State, efficiency and factors for development of AKIS in Bulgaria

Bachev, Hrabrin

Institute of Agricultural Economics, Sofia

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State, Efficiency and Factors for Development of AKIS in Bulgaria

***Hrabrin Bachev*[1]**

Abstract: Unlike in many other countries, in Bulgaria there are no comprehensive analysis of the state and evolution of the system of knowledge sharing, innovation and digitalization in agriculture (AKIS). The goal of this paper is to fill the gap and analyze the state, efficiency and factors of the agricultural knowledge sharing, innovation and digitalization in Bulgaria at current stage of development. Analysis is based on 2019 expert assessment with 32 leading experts from research institutes of the Agricultural Academy, Bulgarian Academy of Sciences, agrarian and other universities, National Agricultural Advisory Service, and major professional associations of agricultural producers. The study has found out that AKIS of the country consists of diverse and numerous organizations, for which activities and complex relations have no sufficient official or other reliable information. The expert assessments in that study let us identify the state, and major achievements and challenges in development in of that complex system. The lack of data however, only partially can be compensated by experts' assessments of these type. It is also necessary to carry out in-depth and representative surveys of individual components and the AKIS as a whole. Furthermore, it is necessary to institutionalize and regulate collection of official statistical, report, etc. information for the state and efficiency of that important system.

Key words: knowledge sharing, innovation, digitalization, agriculture

Introduction

"Stimulating and sharing knowledge, innovation, digitalization and promoting their greater use" is set again as one of the strategic ("horizontal") objective in the new programming period 2021-2027 for implementation of the European Union (EU) Common Agricultural Policy (CAP) (European Commission, 2018). In many other countries, regular in-depth analyzes of the state, efficiency and development factors of the Agricultural Knowledge and Innovation System (AKIS) are made (Anandajayasekeram and Gebremedhinp, 2009; Antle et al. 2017; Chartieret et al., 2015; EIP-AGRI EU SCAR, 2012; FAO, 2019; Touzard et al., 2015; Özçatalbaş, 2017; USDA, 2019; Weißhuhn et al., 2018; World Bank, 2006; Virmani, 2013).

In Bulgaria there are only partial analyzes of the individual elements of this complex system (Башев 2020; Башев и др. 2014; Башев и Михайлова, 2019; Bachev, 2020; Bachev and Denchev, 1992; Bachev and Labonne, 2000; Bachev and Mihailova, 2019). The reason for later is the lack of enough official statistics and other information as well as "sufficient" public interest in the development of this important system.

In our previous publications (Башев 2020; Башев и Михайлова, 2019; Bachev, 2020;) a detailed analysis of two major subsystems of the AKIS in Bulgaria (agricultural R&D and the information, advice and consultation system in agriculture) is made on the basis of available statistical, reporting and other official information. In this article, an attempt is made to analyze the state, efficiency and factors for the development of the country's AKIS at present stage.

[1] Institute of Agricultural Economics, Sofia, E-mail: hbachev@yahoo.com

The goal is to specify major trends and identify main challenges, and assist policies formation during the next programing period[2].

For the purposes of the analysis, an expert evaluation was made in March 2019, with the participation of 32 leading experts from the research institutes of the Agricultural Academy (AA) and Bulgarian Academy of Sciences (BAS), agrarian and other universities, National Agricultural Advisory Service (NAAS), and major professional organizations of agricultural producers.

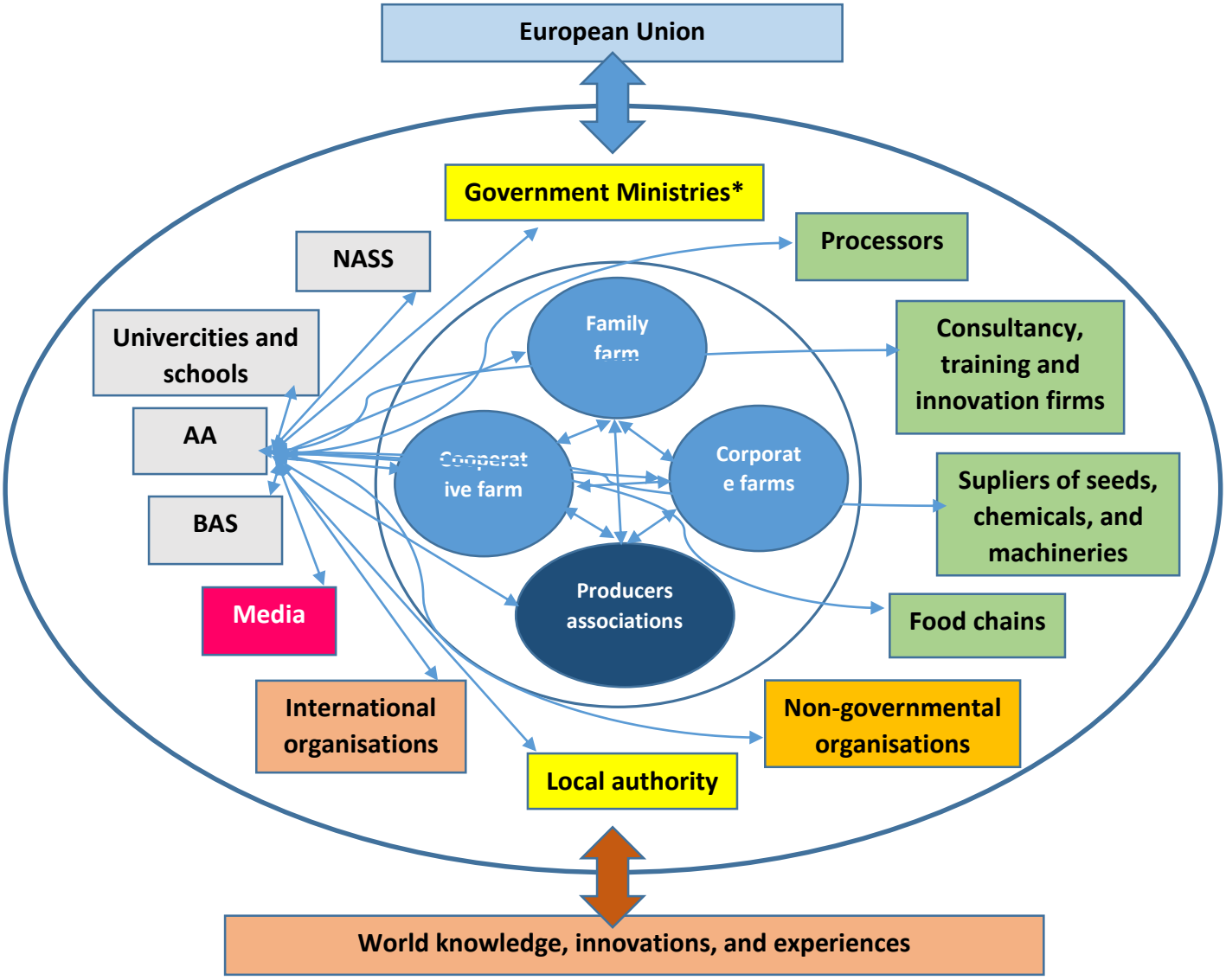
1. Participants and Relations in AKIS

In Bulgaria AKIS is composed of diverse and numerous individuals and organizations involved in the process of generating, sharing, disseminating and implementing knowledge and innovations in the sector. In addition to diverse type of farmers and agricultural farms (subsistent, semi-market, market, individual, family, cooperative, corporative, etc.), this complex system includes research institutes, universities and schools, agricultural advisory service, private consultants, specialized consulting, training and innovation firms, professional farmers' organizations, non-governmental organizations, suppliers of machinery, chemicals and innovations, food chains, processors and exporters of agricultural produce, government agencies, local authorities, non-governmental organizations and interests groups, media of various kinds, international organizations, private individuals, etc.

Figure 1 shows the main agents involved in the Agricultural Knowledge and Innovation System of Bulgaria. For a greater clarity only relationships of one organization (AA) with other organizations in this complex network of multilateral and complex relationships are highlighted.

[2] In fact, that analisis is being used for identifying public intervention needs and measures in the 2021-2027 Program for Agrarian and Rural Development of Bulgaria (Иванов, Башев и др., 2020).

