

THE IMPACT OF DIGITAL TRANSFORMATION ON THE INTERACTION OF  
ENTREPRENEURSHIP IN AGRICULTURAL SECTOR AND SCIENCE

ЦИФРЛЫҚ ТРАНСФОРМАЦИЯНЫҢ АГРАРЛЫҚ САЛАДАҒЫ КӘСІПКЕРЛІК ПЕН  
ҒЫЛЫМНЫҢ ӨЗАРА ІС-ҚИМЫЛЫНА ӘСЕРІ

ВЛИЯНИЕ ЦИФРОВОЙ ТРАНСФОРМАЦИИ НА ВЗАИМОДЕЙСТВИЕ  
ПРЕДПРИНИМАТЕЛЬСТВА В АГРАРНОЙ СФЕРЕ И НАУКИ

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**Abstract.** In the conditions of hard competition of market economy, the relevant task is to ensure the effective functioning of agricultural entrepreneurship. It is quite difficult to solve it by increasing the volume of used natural resources due to their limited character, which requires the search for alternative ways of sustainable development of agricultural production, deepening scientific research based on digitalization. *Purpose* - the article examines aspects of integrational interaction between agribusinesses and science, its level and features, economically justified effect. *Methods* - monographic, comparison and analogy, situational analysis and synthesis, systemic. *Results* - the study reflects the practical experience of the relationship between agricultural science and enterprises of the agro-industrial complex. It is noted that integration ensures close cooperation of organizational and economic structures united by common technological processes and stages of reproduction of the final product: obtaining agricultural raw materials, storage, processing, selling, and servicing. The use of digital technologies ensures an increase in the scale of production of high-quality and competitive products, decrease in production costs and sale of goods, and priority investment areas. *Conclusions* - consolidation of agricultural business structures and scientific achievements is a dynamic multicomponent mechanism. There is no doubt that the connection between scientific activity and practice based on informatization leads to the increase in the scientific and innovative potential of the Kazakhstani AIC and the country's economy. The success of the transition to the innovative model of agro-industrial production in Ka-

zakhsan largely depends on the efficiency of functioning of research and development sphere and, above all, the rate and quality of transferring their results into practical use by agricultural producers.

Аңдатпа. Нарықтық экономиканың қатаң бәсекелестігі жағдайында аграрлық кәсіпкерліктің тиімді жұмыс істеуін қамтамасыз ету өзекті міндетке айналып отыр. Пайдаланылатын табиғи ресурстардың көлемін ұлғайту есебінен оларды шешу олардың шектеулілігіне байланысты айтарлықтай қиын, бұл ауыл шаруашылығы өндірісін тұрақты дамытудың балама жолдарын іздеуді, цифрландыру негізінде ғылыми зерттеулерді тереңдетуді талап етеді. *Мақсаты* - мақалада агробизнес субъектілері мен ғылымның интеграциялық өзара іс-қимылының аспектілері, оның деңгейі мен ерекшеліктері, экономикалық негізделген әсері қарастырылады. *Әдістері* - монографиялық, салыстыру және баламалық, ситуациялық талдау және синтез, жүйелік. *Нәтижелері* - зерттеу аграрлық ғылым мен агроөнеркәсіптік кешен кәсіпорындарының өзара қарым-қатынасының практикалық тәжірибесін көрсетеді. Интеграция жалпы технологиялық процестермен және түпкілікті өнімді өндіру сатыларымен: ауыл шаруашылығы шикізатын алумен, оны сақтаумен, қайта өңдеумен, өткізумен, сервистік қызмет көрсетумен біріктірілген ұйымдық-шаруашылық құрылымдардың тығыз ынтымақтастығын қамтамасыз етеді. Цифрлық технологияларды қолдану жоғары сапалы және бәсекеге қабілетті өнім шығару ауқымын ұлғайтуды, тауарларды өндіру және өткізу кезінде шығындарды азайтуды, инвестициялаудың басым бағыттарын қамтамасыз етеді. *Қортындылар* - аграрлық бизнес-құрылымдар мен ғылыми жетістіктердің топтасуы - бұл серпінді көпкомпонентті тетік. Ақпараттандыру базасындағы ғылыми қызмет пен практиканың байланысы қазақстандық АӨК-нің және ел экономикасының ғылыми және инновациялық әлеуетін арттыруға алып келетіні сөзсіз. Қазақстанның агроөнеркәсіптік өндірісінің инновациялық моделіне көшудің сәттілігі көбінесе зерттеулер мен әзірлемелер саласының жұмыс істеу тиімділігіне және, ең алдымен, олардың нәтижелерін ауыл шаруашылығы тауарын өндірушілерге іс жүзінде пайдалануға беру қарқыны мен сапасына байланысты болады.

