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FACTORS INFLUENCING AGRICULTURAL INNOVATIONS

The minimum level of state support in Kazakhstan does not allow agricultural enterprises to intensively update equipment and technologies due to a low level of profitability, even taking into account state support. The high level of competition in agriculture forces agricultural producers to make every effort and use every opportunity to ensure the production of competitive products. The remaining financial resources are insufficient to ensure normal reproduction, and only state support allows agricultural enterprises to acquire the minimum necessary assets.

The main goal of the article is to make a literature review on the innovation development in agriculture and identify factors impacting it. The authors emphasized the current problems and proposed innovative improvements to the current state of agriculture. The low level of education of farmers and lack of a regional knowledge transfer system together with the production and financing problems does not allow the development of innovative agriculture.

Methods of statistical data analysis, literature analysis, state policy review, systematic approach, content analysis, and comparison were the methodological research tools. A systematic approach allows identifying common system properties and qualitative characteristics of elements of an innovation system. Content analysis compares literature studies. Statistical data analysis gives a visual picture of innovation related information for a period. Literature and state policy analysis enrich existing knowledge and research gaps for influencing agricultural innovations determinants.

Key factors affecting the development of innovative processes in agriculture are the level of financial resources of organizations, the level of motivation to innovate, and the ability of organizations to create innovations or replicate innovations that have already been created. In our opinion, the state should organize research or project calls involving all necessary stakeholders where the implementation point is agribusiness, as innovation requires collaboration, ideation, implementation, and value creation. Currently, state research calls are organized separately for research not necessarily involving end users and implementation and commercialization of innovative ideas, which are not always interesting for agricultural producers.

Key words: innovation, agricultural sector, entrepreneurship, agricultural policy, Kazakhstan.

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Ауылшаруашылық инновацияларына әсер ететін факторлар

Қазақстандағы мемлекеттік қолдаудың төменгі деңгейі ауыл шаруашылығы кәсіпорындарына инновациялық ауылшаруышылық дамуын, рентабельділік деңгейі төмен болған сон жабдықтар мен технологияларды қарқынды жаңартуға мүмкіндік бермейді. Ауыл шаруашылығындағы бәсекелестіктің жоғары деңгейі ауыл шаруашылығы өндірушілерін барлық күш-жігерін жұмсауға және бәсекеге қабілетті өнім өндіруді қамтамасыз ету үшін барлық мүмкіндіктерді пайдалануға мәжбүр етеді. Қалған қаржылық ресурстар қалыпты өндірісті қамтамасыз ету үшін жеткіліксіз және тек мемлекеттік қолдау ауылшаруашылық кәсіпорындарына ең аз қажетті активтерді сатып алуға мүмкіндік береді.

Мақаланың негізгі мақсаты – ауыл шаруашылығындағы инновациялық даму деңгейін және оған әсер етуші факторларды анықтау. Авторлар ауыл шаруашылығының қазіргі жағдайына кедергі мәселелерді және инновациялық жетілдіруді бойынша ұсыныстар ұсынды. Фермерлердің білім деңгейінің төмендігі және өндіріс пен қаржыландыру мәселелерімен қатар аймақтық білім беру жүйесінің болмауы инновациялық Ауыл шаруашылығын дамытуға мүмкіндік бермейді.

Зерттеудің әдіснамалық құралдары статистикалық деректерді талдау әдістері, әдебиеттерді талдау, мемлекеттік саясатқа шолу, жүйелік тәсіл, мазмұнды талдау және салыстыру болды. Жүйелік тәсіл инновациялық жүйе элементтерінің жалпы жүйелік қасиеттері мен сапалық сипаттамаларын анықтауға мүмкіндік береді. Мазмұнды талдау әдеби зерттеулерді салыстырады. Статистикалық деректерді талдау белгілі бір кезеңдегі инновацияларға қатысты ақпараттың көрнекі бейнесін береді. Әдебиет және мемлекеттік саясатты талдау ауылшаруашылық инновацияларының детерминанттарына әсер ету бойынша зерттеулердегі бар білім мен олқылықтарды байытады. Ауыл шаруашылығындағы инновациялық процестердің дамуына әсер ететін негізгі факторлар ұйымдардың қаржылық ресурстарының деңгейі, инновацияға ынталандыру деңгейі және ұйымдардың бұрыннан құрылған инновацияларды құру немесе көбейту қабілеті. Біздің ойымызша, мемлекет барлық қажетті мүдделі тараптарды тарта отырып, зерттеу немесе жобалау конкурстарын ұйымдастыруы керек, мұнда енгізу нүктесі агробизнес, өйткені инновациялар ынтымақтастықты, идеяны, енгізуді және құндылықты құруды талап етеді. Қазіргі уақытта мемлекеттік зерттеуге конкурстар міндетті түрде соңғы пайдаланушылардың қатысуымен емес, сонымен қатар ауылшаруашылық өндірушілері үшін әрдайым қызықты бола бермейтін инновациялық идеяларды енгізу және коммерцияландыру үшін бөлек конкурстар ұйымдастырылуда.