Figure 1. Main actors and relationships in the national Agricultural Knowledge and Innovation System of Bulgaria



*Leading among them are: Ministry of Agriculture, Food and Forestry, Ministry of Education and Science, Ministry of Industry, and Ministry of Environment and Waters

Source: the author

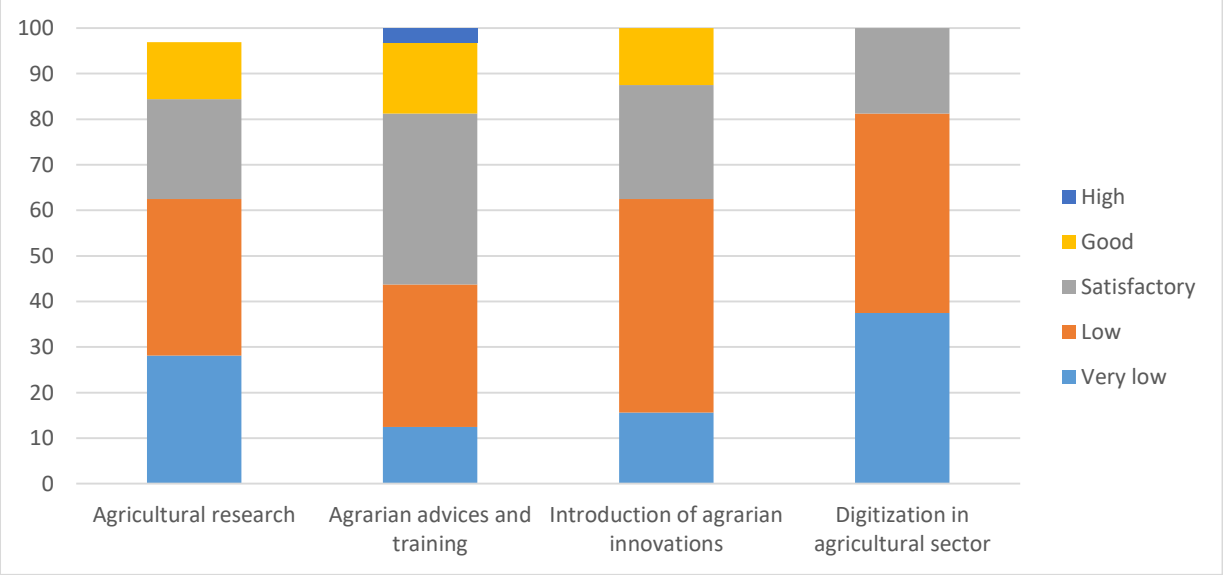
Like most of the other EU member states, there is insufficient official (statistical, reporting, etc.) information on the status and development of this complex system, its individual components, and the complex relationships between its participants. All this makes it difficult both to analyze the state and development of this important national system and to make comparative analyzes with other member states of the Union.

In this study the expertise of the leading experts in the field is used. The expert panel's assessments include answers to 16 questions related to the state, efficiency and factors of the development of the knowledge sharing, innovation and digitization system in agriculture in Bulgaria.

Level and Efficiency of Public Expenditures in AKIS

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, and for the introduction of agrarian innovations (62.5% each), and for agricultural advice and training (43.7 %) is low or very low (Figure 2). 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.

Figure 2. Level of public expenditure and investment for agricultural research, agricultural advice and training, introduction of agricultural innovations, and digitalization in the agrarian sector (%)

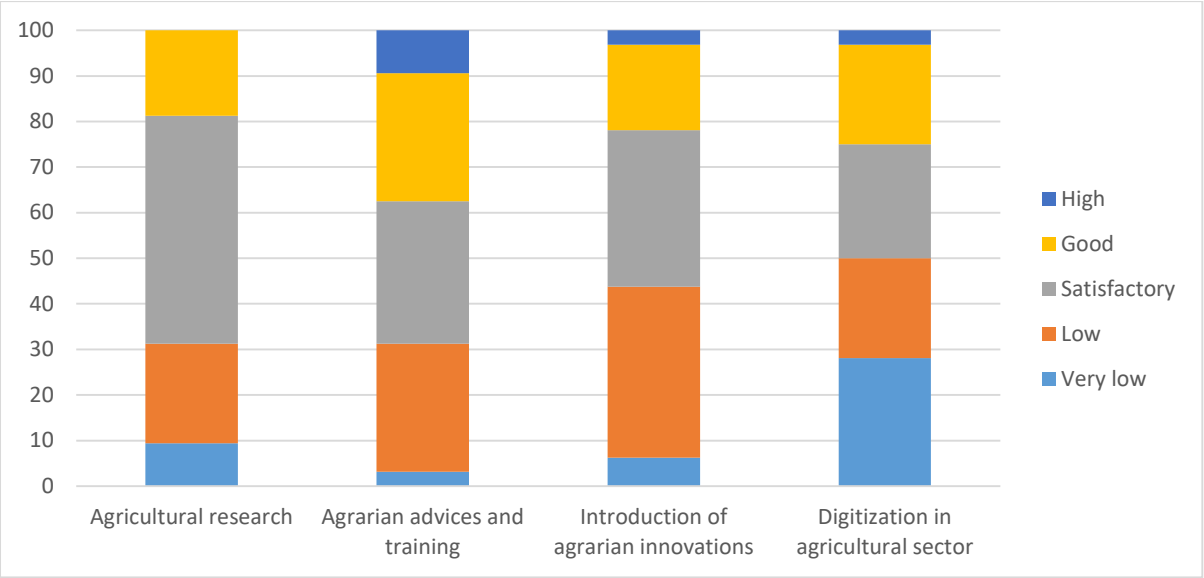


Source: Experts assessment

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 advices and trainings. 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.

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 (Figure 3). However, 31% of experts say that this level is low or very low. The later 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 is to continue.

Figure 3. Efficiency of public expenditures and investments for agrarian research, agrarian advice and training, introduction of agrarian innovations, and digitalization in the agricultural sphere (%)



Source: Experts assessment

As far as the efficiency of public resources for agrarian advices 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 rate 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 later indicates that limited investment in this area is of high efficiency and are to be increased, as there is a great potential for improving efficiency through additional investment.

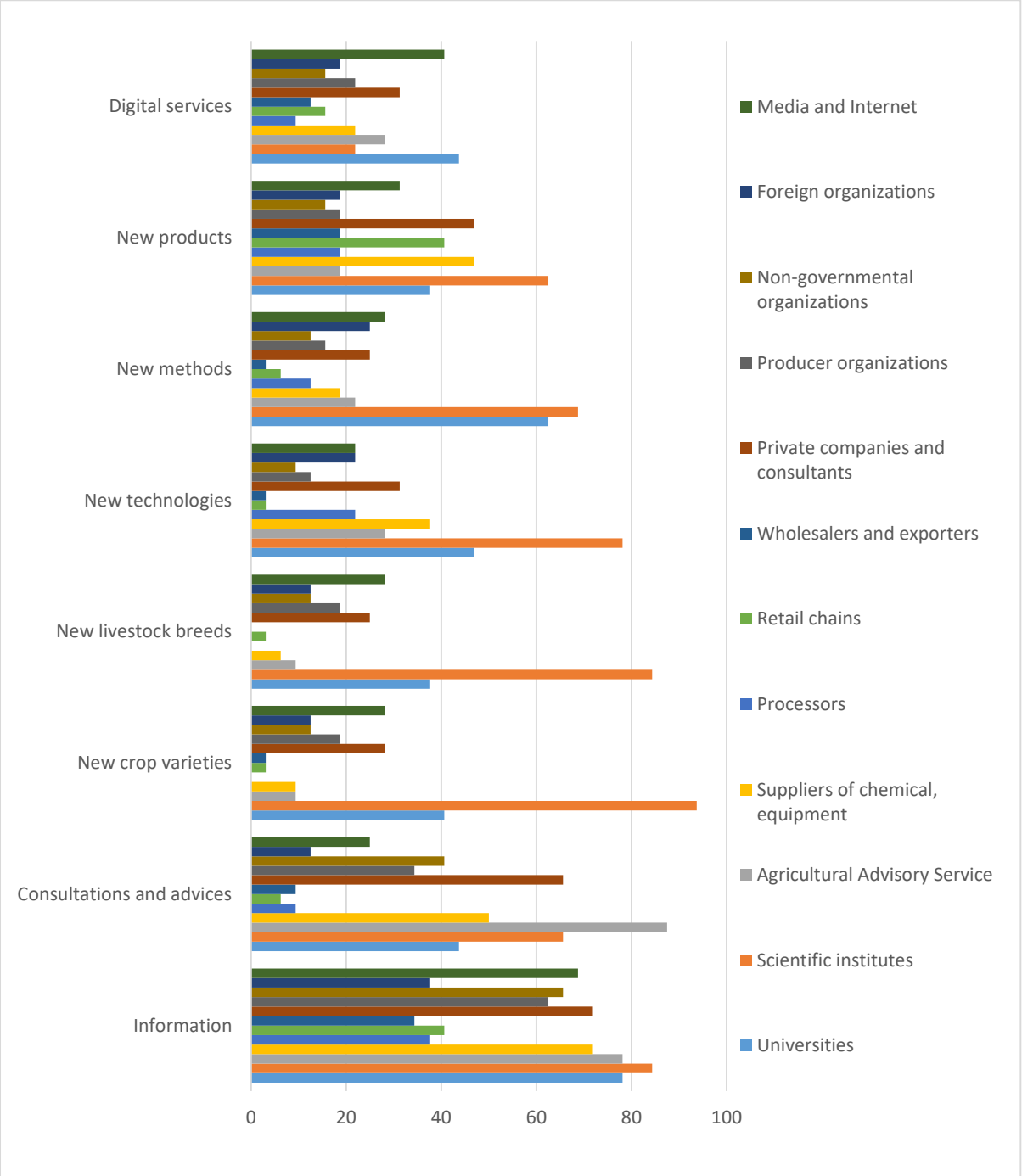
Half of the experts evaluate the efficiency of public spending and investments for digitalization in the agricultural sector as low or very low. However, one in four panelists is of the opinion that the payback in this area is satisfactory, and for the remaining quarter it is good or high. The latter 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 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 4). 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 4. 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 advices for Bulgarian farms (87.5%) (Figure 4). Other important organizations for providing consultations and advices 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 advices 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 advices in the country. The importance of other types of organizations is less in providing farmers with consultations and advices.