Аннотация. В условиях жесткой конкуренции рыночной экономики актуальной задачей становится обеспечение эффективного функционирования аграрного предпринимательства. Решить ее за счет увеличения объемов используемых природных ресурсов достаточно сложно в силу их ограниченности, что требует поиска альтернативных путей устойчивого развития сельскохозяйственного производства, углубления научных исследований на основе цифровизации. *Цель* – в статье рассматриваются аспекты интеграционного взаимодействия субъектов агробизнеса и науки, его уровень и особенности, экономически обоснованный эффект. *Методы* – монографический, сравнения и аналогий, ситуационного анализа и синтеза, системный. *Результаты* – исследование отражает практический опыт взаимоотношений аграрной науки и предприятий агропромышленного комплекса. Отмечается, что интеграция обеспечивает тесное сотрудничество организационно-хозяйственных структур, объединенных общими технологическими процессами и стадиями воспроизводства конечного продукта: получением сельхозсырья, его хранением, переработкой, реализацией, сервисным обслуживанием. Применение цифровых технологий обеспечивает увеличение масштабов выпуска высококачественной и конкурентоспособной продукции, снижение издержек при выработке и сбыте товаров, приоритетные направления инвестирования. *Выводы* – консолидация аграрных бизнес-структур и научных достижений – это динамичный многокомпонентный механизм. Несомненным является тот факт, что связь научной деятельности и практики на базе информатизации приводит к повышению научного и инновационного потенциала казахстанского АПК и экономики страны. От эффективности функционирования сферы исследований и разработок и, прежде всего, темпов и качества передачи их результатов в практическое использование сельхозтоваропроизводителям, во многом зависит успех перехода к инновационной модели агропромышленного производства Казахстана.

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Key words: agricultural sector, digitalization, entrepreneurship, scientific developments, latest technologies, production, products, competitiveness, innovation, cost optimization.

Түйінді сөздер: аграрлық сала, цифрландыру, кәсіпкерлік, ғылыми әзірлемелер, жаңа технологиялар, өндіріс, өнім, бәсекеге қабілеттілік, инновациялар, шығындарды оңтайландыру.