Түйін сөздер: инновация, аграрлық сектор, кәсіпкерлік, аграрлық саясат, Қазақстан.

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Факторы, влияющие на сельскохозяйственные инновации

Минимальный уровень государственной поддержки в Казахстане не позволяет сельскохозяйственным предприятиям интенсивно обновлять оборудование и технологии в связи с низким уровнем рентабельности. Высокий уровень конкуренции в сельском хозяйстве вынуждает сельхозпроизводителей прилагать все усилия и использовать все возможности для обеспечения производства конкурентоспособной продукции. Оставшихся финансовых ресурсов недостаточно для обеспечения нормального воспроизводства, и только государственная поддержка позволяет сельскохозяйственным предприятиям приобретать минимально необходимые активы.

Основной целью статьи является выявление уровня инновационного развития в сельском хозяйстве и факторов влияющих не него. Авторы выявили проблемы и предложили пути для инновационного развития сельского хозяйства. Низкий уровень образования фермеров и отсутствие региональной системы передачи знаний вкупе с проблемами производства и финансирования не позволяют развивать инновационное сельское хозяйство.

Методологическими инструментами исследования были методы анализа статистических данных, анализ литературы, обзор государственной политики, системный подход, контент-анализ и сравнение. Системный подход позволяет выявить общие системные свойства и качественные характеристики элементов инновационной системы. Контент-анализ сопоставляет литературные исследования. Анализ статистических данных дает наглядную картину информации, связанной с инновациями, за определенный период. Анализ литературы и государственной политики обогащает существующие знания и пробелы в исследованиях по влиянию на детерминанты сельскохозяйственных инноваций.

Ключевыми факторами, влияющими на развитие инновационных процессов в сельском хозяйстве, являются уровень финансовых ресурсов организаций, уровень мотивации к инновациям и способность организаций создавать инновации или тиражировать инновации, которые уже были созданы. По нашему мнению, государству следует организовать исследовательские и проектные конкурсы с привлечением всех необходимых заинтересованных сторон, где точкой внедрения является агробизнес, поскольку инновации требуют сотрудничества, идеи, внедрения и создания ценности. В настоящее время государственные исследовательские конкурсы организуются отдельно для исследований, и не обязательно требуют участия конечных пользователей в них, а также отдельно организуют конкурсы для внедрения и коммерциализации инновационных идей, которые не всегда интересны сельскохозяйственным производителям.

Ключевые слова: инновации, аграрный сектор, предпринимательство, аграрная политика, Казахстан.

Introduction

The minimum level of state support in Kazakhstan does not allow agricultural enterprises to intensively update equipment and technologies with a low level of profitability, even taking into account state support. The high level of competition in agriculture forces agricultural producers to make every effort and use every opportunity to ensure the production of competitive products. The remaining financial resources are insufficient to ensure normal reproduction, and only state support allows agricultural enterprises to acquire the minimum necessary assets. The topic needs updating due to current challenges and trends in agriculture development.

Innovation is the process of developing new ideas, methods, products, or services that bring about significant positive change and improvement. Innovation is often associated with creativity, experimentation, and risk-taking.

Innovation can take many forms, such as technological innovation, social innovation, and business model innovation. Technological innovation refers to the development of new or improved technology, products, or processes that can solve problems or create new opportunities. Social innovation refers to the creation of new solutions to address social and environmental challenges. Business model innovation refers to the creation of new ways of doing business, such as new revenue models or distribution channels.

Innovation can happen in any industry or field, from agriculture and healthcare to technology and education. The goal of innovation is to create something new or improve upon existing solutions in a way that has a positive impact on people's lives. Successful innovation often requires collaboration, experimentation, and a willingness to take risks and learn from failure.