With regard to new plant varieties, the vast majority of experts (93.8%) identify research institutes as the most important organizations providing this type of innovations to agricultural farms (Figure 4). Many experts also identify universities (40.6%) as a major supplier 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.

With regard to 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 4). 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 4). A considerable proportion of experts (21.9%) also place foreign organizations, the media and 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 4). 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 4). 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.

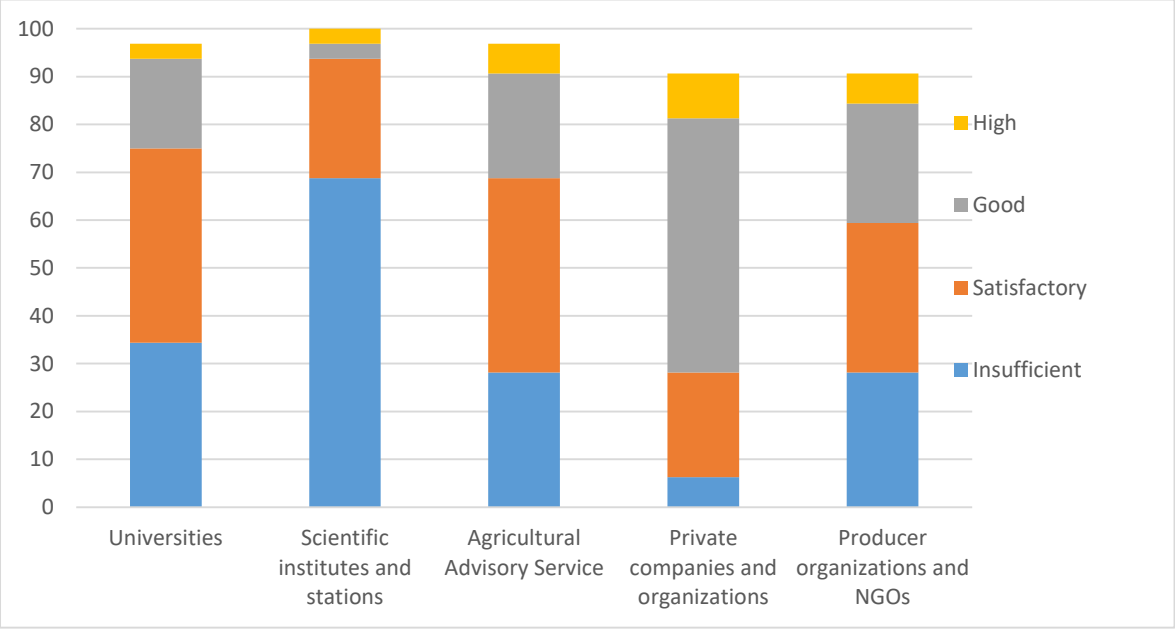
With regards to digital services and innovations, the universities (43.8%), and media and Internet (40.6%) are pointed by the majority of experts as most important to farmers' organizations (Figure 4). For a good number of experts, among the most significant providers of digital information and services, 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 5). At the same time, financial endowment of agrarian research and consultancy at scientific institutes and stations is estimated by almost 69% of experts as unsatisfactory. The later shows that the profit-oriented private sector invests more in financial resources in these important activities comparing to the public scientific institutes that dominate in the sector. Therefore, the financial support to public research institutes is to be increased in order to reduce the existing imbalance with the private sector.

Figure 5. Financial endowment of agrarian research and consultations in the main organizations of the AKIS (%)

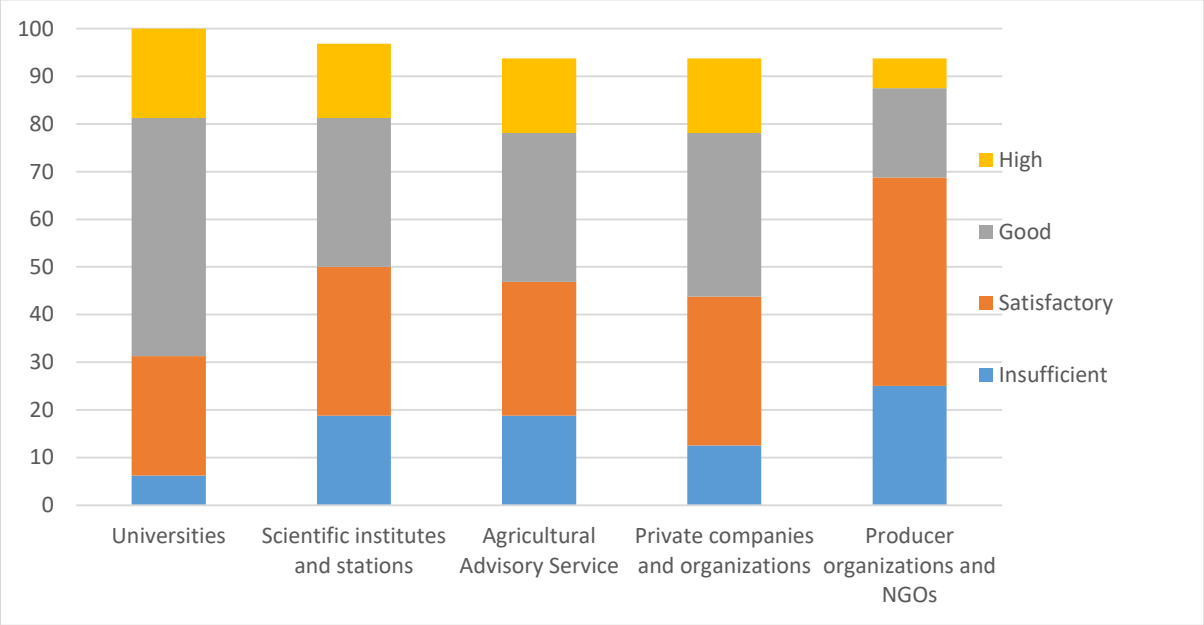


Source: Experts assessment

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.

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 6). Every second expert also believes that staffing for research and consultations of NAAS, and private companies and organizations is good or high.

Figure 6. Staff endowment of agrarian research and consultations in major organizations of AKIS (%)

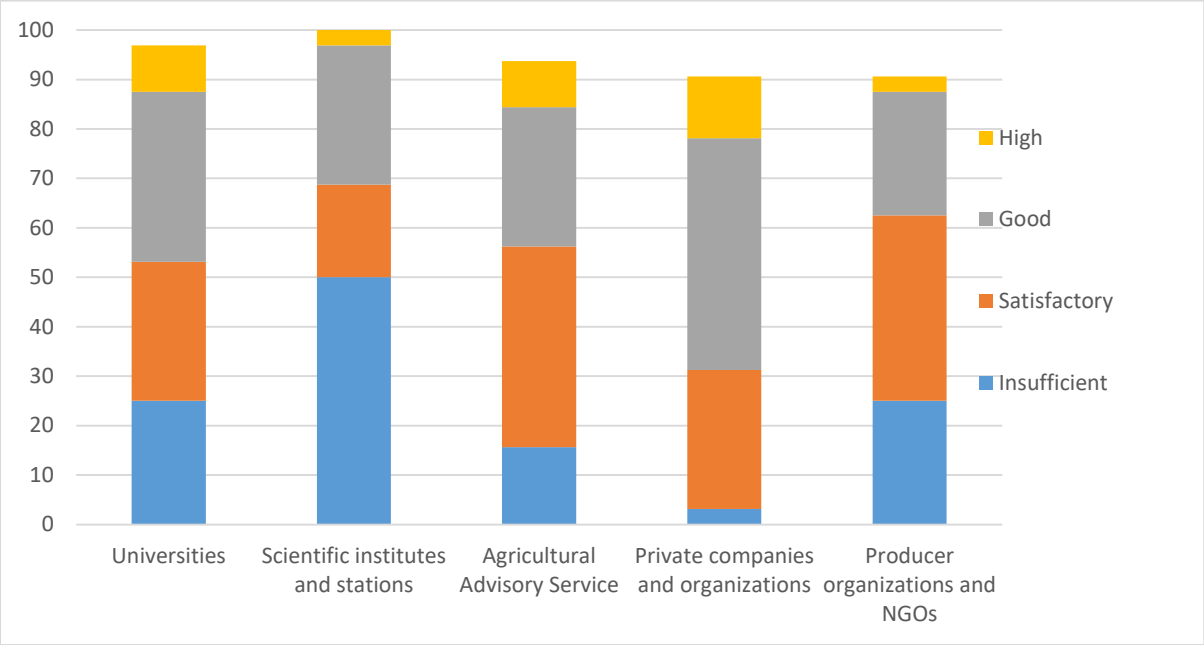


Source: Experts assessment

At the same time, the majority of experts estimate that the staffing of agricultural research and consultancy in scientific institutes and stations as 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.

