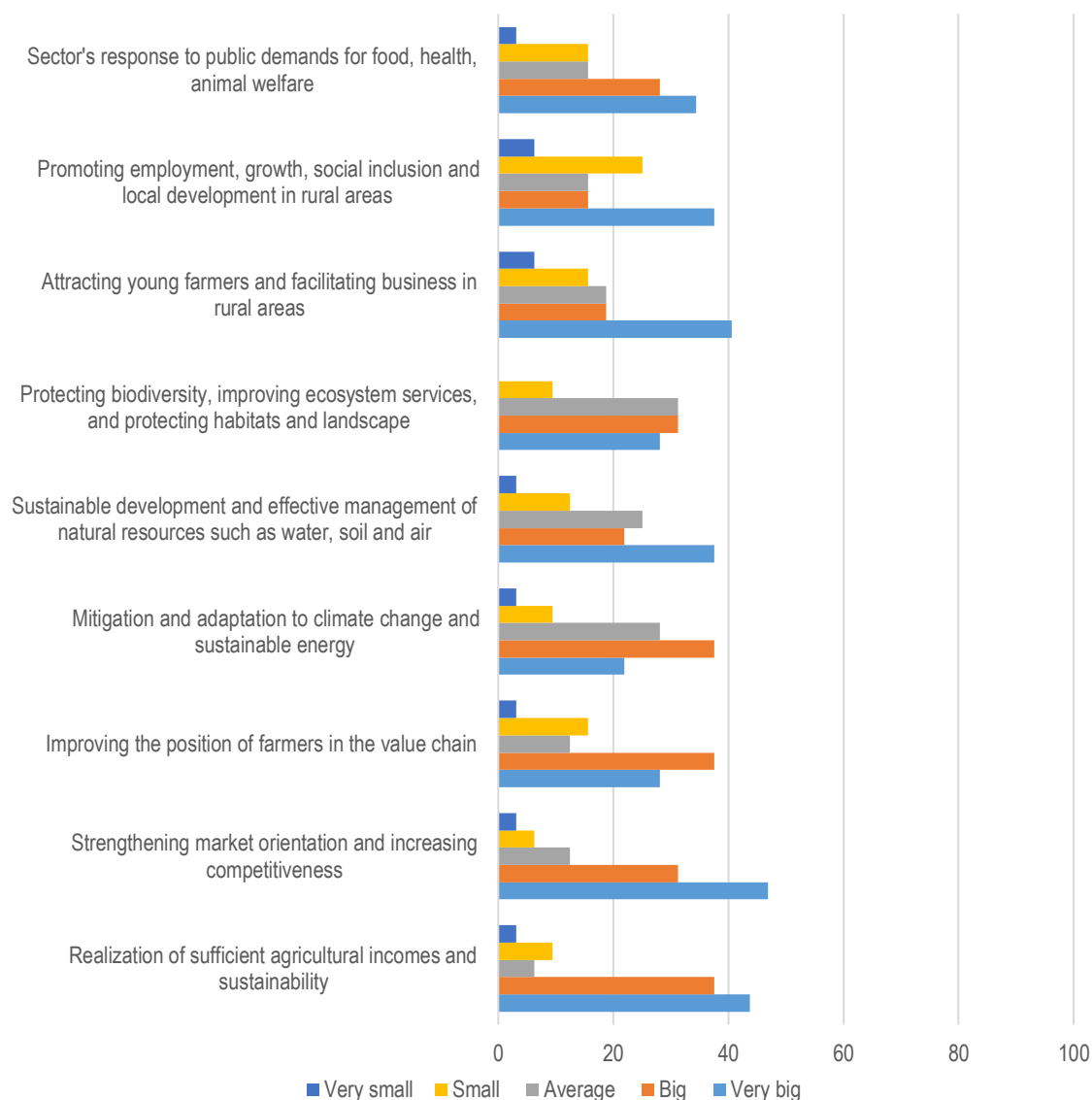
Figure 14. Importance of various factors for amelioration of the dissemination of knowledge, innovations and digitalization in Bulgarian agriculture and rural areas (%)