Rural innovation refers to the process of creating and implementing new ideas, products, or services that address the unique needs and challenges faced by rural communities. Rural areas often have distinct economic, social, and environmental characteristics that can require innovative solutions to address.

Rural innovation can take many forms, such as the development of new technologies, business models, or social programs that can improve the quality of life for people living in rural areas. For example, rural innovation might involve the creation of new methods for sustainable agriculture or forestry, the development of new healthcare services that leverage technology to overcome geographical barriers, or the creation of new business models that can help rural communities to better connect with regional or global markets.

Innovation in rural areas can be driven by a variety of actors, including local entrepreneurs, universities and research institutions, government agencies, and non-profit organizations. Rural innovation often requires collaboration and partnerships between these different actors, as well as a deep understanding of the unique challenges and opportunities faced by rural communities. Successful rural innovation can help to create new economic opportunities, improve the well-being of rural residents, and promote sustainable development in rural areas.

Innovation is a very sensitive issue. Especially if we are talking about an economy that produces safe food. Food that should be functional for people in the future. Currently, there are various definitions of safe food, especially organic products. Fulfilling this condition requires closer cooperation between farmers and agricultural operators. Because of this approach, the importance of the concept of outsourcing began to acquire, which is quite alien to farmers.

Innovation is a phenomenon inextricably linked in the idea of change, it is a novelty, a reform, or an idea perceived as something new. An innovative approach has different facts, processes and phenomena of the following nature: technical, organizational, social, and psychological.

The hypothesis made for this study was that financial factors are the most dominant of ones impacting the level of agricultural innovations.

Stages of the research are the literature review on the determinants of innovations in agriculture; state policy review and analysis of the statistical data to identify the current state and problems. After that the recommendations were proposed.

Literature review

Agricultural innovations are primarily concerned with a need for increasing production (of food, fodder, secondary products) as well as enhancing quality (of produce, production process, growing conditions (Veen, Marijke van der: 2010).

Many factors can influence the development of innovative processes in agriculture. Here are some of the most important ones:

Technological advances: New technologies can drive innovation in agriculture, by providing farmers with new tools and techniques to improve their production methods. For example, precision agriculture technologies, such as drones and sensors,

can help farmers to more precisely apply water and fertilizer to crops, leading to increased yields and reduced costs.

Government policies and funding: Government policies and funding can play an important role in supporting innovation in agriculture. For example, research grants and subsidies for the development of new technologies and practices can encourage farmers to adopt innovative methods. In addition, policies that promote sustainable agriculture and conservation can encourage the development of new practices that reduce the environmental impact of farming.

Industry competition and market forces: Competitive pressures and market forces can drive innovation in agriculture, by incentivizing farmers and agricultural companies to develop new products and practices that can improve efficiency and profitability.

Demographic changes: Changes in population demographics, such as shifting consumer preferences or changes in rural-urban migration patterns, can drive innovation in agriculture. For example, increasing demand for organic and locally sourced food has driven the development of new sustainable farming practices and supply chains.

Environmental and social concerns: Growing concerns about the environmental impact of farming, as well as social concerns such as labor rights and animal welfare, can drive innovation in agriculture. For example, the development of new organic and regenerative farming practices can help to reduce the use of synthetic pesticides and fertilizers, leading to improved environmental outcomes.

Overall, a range of factors can influence the development of innovative processes in agriculture, and it is important for farmers, researchers, policymakers, and other stakeholders to work together to support the development and adoption of innovative practices that can promote sustainable and efficient agriculture.

Innovation in agriculture is crucial for meeting the growing demand for food while also addressing the challenges of climate change, water scarcity, and land degradation. Here are some examples of innovative technologies and practices in agriculture:

Precision agriculture: This approach involves using sensors, drones, and other high-tech tools to precisely monitor crops, soil, and weather conditions. With this information, farmers can optimize their use of water, fertilizer, and pesticides, and improve crop yields.

Vertical farming. This is a method of growing crops in vertically stacked layers, using artificial lighting and controlled environments to optimize growing conditions. Vertical farming can increase crop yields, reduce water usage, and decrease the amount of land needed for agriculture.

Aquaponics. This is a method of growing plants and fish in a symbiotic system. The fish provide nutrients for the plants, while the plants help to purify the water for the fish. This system can produce both crops and protein in a sustainable way.