There is also considerable differentiation in the availability of advanced agricultural research and consulting equipment in different types of organizations (Figure 7). 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.

Figure 7. Endowment with modern equipment of agrarian research and consultations in major organizations of AKIS (%)

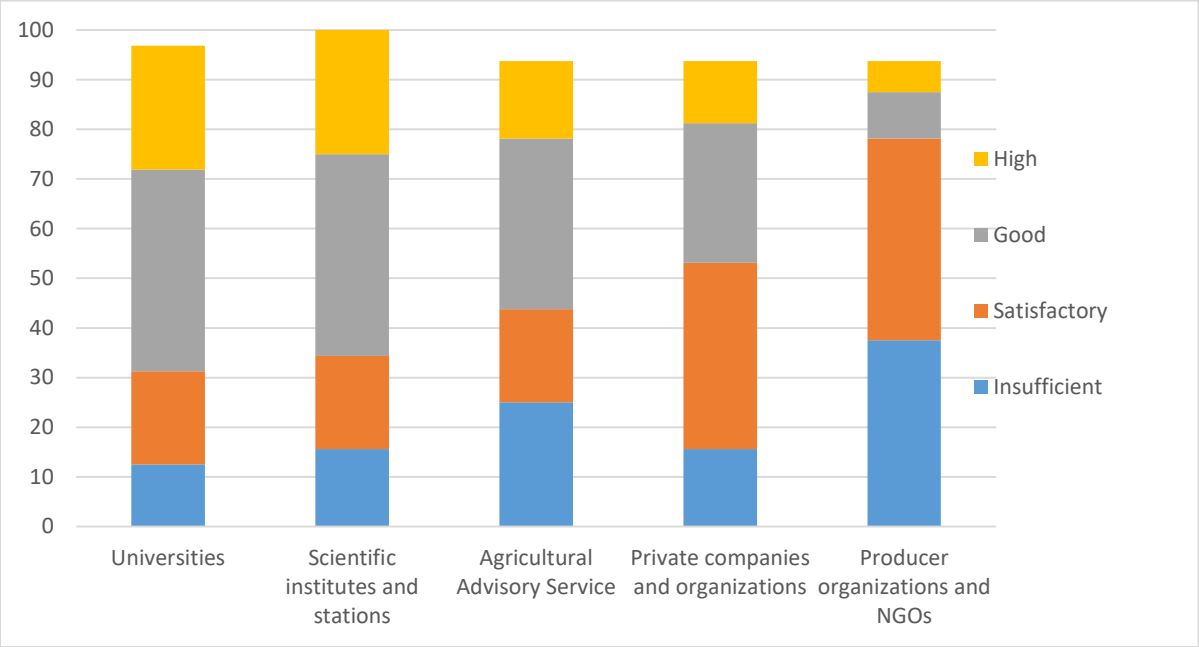


Source: Experts assessment

The majority of experts believe that the availability of modern equipment in NAAS is satisfactory (40.6%), and not many who rate 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 later indicates for the different material capacities of the individual non-profit-making organization, and the needs to take public action to support those lagging behind.

Despite the inadequate and quite divers 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 8). This indicates that public organizations in agricultural research and consultations will continue to dominate in the future and have to receive increasing public support.

Figure 8. Potential for modern agrarian research and consultations in major organizations of AKIS (%)



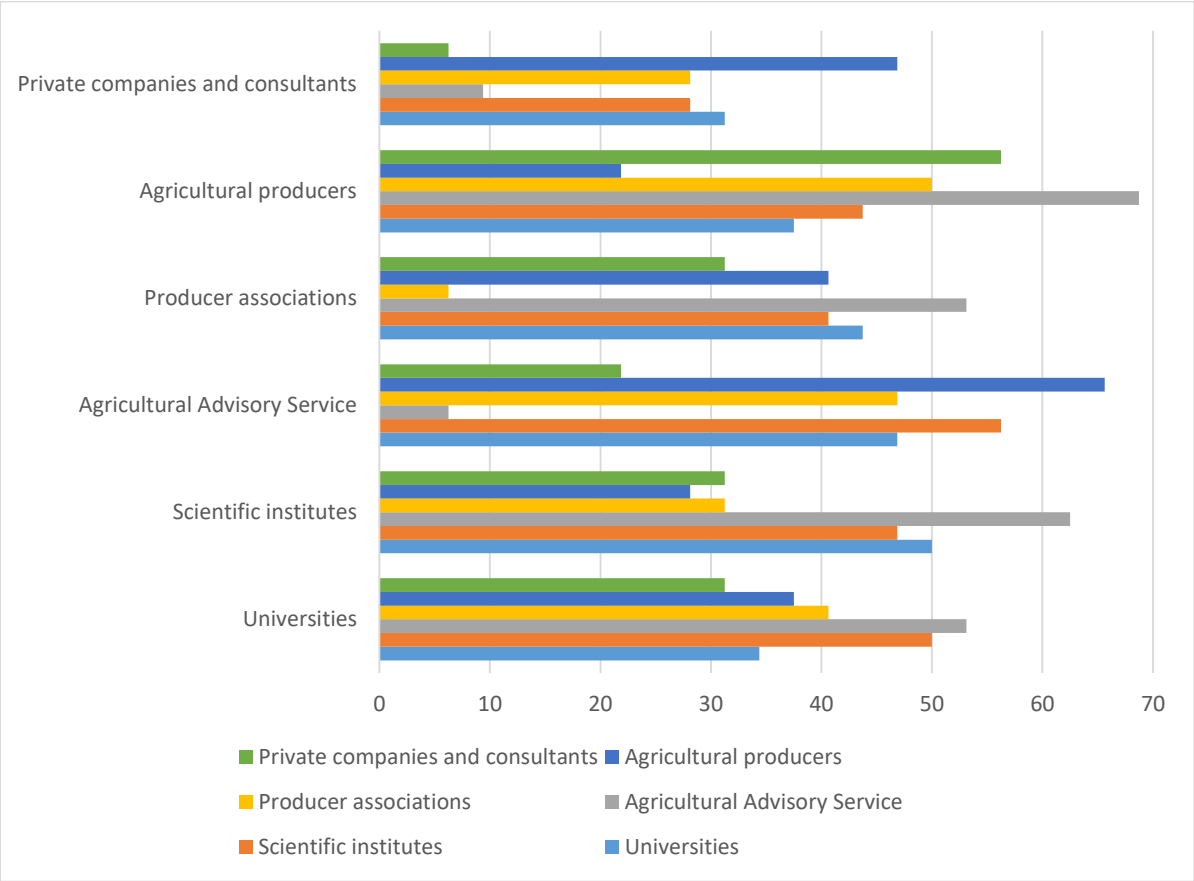
Source: Experts assessment

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.

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 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 9).

Figure 9. Efficiency of links between organizations in AKIS (%)



Source: Experts assessment

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.

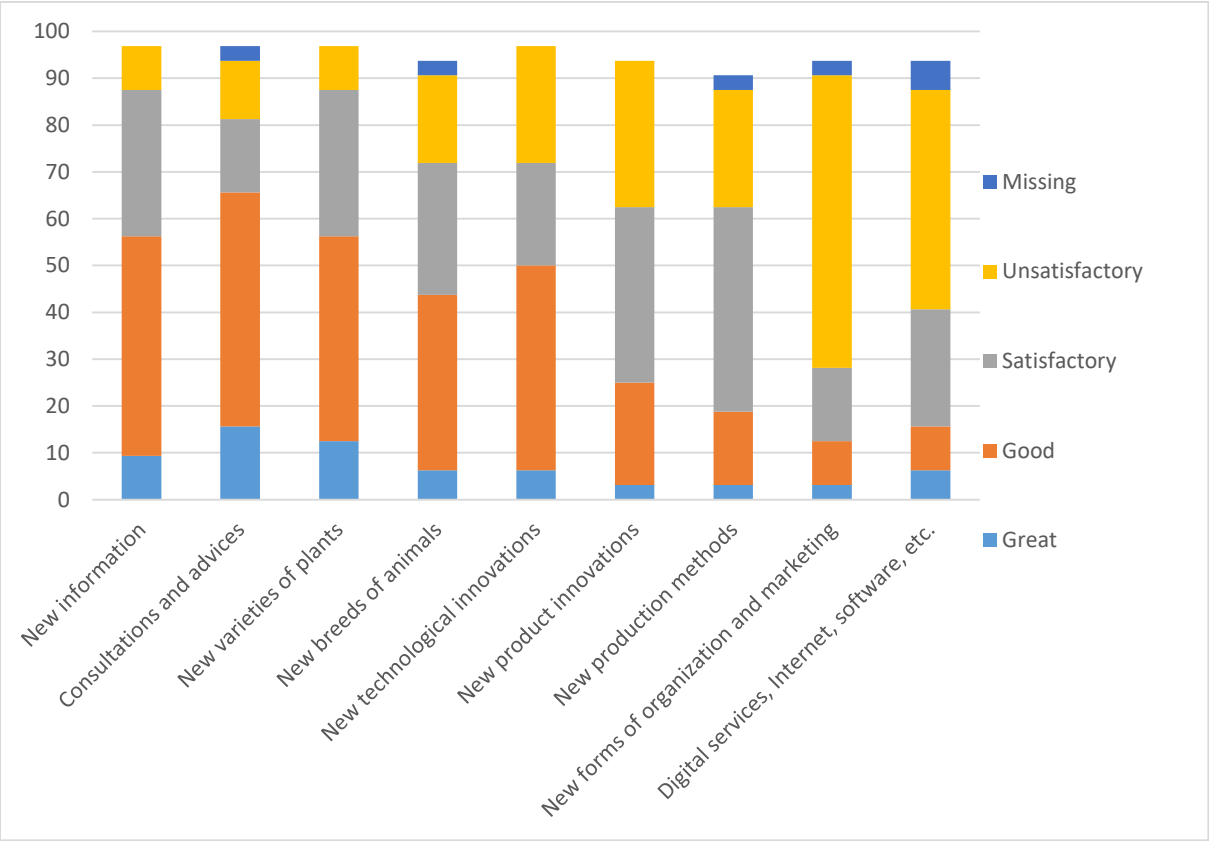
In order to improve all these critical links for the development of the AKIS, effective measures are to be taken immediately from the leadership of the public sector organizations, as well as adequate incentives for participants and public support introduced though state funding, tax relief, logistics, assistance, regulations, networking, etc.