Source: Experts assessment

The final question to the panel of experts is the extent to which the achievement of the horizontal objective of dissemination of knowledge, innovations, and digitalization in agriculture and rural areas in Bulgaria contributes to the achievement of the various objectives of the EU CAP. Most experts believe that the successful achievement of the horizontal objective contributes to a large or very large extent to the achievement of all specific objectives of the EU CAP (Figure 15). According to most experts, improving the dissemination of knowledge, innovations, and digitalization of agriculture and rural areas contributes to the greatest extent to the achievement of the specific objectives of sufficient agricultural incomes and sustainability (81.3%), and enhancing market orientation and increasing competitiveness (78.1%). On the other hand, a relatively smaller majority of the experts believe that improving dissemination of knowledge, innovations, and digitalization in agriculture and rural areas contributes significantly to promoting employment, growth, social inclusion, and local rural development (53.1 %). All this proves that the effective measures are to be undertaken during the new programming period to realize the horizontal objective of the EU CAP for improvement of the dissemination of knowledge, innovations, and digitalization in agriculture and rural areas, in order also to achieve successfully the specific objectives of the Union.

Figure 15. Extent in which dissemination of knowledge, innovations and digitalization in agriculture and rural areas in Bulgarian contributes for achievement of different objectives of EU CAP (%)



Source: Experts assessment

2. SWOT Analysis, Development Strategy and Intervention Needs

On the base of the diagnosis of the state and trends in development of AKIS in Bulgaria, SWOT for AKIS is formulated by the panel of experts (Table 1).

Table 1. SWOT analysis for AKIS in Bulgaria

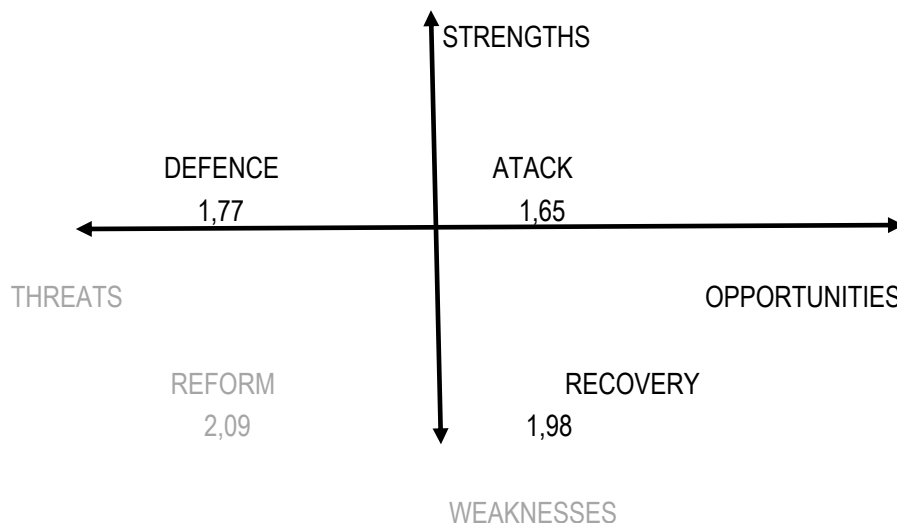
STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> ▪ AKIS of the country includes diverse and well-developed scientific, university, private and professional organizations ▪ Agriculture is the only sector for which special service structures (Agricultural Academy and NAAS) are built and publicly funded ▪ The relative share of scientists, doctors and doctors of science in AR&D is increasing ▪ The number of recognized new varieties and hybrids of plants and animal breeds, and approved technologies is considerable ▪ Vocational education in the field of agriculture and forestry is provided in a large number of secondary and higher schools ▪ The number of consultations provided to farmers has increased and the subjects expanded ▪ Availability of free and affordable support to farmers through NAAS ▪ Opportunity for farmers to participate in hundreds of diverse events for transfer and dissemination of knowledge and innovation ▪ Private consultancy organizations are active in preparing business plans and projects for investment measures ▪ There is a growing interest in implementation by producers for all types of innovations ▪ Numerous activities taking place related to digitization of agriculture, an important part of which is the Digital Innovation Hub ▪ Significant measures taken to digitize agricultural administration, leading to increased efficiency and improved services 	<ul style="list-style-type: none"> ▪ There is insufficient official or other reliable information on AKIS in the country ▪ The share of the university and private (business) sectors of AR&D is negligible ▪ Poor staffing and age structure of AR&D ▪ Material endowment of AKIS lags behind world standards ▪ Obsolete facilities and reduced, on the border of the "critical" mass, personnel, financial and material resources in some of the AKIS units ▪ Low quality of education and insufficient adaptability of schools to the business needs ▪ Most farm managers are only with practical experience and no agricultural training. ▪ Lack of financial resources, unwillingness to take risks and insufficient training of farmers make it difficult to innovate ▪ In many areas, a limited number of private organizations providing consultancy ▪ Only 5% of producers in mountainous regions use computer programs in farm management ▪ There is considerable variation in internet access of households in densely populated and rural areas ▪ Much of the links in AKIS are not efficient ▪ The degree of introduction of new production methods, forms of organization and marketing, precision farming technologies and process automation is unsatisfactory ▪ There is considerable differentiation in the use of advice and consultations and introduction of innovations in different sub-sectors of agriculture, in farms of different legal types and sizes, and in different regions ▪ There is insufficient information among farmers and producers' organizations on the achievements and innovations of local institutions