Conservation agriculture. This is a set of practices that aim to improve soil health, reduce erosion, and enhance biodiversity. Conservation agriculture involves minimizing soil disturbance, maintaining soil cover, and rotating crops. These practices can help to increase soil organic matter, reduce greenhouse gas emissions, and improve yields.

Genetically modified crops. These are plants that have been genetically engineered to have certain desirable traits, such as resistance to pests or drought. While controversial, genetically modified crops can help to increase yields and reduce the need for pesticides and other chemicals.

Implementing innovation in agriculture requires a multi-faceted approach, involving farmers, researchers, policymakers, and other stakeholders. Here are some steps that can help to promote and implement innovation in agriculture:

Identification of challenges. It is important to identify the specific challenges that farmers are facing, such as water scarcity, soil degradation, or pest infestations. Understanding the specific challenges can help guide the development of innovative solutions.

Foster collaboration. Innovation in agriculture often requires collaboration between farmers, researchers, and other stakeholders. Encouraging collaboration and information sharing can help to identify new solutions and accelerate their adoption.

Investing in research and development. Investing in research and development is crucial for developing new technologies and practices that can improve agriculture. Governments, NGOs, and private companies can all play a role in funding research and development.

Providing training and education. To successfully adopt new technologies and practices, farmers and other stakeholders need training and education. Providing workshops, training programs, and other educational opportunities can help to increase awareness and knowledge of innovations.

Providing financial incentives. Financial incentives, such as grants, subsidies, and tax credits, can help to encourage farmers to adopt new

technologies and practices. These incentives can help to offset the initial costs of adopting innovations.

Promoting policy reforms. Policy reforms can help to remove barriers to innovation and create a supportive environment for new technologies and practices. This can include reforms to regulations, subsidies, and other policies that affect agriculture.

By taking these steps, it is possible to promote and implement innovation in agriculture, which can help to increase food security, improve sustainability, and support rural livelihoods.

Looking closely at factors that can affect agriculture development, adaptation of innovative management strategies globally there are education, farming experience, family size, cropping area, and access to weather forecast information, adoption decisions over time and the increase in crop profitability resulting from skill development, which comes from experience in growing the crop (Elahi, Ehsan, et al.2022: 102255, Ghadim, Amir K. Abadi, and David J. Pannell. 1999: 145-154).

Meijer, Seline S., et al. suggested that the number of years of formal education, global good agriculture practice, agricultural experience, household size, animal assets, and womens' employment influenced both the innovativeness and sustainability variables. Encouraging the participation of women in agricultural production in rural areas, including sustainability-related issues in addition to technical issues in farmer training programs, and ensuring the participation of women in such training are issues that should be considered in future They also suggested that uptake of agricultural technologies is a complex process influenced by both extrinsic and intrinsic variables, and recommend that future studies aiming to understand the adoption process of agricultural innovations take into account both sets of variables. A mechanistic understanding of how intrinsic and extrinsic factors interact and drive adoption can help in targeting technologies appropriately to ensure sustainability (Meijer, Seline S., et al 2015: 40-54).

Additionally, the structure of an industry's policy system and how organizations and individuals within the industry interact is a relevant factor (Morriss, Stuart, et al. 2006: 26-46).

He, Weichun, Erling Li, and Zhizhen Cui (2021) found out that agricultural technologies' diffusion, absorption, and implementation are three influencing factors of the green efficiency of agricultural innovation for China agriculture.

Kenya's case showed that plot size, off/non-farm income, household credit, and extension contact positively influence the decision to adopt and the level of adoption. Technical training positively affects the level of adoption but negatively influences the probability of adopting some innovation (Jerop, Rebecca, et al. 2018: 1888-1900).

Considering components of the framework through the parameters of legitimacy, social justice, and sustainability enables to create a set of guiding questions that can highlight the normative and power dynamics of the agricultural innovation process, and therefore important to govern the process of agricultural innovation (Sunding, David, and David Zilberman. 2001: 207-261).

Moreover, the process of innovation involves a complex interaction between farmers, the research agencies and markets (Jarrett, F. G.1985: 217-234).

World experience shows that in developed countries, expenditures on research and development are constantly growing, reaching in many of them 2.5-3.7% of GDP, while the state's share in these expenditures averages 25-34%. These countries primarily include Israel (4.27%), Finland (4.01%), Sweden (3.75%), Japan (3.28%) and Korea (4.23%).

Advanced farmers use automated harvesters, drones, autonomous tractors, seeding, and weeding to transform how they cultivate their crops (Agriculture Innovation: 10 Tech Trends to Watch in 2023).