Access of Farmers to Knowledge, Consultations, Innovations and Digital Services

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 advices (65.6%), new plant varieties (56.3%), new breeds of animals (43.8%) and new technological innovations (50%) (Figure 10). Therefore, in these areas, the existing AKIS works relatively well and serves farmers effectively.

Figure 10. Extent of access of agricultural producers to information, consultations, innovations, and digital services (%)



Source: Experts assessment

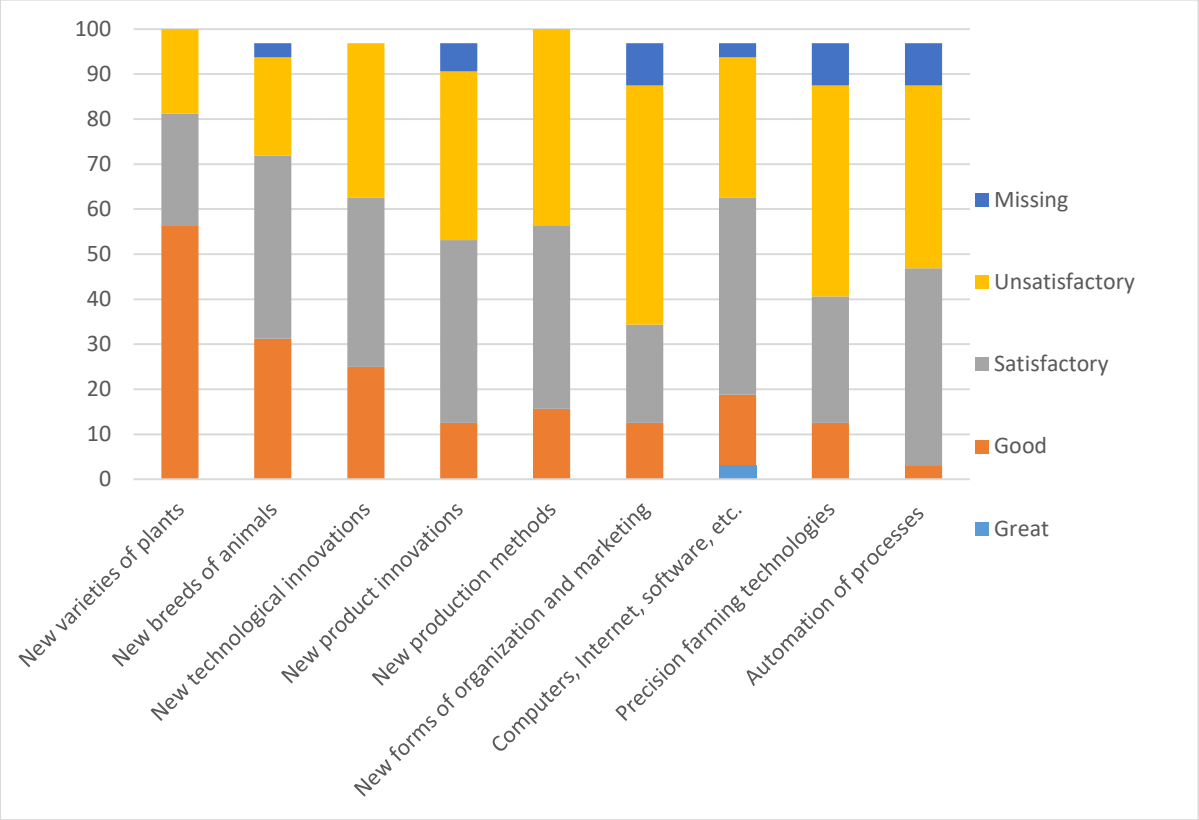
At the same time, however, the majority of experts assess that producers' access to new product innovations and new production methods is satisfactory (37.5% and 43.8% respectively) or unsatisfactory (31.3% and 25%). The most unfavorable situation is the access of farmers to new forms of organization 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 in order 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, internet, software, etc. is also unfavorable. Just over 53% of the experts consider this access to be inadequate or nonexistent, 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 in order to overcome the lag in the digitalization of the agricultural production and rural areas of the country.

There is also a great variation in the degree of introduction of different types of innovations in Bulgarian agriculture (Figure 11). 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%).

Figure 11. Extent of introduction of diverse type of innovations by agricultural producers in Bulgaria (%)



Source: Experts assessment

The majority of experts evaluated as satisfactory the degree of 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 is of the opinion that the degree of 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.

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

There is considerable differentiation in the degree of use of advices 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 in different regions of the country. According to the experts, the most widely advices and consultations are used in vegetable production (34.4%), field crops (31.3%), fruit growing (28.1%) and animal husbandry (28.1%) (Figure 12). At the same time, only a small number of experts believe that the other sub-sectors of agriculture benefit greatly from the advices 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 12). According to the experts, innovations in the rest of the agricultural sub-sectors are not very much introduced. The later 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.

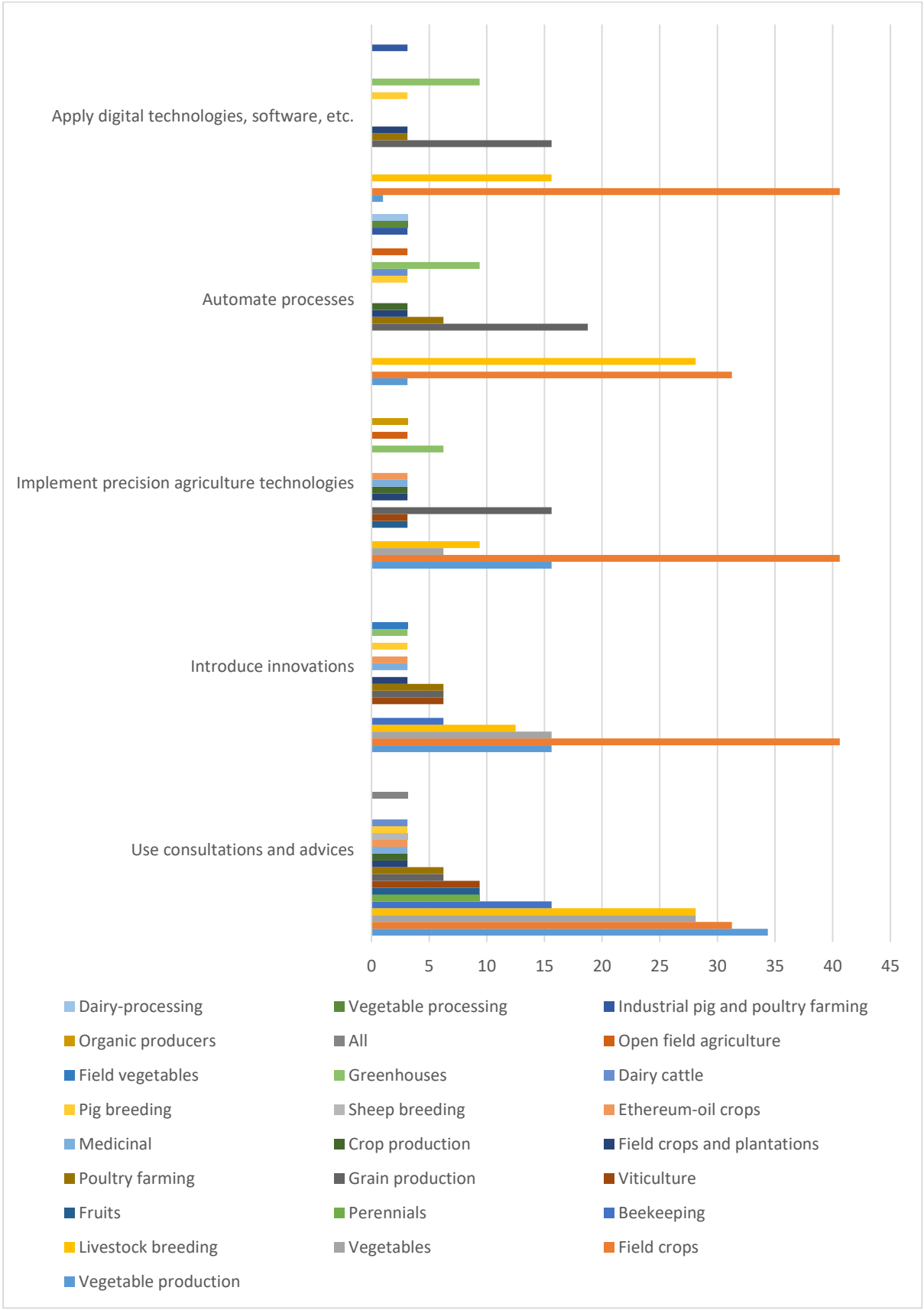
A relatively large proportion of the experts believe that precision farming technologies are most widely applied in field crops (40.7%) and a smaller proportion of them in vegetable and grain production (15.7% each) (Figure 12). At the same time, most experts do not consider that precision agriculture technology are 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 12). 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 labor, productivity and labor productivity, etc., could be realized.