	<ul style="list-style-type: none"> ▪ Few publicly supported farms introduce new technologies or product ▪ Nearly half of farmers are unaware of the nature of digital agriculture, and only 14% use modern digital technologies
<p>OPPORTUNITIES</p> <ul style="list-style-type: none"> ▪ The role of budgetary funding for AR&D is relatively increasing ▪ With sufficient incentives and benefits, the private sector is actively involved in AR&D ▪ Existence of significant public support and funding for “Transfer of Knowledge and Actions”, “Consultancy Services, Farm Management and Replacement Services” and “Cooperation” ▪ Modernization of agricultural holdings is an important area of public support for Bulgarian farms. ▪ Adopted Strategy for Agriculture and Rural Digitization aiming to turn agriculture into a highly technological, sustainable, productive and attractive sphere ▪ There is great potential for increasing efficiency with adequate support and modernization of AKIS ▪ European and world AKIS offer great opportunities for rapid and efficient transfer of knowledge and innovations 	<p>THREATS</p> <ul style="list-style-type: none"> ▪ Expenditures for R&D in agricultural sciences is significantly reduced in both absolute and relative terms ▪ Significant reduction in AR&D expenditure in the Gross Value Added of agriculture ▪ Share of AR&D budget expenditures in the total budget expenditures is decreasing while the share of AR&D funding from the state budget is variable ▪ The costs of innovations are high, leading to high prices for innovative technologies and products ▪ There is no effective organization of AR&D, and systems for public funding, coordination and assessment of activity, evaluation and stimulation of researchers and teams, and protection of intellectual agrarian property ▪ Most of the innovations implemented in the country are "imported" from abroad due to the lack of effective solutions in the local institutes and universities ▪ Regulatory restrictions for implementing public-private partnerships between research centers and agribusiness ▪ Bulgaria lags far behind the rest of EU in terms of the entry of digital technologies into the economy and society ▪ Implementation of measure 16.1 of the RDP 2014-2020 is lagging behind comparing to other EU states ▪ Competition with global suppliers of new knowledge and innovations in the agricultural sector is increasing

Source: the author

After SWOT is done the Expert panel gave scores indicating importance (Scale 0-3) of the major Strengths, Weaknesses, Opportunities, and Threats of AKIS in Bulgaria. On that base, a Strategic Orientation matrix has been built (Figure 16).

Figure 16. Strategic orientation for AKIS development in Bulgaria



Source: the author

The summary of experts' assessments found out that the scores in quadrant IV are the highest, which means that the Weaknesses of AKIS in the country prevent from confronting the Threats of the socio-economic, market, and natural environment. This calls for the selection of a general REFORM strategy. Moreover, the scores in Quadrant III are close to the highest one, indicating that AKIS in Bulgaria has many Weaknesses and it is not able to take advantage of the existing options of the environment. That also calls for a need to launch a global RECOVERY type strategy.

Consequently, the specific strategy for AKIS development during the next programming period is suggested and agreed upon: "Improving the level and forms of agriculture through stimulating knowledge sharing, innovation, and digitization".

Seven major needs and 23 sub-needs for public intervention for the realization of the defined strategy have been specified after careful consideration (and assessment of comparative efficiency) which needs of AKIS could be effectively fulfilled by the market and private modes and where there is a strong need for public involvement during the next programming period.