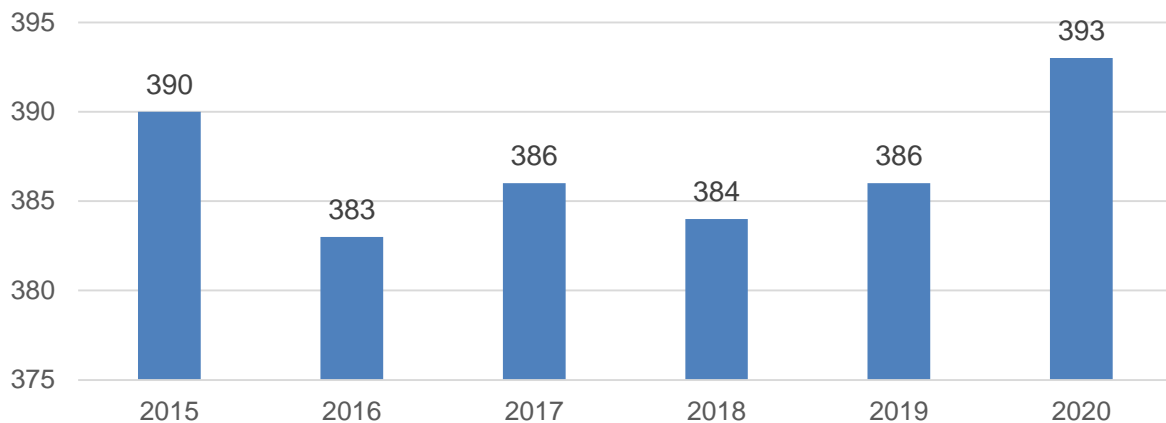


Figure 1 - Number of organizations engaged in R & D

A typical feature of agricultural science is to ensure the implementation of the agrarian policy of the state, as well as it turns into a complex and continuously growing system, into the most dynamic, mobile, productive force of industry. Today Kazakhstan's science is becoming an efficient force of production sectors, which is manifested in profound changes in the relationship between agricultural business and science.

The analysis of global trends in the introduction of innovative technologies in production has a high rate of development and brings large revenues to those countries where sufficient attention is paid to them.

As can be seen from figure 2, in Kazakhstan, domestic expenditures on research and development work in 2020 increased by 23% compared to 2015.

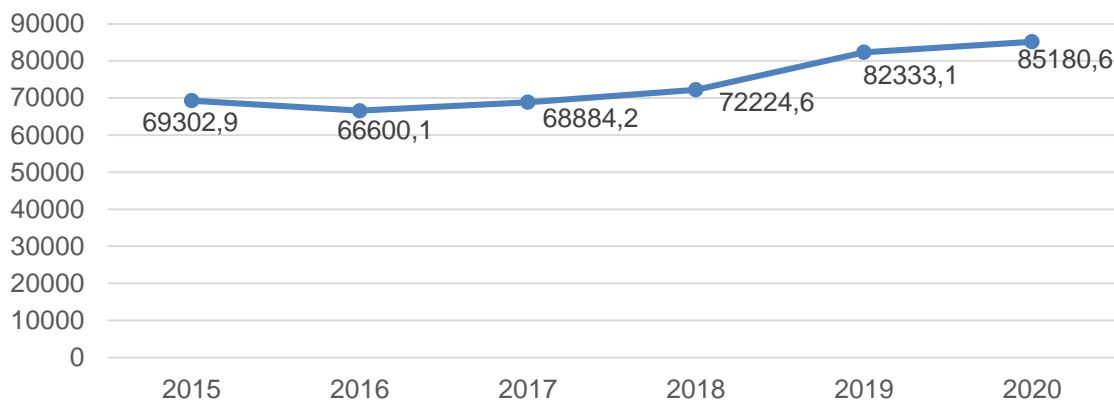


Figure 2 - Internal costs for research and development work, mln tenge

This indicates that in recent years, Kazakhstan has allocated enough funds for research and development.

In modern conditions, it is important to improve the organizational mechanism for accelerating the implementation of the results of scientific and technical achievements [3]. This concerns the development and implementation of special scientific and technical programs and digital technologies in agriculture for all subjects of the Republic of Kazakhstan.

The agricultural sector is a risky type of business, largely dependent on the whims of nature. The intensity and seasonality will become increasingly unpredictable, which will

significantly reduce the possibility of adapting the agricultural business to such changes. Digitalization in agricultural production will reduce these risks, adapt to climate change, increase crop yields and animal productivity. It is possible to achieve a reduction in production costs, increase its quality and competitiveness on the basis of effective use of resources and scientifically based approaches to digitalization of agriculture. Providing the necessary financial instruments for agricultural production in the context of global risks will reduce transaction costs for production.

The agricultural sector is one of the main spheres of the country's economy, which

forms the agro-food market, food security, and the labor potential of rural territories [4]. The level of socio-economic situation of the population in rural areas is influenced by the level of development of agricultural production [5]. Therefore, it is necessary to improve the system of scientific support for agricultural production and the technological process of production through the integration of science and business.

The integration of agricultural business and science is a dynamically developing system. The integration of interaction between agricultural business and science ensures close cooperation of organizational and economic structures united by common technological processes and stages of reproduction of the final product.