With regard to 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 12). Other subsectors are lagging far behind in terms of implementation of digital technologies, software, etc. The later requires the implementation of specific measures to expand digitalization of the production and management in lagging sub-sectors.

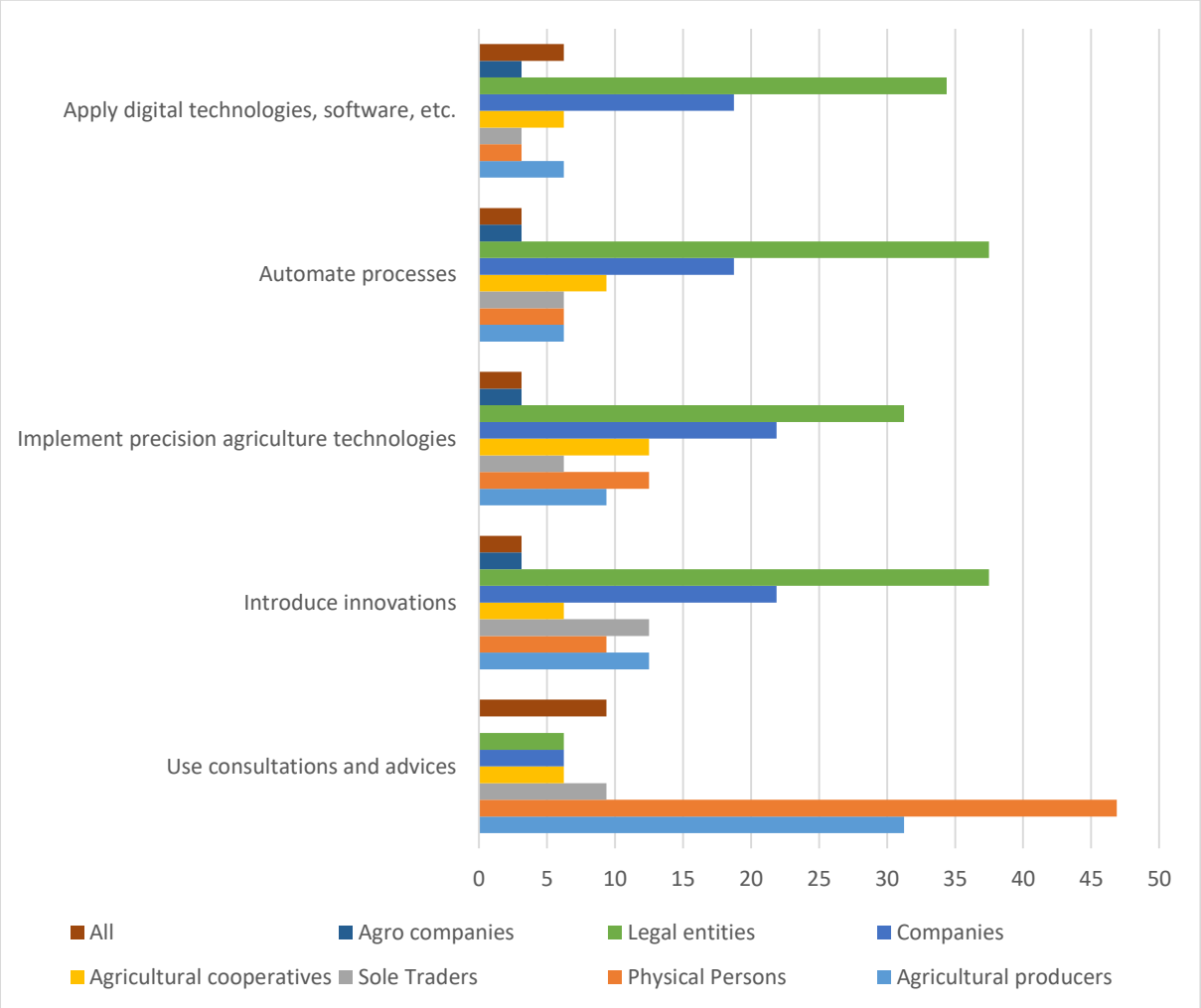
Figure 12. Extent of utilization of advices and consultations, and introduction of innovations of various type in individual subsectors of Bulgarian agriculture (%)



Source: Experts assessment

There is also a great variation in the extent to which advices, 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 advices and consultations (Figure 13). Just over 31% of the experts also indicated that advices and consultations was widely used by agricultural producers. According to the majority of the experts panel, other juridical types of farms make little use of the advices and consultations provided by various public and private organizations.

Figure 13. Extent of usage of advices, consultations, and introduction of various kind of innovations in agricultural farms od different juridical type (%)



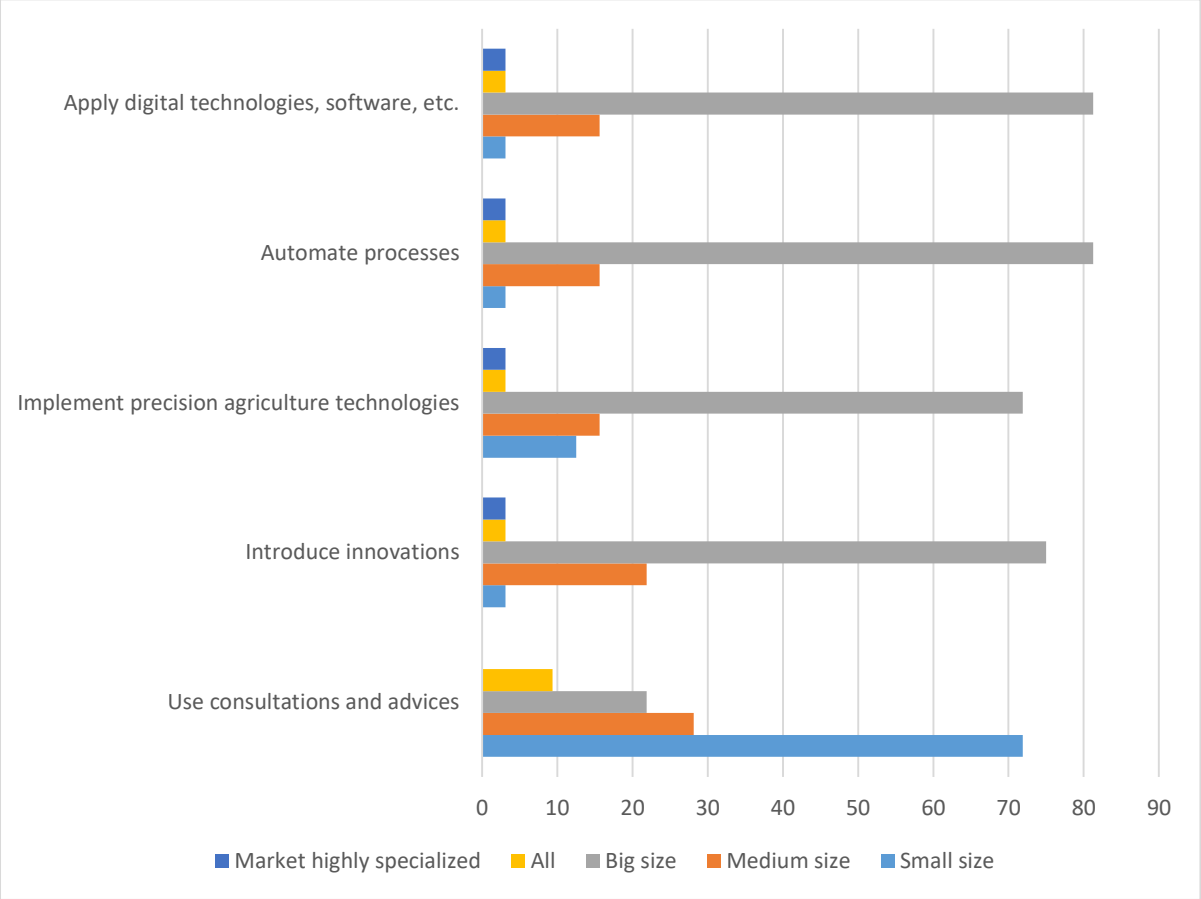
Source: Experts assessment

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 13). 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 in order 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 13). The later requires the introduction of specific public measures to stimulate and support innovations in these new areas by all types of farms.