According to OECD, stronger agricultural innovation systems must be collaborative, with all actors working in networks to produce innovations that the sector needs and can use (Agricultural productivity and innovation).

The minimum level of state support from the state does not allow agricultural enterprises to intensively update equipment and technologies with a low level of profitability, even taking into account state support.

In the next decade, crop researchers, farmers, and the governments of countries worldwide will be focused on building innovation and new technologies to improve global crop productivity, support smallholder farmers, and reduce the environmental impact of agriculture (Top 13 Innovations in Agriculture/Farming in 2023:2023).

Methodology

Methods of statistical data analysis, literature analysis, state policy review, systematic approach, content analysis, and comparison were the methodological research tools. A systematic approach allows identifying common system properties and qualitative characteristics of elements of an innovation system. Content analysis compares literature studies. Statistical data analysis gives a

visual picture of innovation related information for a period. Literature and state policy analysis enrich existing knowledge and research gaps for influencing agricultural innovations determinants.

Results and discussion

As a result of the study, it was found that the key factors affecting the development of innovative processes in agriculture are the level of financial resources of organizations, the level of motivation to innovate, and the ability of organizations to create innovations or replicate innovations that have already been created. It has been established that the predominant part of the formed innovations in agriculture is replicative, based on the borrowing of someone else's experience and knowledge. As recommendations, the expediency of regulating the ratio of basic prices for agricultural products and marginal prices for goods and services of related sectors of the agro-industrial complex has been substantiated.

Kazakhstan has a number of programs to support agriculture, but their effectiveness is not high, and therefore there is a need for significant funding for broadband in rural areas and the importance of strengthening broadband programs. However, the relationship between advances in knowledge, resource use, and human well-being is still complex.

Government extension services are struggling and offer little new knowledge to farmers. Too little linkage between research and extension, or between these services and the private sector. In terms of education, agriculture has the highest share of employed with just a high school degree. At the same time, the requirements for vacancies in agriculture on the electronic labor exchange reflect the demand for unskilled labor. For example, for more than half of the vacancies, it is enough to have a general secondary education – 51.4% while higher education is required only for 4.1% of the posted vacancies (M. Tolebayeva. Agriculture in Kazakhstan. Part 2)

The problems related to education level of employed in agriculture were highlighted in the state policy document, the Concept of development of the agro–industrial complex of the Republic of Kazakhstan for 2021 – 2030 as the underdevelopment of the service infrastructure of agricultural science, including the lack of local outreach centers, transfer and commercialization of agricultural technologies; underfunding of knowledge dissemination, commercialization and transfer of agricultural technologies; weak interaction with the leading scientific centers of the developed countries of the world. To overcome them development of knowledge dissemination centers in the agro-industrial complex through a state task expansion of the network of existing centers for the dissemination of knowledge on the basis of universities, research institutes, experimental farms, colleges and agricultural formations, as well as the practice of conducting training seminars by foreign consultants on the development of the agro-industrial complex were planned for 2021-2030 (Concept of development of the agro–industrial complex of the Republic of Kazakhstan for 2021 – 2030).

It was a lost and found track of dissemination and outreach programs for agricultural producers after the USSR period. However, to be creating innovations it is not enough. In our opinion, the state should organize research or project calls involving all necessary stakeholders where the implementation point is agribusiness, as innovation requires collaboration, idea creation, implementation and value creation.

Increasing farm productivity can increase agricultural incomes, make more food available to consumers at lower prices, and in some cases relieve pressure on the environment. But sometimes the consequences are negative and require compromises. For example, policies to improve the environmental sustainability of agriculture can increase costs for farmers and lead to higher prices for consumers. However, increasing productivity per unit of land is the main driver of agricultural growth. All measures to improve productivity should be used, including: increasing yields, diversifying towards higher value crops, and developing value chains to reduce marketing costs.

In addition, most agricultural producers have very modest incomes. Business organizations lack motivation to research. Thus, the policy of regulating the level of income in the sectors of the agro-industrial complex can bring two-way benefits to society. On the one hand, a small increase in the level of income of most agricultural producers can intensify their activities to modernize production and develop innovation processes, since they will be better provided with resources, and government spending on supporting farmers can be reduced. On the other hand, it is possible to reduce the income level of the allied monopolists.