The result of integration is an economic effect obtained due to the following factors:

- increase in production volumes;
- reduction of agricultural production costs;
- improving the quality and competitiveness of products;
- implementation of the results of scientific and technical achievements in production [6].

Integration, based on intersectoral and inter-farm relations, is one of the main factors for the effective use of production resources of all structural units of agricultural production of the integration formation, as well as the most effective use of labor and financial resources in order to obtain integration effects from the joint reproduction process [7].

A human uses natural resources, organizes the production of products, protects his life, but nature has a positive and negative impact on the human. The author of the book "Technogenic systems and environmental risks" professor S.V. Belov notes, that «in the conditions of global risks, scientific and practical human activity aimed at creating a high-quality comfortable technosphere in all its manifestations in the field of production becomes a radical protective effect both in relation to man and in relation to nature". Therefore one of the ways to effectively organize production and preserve nature is to apply the results of scientific and technical research and improve the interaction of agricultural business and science.

The system of scientific support of agricultural production should be effective, flexible, multi-level and aimed at the development of the state's agricultural policy [8]. The development of agricultural production in the conditions of digitalization implies qualitative changes in the organization of the management system. Artificial intelligences control not

only techniques, agricultural machines, biological developments of crop production and animal husbandry, but also human activity, considering it as an emotional appendage of the organization of production processes.

One of the conditions for creating a competitive agricultural business can be the processes of effective implementation of breakthrough technologies in agricultural production based on the processes of innovative integration. Through integration, science can generate new ideas in production. At the same time, modern production cannot develop in isolation, the integration ties of science and business are increasingly strengthening along the entire reproductive chain in the territorial aspect.

Science becomes the basis, and the dissemination of knowledge is a key factor in the modernization strategy of production. Integration links between science and production systems are becoming objectively necessary. In this regard, the development of the theory, methodology and practice of managing the innovative development of agriculture, the integration connectivity of science and production is an urgent problem that has not received due attention in the modern economic scientific literature.

Improving the mechanism of effective interaction between agricultural business and science in Kazakhstan is a complex economic, social and political task in the conditions of the World Trade Organization. The support of farmers within the framework of the World Trade Organization through the "green" basket allows commodity producers to receive state support through scientific research. Kazakhstan managed to defend a special condition and fix the threshold level of this support in the amount of 8.5% of the gross agricultural product. At the same time, according to the rules of the World Trade Organization Kazakhstan has the right to provide this 8.5% twice (or 17% of the gross agricultural product).

The report on the implementation of the State program for the development of the agro-industrial complex of the Republic of Kazakhstan for 2017-2021 noted that in 2018 the volume of attracted investments due to investment subsidies amounted to 208.7 million tenge [9], which amounted to 12.4% of the total gross agricultural product, the value of the country's gross output in 2018 amounted to 39.8 billion tenge, and the gross agricultural product - 1.67 billion tenge. Therefore there is a need to improve the integration of interaction between agricultural business and science,

which ensure the economic growth of agricultural production in the face of global risks.

In 2018 384.2 thousand tons (20.5%) were slaughtered or sold for slaughter of livestock and poultry (in live weight) by agricultural enterprises, 393.0 thousand tons (20.5%) by individual entrepreneurs and peasant or farm farms, and 1.09 million tons (58.4%) by households.

If we consider the share of participation of agricultural producers in the development of meat production, then the largest share of

production is in private subsidiary farms - 58.4%, belonging to unorganized business, where the requirements of technological processes are not met, agricultural enterprises and individual entrepreneurs and peasant or farm farms have a share of 20.0% each.

Analyzing table, it is possible to observe an annual increase in the number of entities producing agricultural products, including a 33% increase in the number of legal entities and farms in 2020 compared to 2015, personal subsidiary farms - by 2%.