There is also a great differentiation in the extent of utilization of advices and consultations, and in the introduction of innovations in farms of different sizes. A significant number of experts consider that small farms use the most advices and consultations (71.9%), while other categories of producers use less "external" advices and consultations (Figure 14).

Figure 14. Extent of utilization of advices and consultations and in the introduction of innovations of various type in agricultural farms of different sizes (%)

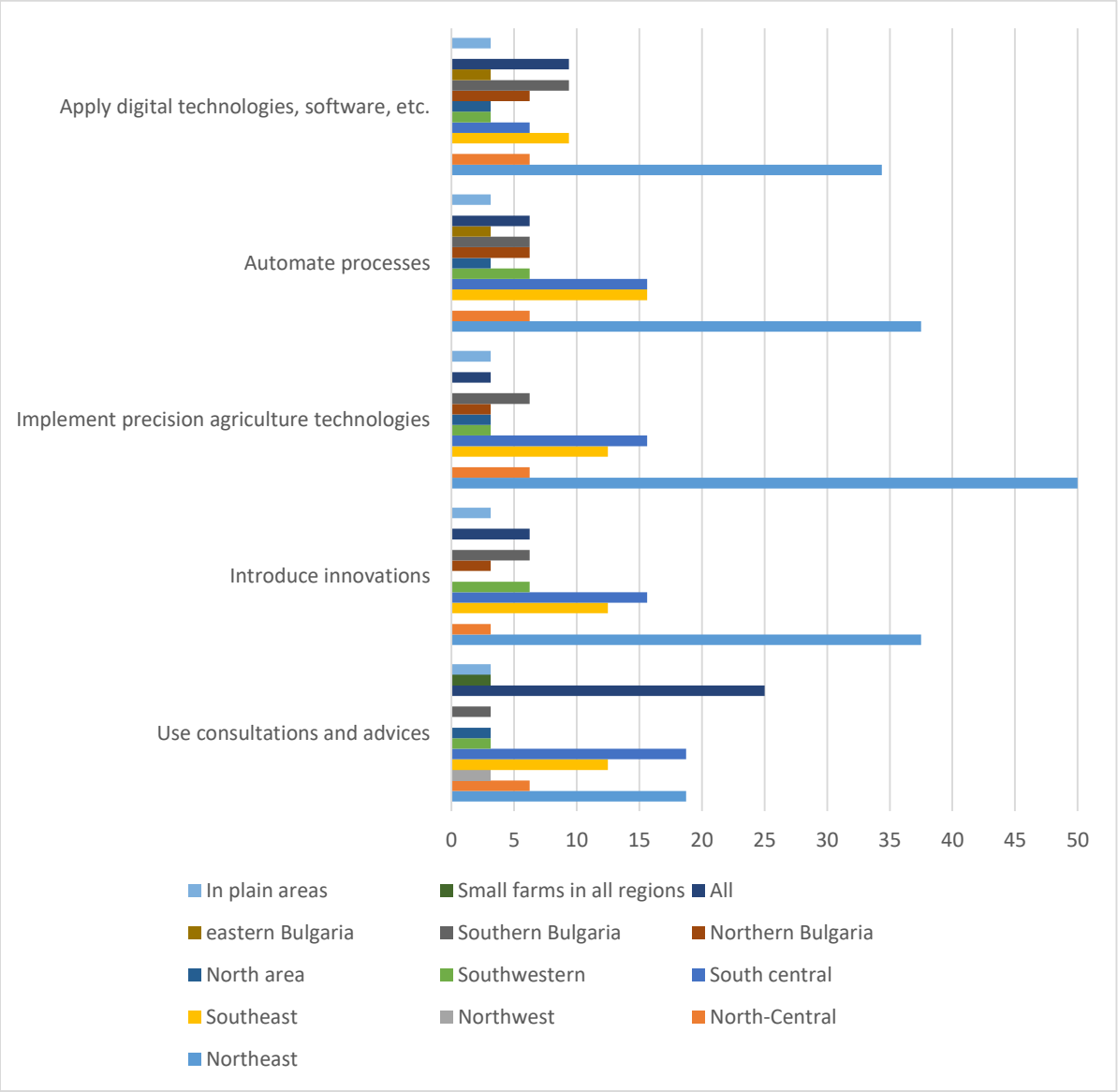


Source: Experts assessment

On the other hand, the vast majority of the experts are of the opinion 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 in order to reduce the wide disparities in this regard.

Finally, there are differences in the degree of use of advices and consultations, and in the introduction of different types of innovation in different geographical regions of the country. According to one in four experts, advices and consultations are used evenly throughout the country (Figure 15). A considerable number of experts also points the North-East and South-Central regions of the country (18.8% each) as the largest users of advices and consultations.

Figure 15. Extent of utilization of advices and consultations and in introduction of innovations of various type in different regions of the country (%)



Source: Experts assessment

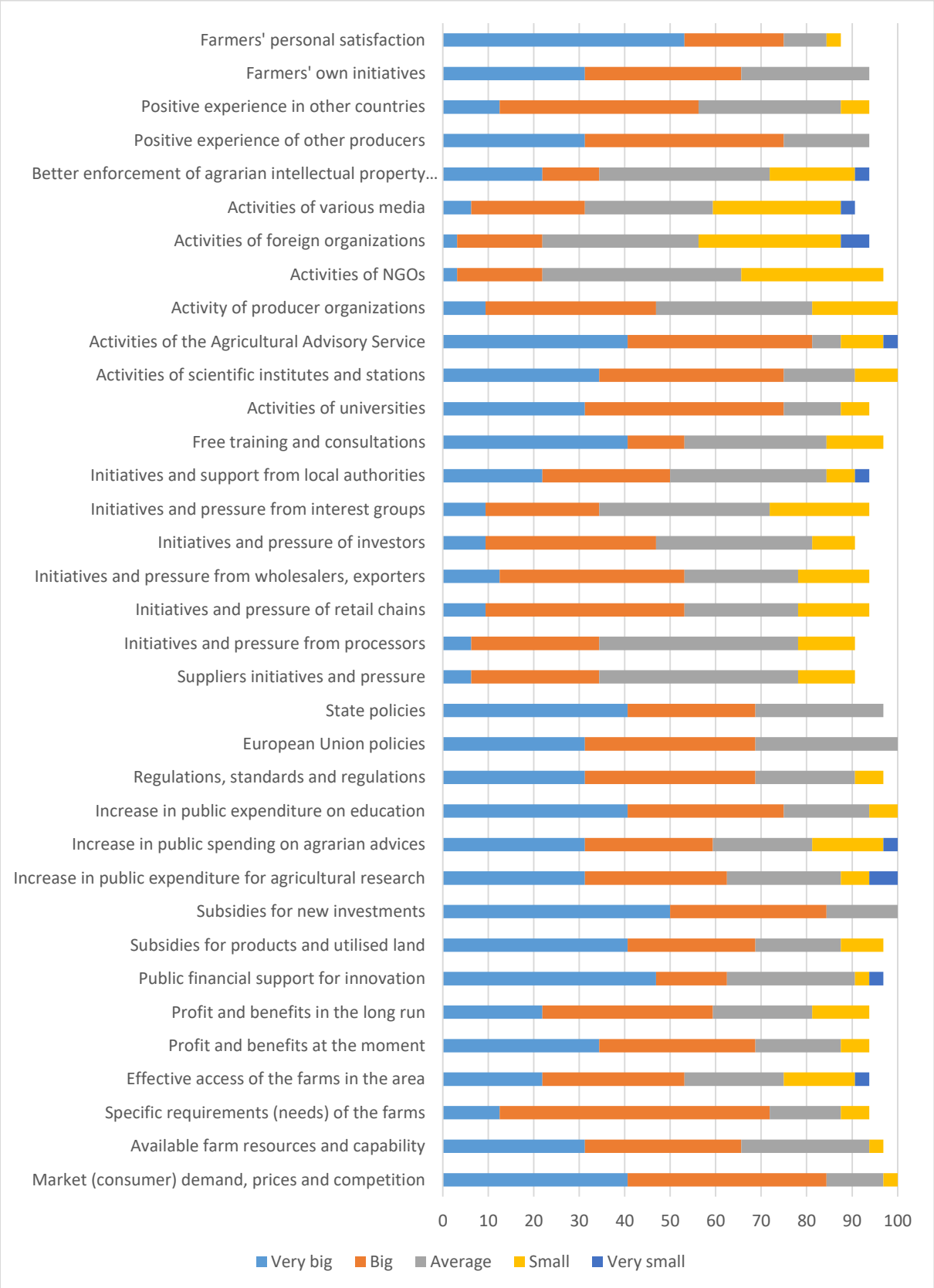
According to the majority of experts, the largest adopter of innovations is the Northeast Region (37.5%), which is also a leader in the application of precision agriculture technologies (50%), process automation (37.5%) and the implementation of digital technologies, software, etc. (34.4%). A relatively smaller proportion of the experts also identify the South Central and Southeastern 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 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 it 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.