In agriculture, the combination of high levels of competition and low incomes due to the monopolistic practices of related enterprises limits the ability to modernize outdated technologies and

intensify innovation, and forces the state to maintain high budgetary expenditures to support farmers. The state can, by its actions, increase competition among agricultural companies associated with agricultural producers. As a result, this will strengthen the process of modernization of outdated technologies and the development of innovations in all sectors of the agro-industrial complex.

Table 1 – Number of innovative agricultural organizations for 2017-2021

	Number of entities, units				
	2017	2018	2019	2020	2021
The Republic of Kazakhstan	386	384	386	396	438
Akmola	11	11	13	12	10
Aktobe	16	16	15	15	15
Almaty	11	9	9	9	10
Atyrau	10	10	10	10	10
West Kazakhstan	8	10	12	10	9
Zhambyl	11	9	10	9	9
Karaganda	29	28	30	29	38
Kostanay	14	12	12	13	15
Kyzylorda	8	7	6	7	10
Mangystau	6	6	6	6	7
Pavlodar	11	14	12	10	9
North Kazakhstan	5	5	5	5	8
Turkestan	6	6	7	8	9
East Kazakhstan	34	35	31	30	37
Nur-Sultan (Astana)	62	60	56	76	90
Almaty city	131	135	138	135	139
Shymkent	13	11	14	12	13

Note: Calculated by the authors according to the official data of the Taldau information and analytical system of the Bureau of National Statistics

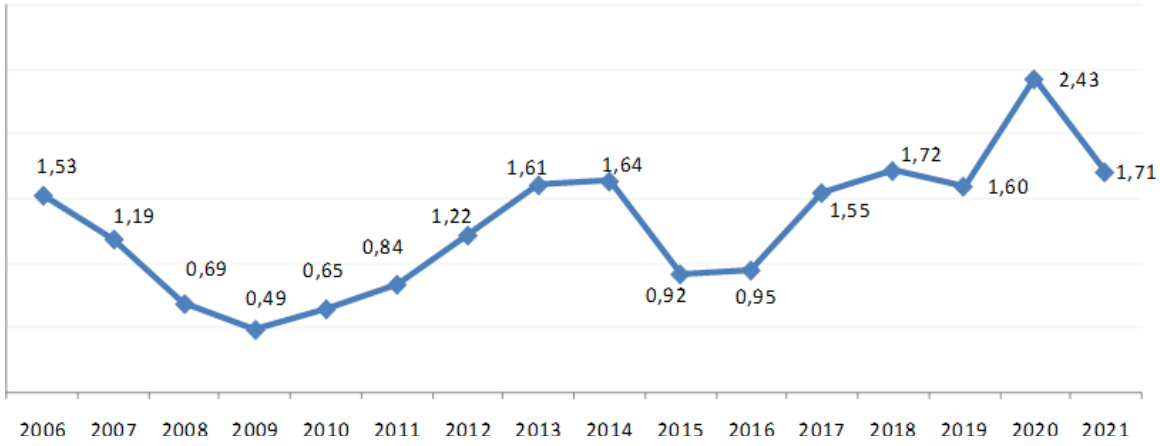
Most agricultural companies located in the big cities, former and current capital metropolises and developed agricultural middle size municipalities like Karaganda and Kostanay.

The indicators of innovative activity of enterprises in Kazakhstan are in the dynamics of decline, this is due not only to the COVID-19 pandemic, but also, in general, to low-effective state programs to support innovative projects of businesspersons. In 2021 10% of innovative companies out of all types of industries operated in the agricultural sector.