Table - Registered producers of agricultural products

	2015 year	2016 year	2017 year	2018 year	2019 year	2020 year
Legal entities	12 993	13 186	14 842	15 770	16 525	17 403
AE, IE	189 038	184 608	185 754	194 828	229 129	249 644
Personal small-holdings	1 604 067	1 608 754	1 643 349	1 645 739	1 635 636	1 638 561

Today there are many problems of agricultural production, these are:

- many farms do not comply with the technologies of raising, keeping and feeding animals. Therefore, it is necessary to introduce or comply with the zootechnical plan for conducting reproduction in animal husbandry and their transformation, as well as compliance with the technology of forage harvesting according to their nutritional value and quality. By observing all these measures in farms, it is possible to increase the productivity of animals and increase the income of farms;

- irrational use of agricultural land, underdevelopment of seed production. It is necessary to apply precision farming technologies in crop farming farms. Precision farming technologies provide for the application of fertilizers and tillage taking into account its initial state, which cannot be achieved using classical technologies and this will reduce the cost of production and increase the income of farms;

- it is necessary to apply the results of scientific research in farms. The results of scientific achievements are the basis for the intensification of agriculture, increasing its efficiency. They contribute to the stable, sustainable development of the industry, mitigation of the impact of adverse weather and climatic conditions, transformation of labor and life in rural areas.

Scientific achievements make it possible to effectively manage biological processes, light and water regimes, the balance of nutrients and other production conditions. The use of breeding animals in farms improves the productivity of livestock, the introduction of

innovative technologies in production makes it possible to reduce the labor and other resources of farms and this will make it possible to get more income compared to the current period in agricultural formations [10].

The introduction of innovative technologies into production in farms is the most important condition for increasing and reducing the cost of products, contributes to the effective use of all types of resources used, eliminating irrational transportation of products [11].

The economic mechanism of the process of integration of agricultural business and science is inherently connected with the combination of financial and labor resources to obtain economic and commercial effects.

It is necessary to create favorable conditions for the successful development of innovative technologies in the agricultural business and threw.

Based on the analysis of the integration interaction of agricultural business and science, we can talk about the need for a new methodological approach to its cognition, which will determine the ways of its development, management methods to achieve integration in industrial relations [12].

The success of the transition to an innovative model of development of the Kazakh economy is significantly influenced by the quality of the implementation of the results of scientific research and development in agricultural production [13].

It is possible to measure the economic efficiency of integrating the interaction of competitive agricultural business and science by correlating the effect obtained and the resources spent.

Currently, the management of agricultural production in Kazakhstan in difficult socio-economic conditions requires the integration of the subjects of science and agricultural production.

### Conclusions

1. There is a need to improve the system of scientific support for agriculture. With the modernization of the science management system, we can see the improvement of the mechanisms for financing scientific research. The system of scientific support of agriculture should be effective, flexible and it should be integrated into the organizational and economic mechanism of the functioning of the state agricultural policy, for this it is necessary to organize the following activities:

◆ in the conditions of digitalization and global risks, it is necessary to create a scientific and production cluster of digital technologies in agriculture, which will increase its efficiency. The creation of a scientific and production cluster of digital technologies in agriculture will allow introducing advanced production technologies into the process of agricultural production. Thanks to this, the future cluster will rely on complex technologies, such as robots, temperature and humidity sensors, aerial photographs and GPS technologies, etc. These achievements will allow the organizations of the research and production cluster to be profitable, efficient and environmentally safe;

◆ development of recommendations for the creation of the intellectual center "agriculture 4.0".

2. The study of the economic principles of intellectual property in relation to agriculture was clearly insufficient to solve the problem of its effective inclusion in adaptation to market relations. Therefore, an important aspect of updating attention to the problem of using intellectual property is to identify the features of intellectual property in agriculture and find ways to use it effectively.

The solution of the set tasks is of great economic importance for agriculture and therefore reaches the level of an independent scientific direction that requires the development of appropriate theoretical and methodological provisions.

3. The practical significance of the study is determined by the possibility of using recommendations to improve the efficiency of production and competitiveness of products, achieved by reducing the path from scientific development to the production of a serial batch of new products, reducing financial costs for the development and introduction of innovative technologies into production. The

fundamental differences between the research ideas and existing analogues indicate that the paper examines the problem of interaction between agricultural business and science, and the authors have also prepared proposals to improve the integration impact of interaction between agricultural business and science in the context of digitalization and global risks.

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