Factors for Improving Dissemination of Knowledge, Innovations and Digitalization

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 16). Therefore, the support for market development is to be extended as well as of the public support (subsidies) for consultations and training, and for the private investments in the area.

Figure 16. Importance of various factors for amelioration of the dissemination of knowledge, innovations and digitalization in Bulgarian agriculture and rural areas (%)



Source: Experts assessment

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 advices (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 improvement 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

Contribution to the Specific Objectives of EU

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 17).

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 17. 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

Conclusions

The country's AKIS is composed of diverse and numerous organizations, for which activities and complex relations lack sufficient official or other reliable information, deterring considerably its analyses and management. The experts' assessment in this study allow to identify the state, and the main achievements and challenges to the development of this complex system. The lack of data can only partly be offset by the expert evaluations for the state, efficiency and factors of development of this complex system. It is therefore necessary

to carry out, in addition to the expert-based analyses, in-depth and representative studies of the individual components and of the AKIS as a whole. It is also necessary to institutionalize and regulate the collection of official statistical, reporting and other information on the status and efficiency of this important system.

References

Башев Х. (2020): Дигитализация на селското стопанство и райони в България, Икономика и управление на селското стопанство, бр.1.

Башев Х. (2018): Влияние на институционалната среда върху аграрната устойчивост в България, Икономическа мисъл, 3-32

Башев Х. (2014): Екоуправление в селското стопанство, Икономическа мисъл, бр 1, 29-55.

Башев Х. (2009): Управление на договорните отношения на фермата, Икономика и управление на селското стопанство, 2, 38-50.

Башев Х. (2008): Еко-управление в българското земеделие-форми, ефективност, перспективи, Икономика и управление на селското стопанство, 1, 33-43.

Башев Х. (2005): Подход за оценка на устойчивостта на фермите, Икономика и управление на селското стопанство, 6, 24-37.

Башев Х. и М.Михайлова (2019): Състояние и развитие на аграрната научноизследователска и развойна дейност в България, Икономика и управление на селското стопанство, бр.3, 3-22.

Башев Х. и М.Михайлова (2019): Състояние и развитие на системата за обучение и съвети в селското стопанство на България, Икономика и управление на селското стопанство, бр.3, 21-41.

Башев Х. и М.Михайлова (2019): Състояние, ефективност и фактори за развитие на системата за споделяне на знания, иновации и дигитализация в селското стопанство, Икономика и управление на селското стопанство, бр.4, 3-23,

Башев Х., Н. Котева, М. Младенова (2014): Ефекти от прилагане на европейски политики върху земеделските стопанства в Р.България, сп. Икономика-21, 4-1, 97-114.

Башев Х., Ш. Че (2019): Управление и оценка на аграрната устойчивост в България и Китай, Институт по аграрна икономика.

Иванов Б., Р. Попов, Х. Башев, Н. Котева, Н. Маламова, М. Чопева, К. Тодорова, И. Начева, Д. Митова (2020): ДОКЛАД АНАЛИЗ НА СЪСТОЯНИЕТО НА СЕЛСКОТО СТОПАНСТВО И ХРАНИТЕЛНОВКУСОВАТА ПРОМИШЛЕНОСТ SWOT АНАЛИЗ, ИАИ
https://www.mzh.government.bg/media/filer_public/2020/01/21/analiz_na_sstoianieto_na_selskoto_stopanstvo_i_khranitelno-vkusovata_promishlenost_izgotven_ot_institut_po_agrarna_ikonomika.pdf

Anandajayasekeram P. and B. Gebremedhin (2009): Integrating innovation systems perspective and value chain analysis in agricultural research for development: Implications and challenges. Improving Productivity and Market Success (IPMS) of Ethiopian Farmers Project Working Paper 16, International Livestock Research Institute, Nairobi.

Antle J., J. Jones and C. Rosenzweigc (2017): Next generation agricultural system data, models and knowledge products: Introduction, Agricultural Systems; 155: 186–190.

Bachev H. (2015): What is Sustainability of Farms?, Journal of Economic and Social Thought 3 (1), 35-48

Bachev H. (2013): Risk management in the agri-food sector, Contemporary Economics, Volume 7, Issue 1, 45-62.

Bachev H. (2018): Management and Agrarian sustainability-impact of institutions in Bulgaria, International Journal of Management and Sustainability 7 (2), 113-142 8

Bachev H. (2020): State and Evolution of Public and Private Research and Development in Bulgarian Agriculture, International Journal of Sustainable Development & World Policy, Volume 9, 1, 10-25.

Bachev H., M. Labonne (2000): About the organization of agrarian innovations, Station d'Economie et de Sociologie Rurale, Ecole Nationale Superieure Agronomique (ENSA, INRA).

Bachev H., B. Ivanov, E. Sokolova, D. Toteva (2017): Agricultural Sustainability in Bulgaria - Levels and Factors, International Journal of Environmental Sciences & Natural Resources 6 (2), 42-51.

Bachev H., B. Ivanov, E. Sokolova, D. Toteva (2017): Evaluation of agrarian sustainability in Bulgaria, Journal of Social and Administrative Sciences 4 (3), 233-242.

Bachev H. and M. Mihailova (2019): Analysis of the State of the System of Sharing of Knowledge and Innovations in Bulgarian Agriculture, EconPapers
https://econpapers.repec.org/paper/pramprapa/94230.htm

Bashev H., R. Denchev (1992): Economic Efficiency of Agricultural Research, in Issues in Agricultural Development, Occasional Paper Series, IAAE, Volume 6, 29-33.

Bachev H., M. Labonne (2000): About the organization of agrarian innovations, Station d'Economie et de Sociologie Rurale, Ecole Nationale Superieure Agronomique (ENSA, INRA).

Bachev H., S.Tanic (2011): Issues and challenges for farm and enterprise diversification and integration of small scale farmers into value chains in EECA, FAO Consultation on "Enabling Environment for producer-agribusiness linkages in EECA", Ankara.

EIP-AGRI EU SCAR (2012), Agricultural knowledge and innovation systems in transition – a reflection paper, Brussels.

European Commission (2018): Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing rules on support for strategic plans to be drawn up by Member States under the Common agricultural policy (CAP Strategic Plans) and financed by the European Agricultural Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development (EAFRD) and repealing Regulation (EU) No 1305/2013 of the European Parliament and of the Council and Regulation (EU) No 1307/2013 of the European Parliament and of the Council, European Commission, Brussels, 1.6.2018

FAO (2019): COMMUNICATION IN RESEARCH AND DEVELOPMENT, FAO, http://www.fao.org/3/v9406e/v9406e02.htm

Chartier O., M. Doghmi, C. Fourcin, M. Broek, P. Midmore (2015): Investment in Agricultural Research in Europe: Synthesis Report, IMPRESA project, EC 7th Framework Programme.

Todorova S., H. Bachev (2018): Farming Structures in Transition Agriculture: the Case of Bulgaria, Tohoku Journal of Rural Economics 26 (2), 32-47.

Touzard J., L. Temple, G. Faure and B. Triomphe (2015): Innovation systems and knowledge communities in the agriculture and agrifood sector: a literature review, Journal of Innovation Economics & Management, 2, (17), 117-142.

Özçatalbaş O. (2017): Human Development and Research-Development-Extension Relationships, in S. Maad (editor) Research and Development Evolving Trends and Practices - Towards Human, Institutional and Economic Sectors Growth, IntechOpen, DOI: 10.5772/intechopen.69096

USDA (2019): Agricultural Research Funding in the Public and Private Sectors, USDA, https://www.ers.usda.gov/data-products/agricultural-research-funding-in-the-public-and-private-sectors/

Weißhuhn P., K. Helming, and J. Ferretti (2018): Research impact assessment in agriculture—A review of approaches and impact areas, Research Evaluation, Volume 27, Issue 1, January 2018, Pages 36–42, https://doi.org/10.1093/reseval/rvx034

World Bank (2006): Enhancing Agricultural Innovation: How to Go Beyond the Strengthening of Research Systems, The International Bank for Reconstruction and Development / The World Bank, Washington DC.

Virmani S. (2013): Public-Private Partnership and Policy Reforms for Effective Agricultural Research, Development, and Training, in G. Bhullar and N. Bhullar, Agricultural Sustainability, Elsevier.