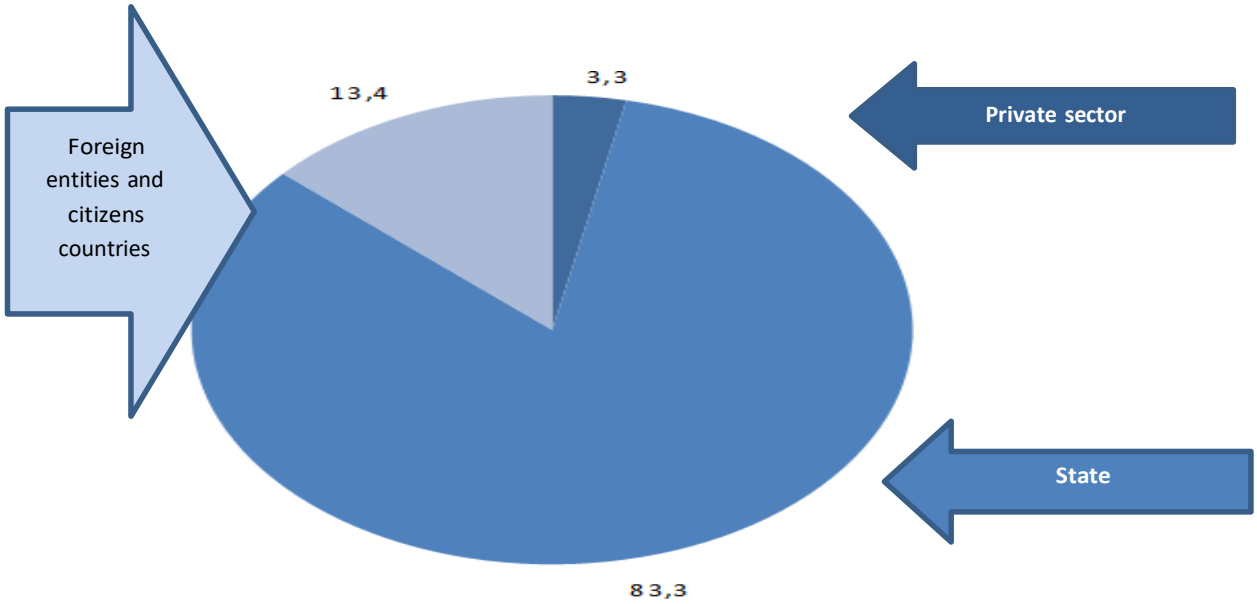
The state spends significant funds to support the income of agricultural producers and stimulate innovation, including in the sectors of the economy related to agriculture. However, in Kazakhstan, spending on innovation is 0.1% of GDP with a sustainable decline from 0.28 % in 2005 and not changing significantly (0.14-0.13%) for 2016-2021. While expenditures of the leader in innovation, Germany on R&D are 2.9% of GDP, Singapore – 2.2%, Russia – 1.1%.

The indicator is not stable for a given period, with the highest number of 2.43% in 2020 and the lowest of 0.49% in 2009.

Most innovations were produced in the processing industry; only nearly 3% of them belonged to agriculture in 2021. Prominent part of the created innovations were process innovation rather than product.



Picture 1 – Share of innovative produce in GDP, %
Note: Calculated by the authors according to the official data
of the Taldau information and analytical system of the Bureau of National Statistics



Picture 2 – Share of innovation expenditures by ownership, %
Note: calculated by the authors according to the official data
of the Taldau information and analytical system of the Bureau of National Statistics

The dominant share of innovations expenditures was represented by the government, whereas only just over 3% was spent by the private sector.

Conclusion

The dominant share of innovations expenditures in Kazakhstan was represented by the government, and most innovations were produced in the processing industry, only a small part of them belonged to agriculture. Lack of developed innovative environment, infrastructure, investments are the barriers to balanced innovations diffusion.

The indicators of innovative activity of enterprises in Kazakhstan are in the dynamics of decline, this is due not only to the COVID-19 pandemic, but also, in general, to low-effective state programs to support innovative projects for development.

Key factors affecting the development of innovative processes in agriculture are the level of

financial resources of organizations, the level of motivationtoinnovate, andtheabilityoforganizations to create innovations or replicate innovations that have already been created. It has been established that the predominant part of the formed innovations in agriculture is replicative, based on the borrowing of someone else's experience and knowledge. The low level of education of farmers and lack of a regional knowledge transfer system together with the production and financing problems does not allow the development of innovative agriculture.

As recommendations, the expediency of regulating the ratio of basic prices for agricultural products and marginal prices for goods and services of related sectors of the agro-industrial complex has been substantiated. As fostering agricultural innovations is the complex process it needs a milt facet approach involving all stakeholders, their knowledge, and strong management system and governance on state and business level, education and outreach for farmers on best innovative technologies.

There is too weak a linkage between research and extension, and between these services and the private sector. In our opinion, the state should organize research or commercial projects involving all necessary stakeholders where the implementation point is agribusiness products, as innovation requires collaboration, idea creation, implementation and value creation. Currently state research calls are organized separately for research not necessarily involving end users, implementation, and commercialization of innovative ideas which are not always interesting for agricultural producers.

As international experience suggested, the R & D expenditures level should be high enough of at least 3% of GDP in order to be innovative and produce agricultural and other innovations.

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