- I. Collecting complete and reliable information on the state and development of the System of Sharing of Knowledge and Innovations and Digitization in agriculture
 - a. Collecting information on the status and development of research, consultancy and innovation introducing activities of universities;
 - b. Collecting information on the status and development of research, consultancy and innovation introducing activities of private sector;
 - c. Collection of information on the digitization of agriculture and rural regions;
- II. Significant modernization of the AKIS of the country
 - a. Significant increase in investment for R&D activity and for introduction of innovations in agriculture;
 - b. Support and stimulation of private investment in R&D activity and introduction of innovations in agriculture;
 - c. Supporting and stimulation public-private partnerships and co-operation in financing and organizing R&D activity and introduction of innovations in agriculture;
 - d. Improvement of the system of registration, protection and commercialization of intellectual agricultural products (new varieties, breeds, technologies, production methods, etc.);
- III. Significant expansion of the AKIS of the country:

- a. Sustainable growth of budgetary investments in R&D activity and introduction of innovations in agriculture;
- b. Improving the incentives for retaining and attracting highly qualified staff R&D activity in agriculture;
- c. Improvement of the material and technical base, and the resource, financial and human endowment of the public scientific, educational and consulting organizations in the agricultural sphere;

IV. Improving educational and qualification level of managers, specialists and workers in agricultural sector:

- a. Encouragement and support of all forms of training and upgrading of the employees in the agricultural sector;
- b. Encouragement and support for improving the educational and qualification level of managers and workers in agricultural holdings and rural residents;
- c. Expanding the training and qualification of the AKIS participants in priority areas, including the organization of networks for sharing of knowledge and innovations;
- d. Adapting the training system to the contemporary needs of farmers and businesses;

V. Promoting and supporting the various forms of dissemination of knowledge and innovations in agriculture:

- a. Encouraging and supporting joint initiatives of scientific, business, non-governmental and professional organizations, and farmers for dissemination of knowledge and innovations in agriculture;
- b. Accelerating the setting up of operational groups of interested farmers, researchers, consultants and business (EIP) in agriculture to solving specific problems;
- c. Free, easily accessible, tailored to the needs and diverse in forms and subject consultations and information for agricultural producers;

VI. Overcoming the big differences in the technological level and production efficiency in different types of farms, subsectors of agriculture and regions of the country:

- a. Enhanced support for sharing and transfer of knowledge and digitization in lagging areas;
- b. Enhanced support and incentives for the introduction of new production methods and technologies for precision agriculture, processes automating, and implementation of digital technologies, software and other innovations in perspective areas;

VII. Supporting and stimulating digitization of agrarian management, agricultural production and rural areas:

- a. Expanding the use of digital technologies in the management of the sector and in the relationships with producers;
- b. Expanding access to and use of computers and digital technologies in agriculture and rural areas;
- c. Supporting the introduction of digital technologies in small and medium-sized agricultural producers and their organizations;
- d. Supporting innovative initiatives for the creation, adaptation and introduction of digital technologies in the management and production of small and medium-sized enterprises.

All these needs have been fully or partially incorporated in the documents of the Strategic Plan for Agrarian and Rural Development of Bulgaria for 2021-2027 (due to be approved in 2022).

Conclusion

Governance of AKIS is an ongoing process that requires continuous dialogue, collaboration, and learning among stakeholders. It should be adaptive to changing circumstances, technological advancements, and emerging challenges in the agricultural sector. Effective governance enables the integration of scientific knowledge, local expertise, and farmers' perspectives, leading to sustainable and inclusive agricultural development.

Effective governance of AKIS is crucial for promoting agricultural development, enhancing productivity, sustainability, and resilience, and addressing the challenges and opportunities facing the sector. It involves the coordination and alignment of various actors and organizations involved in agricultural research, extension services, education, policy-making, and agricultural value chains.

The SWOT analysis provided an overview of the strengths, weaknesses, opportunities, and threats that the AKIS in Bulgaria may face. It can help identify areas for improvement, strategic planning, and policy interventions to strengthen the AKIS and promote sustainable agricultural development in the country.

Credit Authorship Contribution Statement

I take the sole credit for writing the paper, and drafting and modelling the theory, as to conceiving the idea of the paper, thus having played the full part in conducting the entire research.

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Conflict of Interest Statement

I declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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