

DOI: 10.55643/fcaptop.5.58.2024.4445

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Received: 24/05/2024

Accepted: 11/10/2024

Published: 31/10/2024

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# DEVELOPMENT OF AGRICULTURAL SCIENCE ON THE PLATFORM OF INNOVATIVE BIOECONOMY

## ABSTRACT

Ukraine's economy is in a state of crisis caused by the war. The agricultural sector in extreme conditions is trying to fulfill its function of ensuring the food security of the state, supporting its export potential despite limited resources and logistical problems. Agrarian science in the conditions of budget funding deficit is trying to find ways to use the scientific and experimental base, developed varieties and technologies to promote the stabilization and revival of agro-industrial production in the industry and regions. Effective models of implementing the innovative potential of agrarian science on a business basis are necessary.

The purpose of the study is to justify the platform of market adaptation of science to crisis conditions and the mobilization of scientific potential in the breakthrough directions of the development of the agrarian sphere on the basis of innovative bioeconomy and close cooperation between science and business.

To realize the set goal, the work assessed the possibilities of integrating science and business on the platform of innovative bioeconomy in the crisis economic and legal conditions of Ukraine; the bio-ecosystem of the platform and its operational mechanism of the partnership of science and business for the implementation of joint innovation and investment projects are substantiated. For the introduction of a well-founded bio-ecosystem, a set of measures is proposed for the formation of a platform in the system of agrarian science on the basis of conducted tests and adopted organizational decisions based on the example of the National Academy of Agrarian Sciences of Ukraine.

Cooperation between agricultural science and business on the basis of the proposed public-private partnership platform ensures the mobilization of scientific potential to solve pressing issues of innovative development of agricultural production, rural areas through the creation and transfer of breakthrough and supporting bioinnovations, the production of competitive innovative agro-food products.

**Keywords:** agricultural science, agribusiness, platform of innovative bioeconomy, public-private partnership, cluster model of production of innovative products

**JEL Classification:** O13, O32, Q16, L23

## INTRODUCTION

In the conditions of the destroyed economy of Ukraine as a result of the military actions, the question of the effectiveness of the functioning, restoration and development of the agricultural sector, ensuring the food security of the state is one of the most important.

According to the Ministry of Agrarian Policy, state efforts in 2022–2023 were focused on deregulation and support of the agricultural sector, including the provision of assistance in 2022 in the amount of UAH 1.645 billion per 1 hectare and 1 head of cattle, UAH 90 billion in soft loans, promotion of technological development with the support of FAO and EU funds, including the free transfer of corn, buckwheat, potato seeds, hygiene products for cattle to producers. In 2023, support was provided with the assistance of the World Bank in the amount of UAH 1.56 billion to the agricultural sector, the provision of preferential loans in the amount of USD 0.432 billion, and preferential lending for farmers was also provided jointly with the IFC (50%) and other donors (50%) in the amount of USD 1 billion. The priority is the development of the industry's

digitalization, agro-logistics, the implementation of legislative norms of European integration, land reclamation, and fish farming.

These sectoral programs and international aid do not provide targeted support to the important sector of the agrarian economy - academic and educational science. The limited funding of fundamental and applied research does not cover even 50% of the needs for the salary of scientists, the development of the research and technological base is expected at the expense of income from the sale of products of experimental and production divisions of scientific institutions. But according to the legislative decisions adopted in July 2023, the state is withdrawing the mainland and property complexes from science, which raises the question of the future existence of the scientific sector of the agro-industrial complex. Higher education institutions cover part of their financial needs at the expense of educational activities (contracts for the training of students and postgraduates). Academic and educational institutions also participate in competitions for research and development grants, but state sources are very limited, and access to international grant programs (Horizon Europe, etc.) is difficult for Ukrainian researchers.

Agrarian science, despite the lack of resources, has high-yielding varieties and technologies that can become the basis for the restoration of stable agricultural production in the industry and regions, high-tech development of the agricultural sector. Effective models of the revival and development of agricultural production on the basis of a partnership between science and business are necessary.

## LITERATURE REVIEW

In the conditions of insufficient state funding and a low level of private investment in domestic research and development, the question of creating effective forms of public-private partnership in the innovative sphere of Ukraine is urgent [1]. One of the most effective mechanisms of public-private partnership, which has proven itself in the EU countries, which ensures the involvement of business and civil society in close cooperation in determining the strategic scientific and innovative priorities of the state and in the process of their implementation, financial participation in specific scientific and innovative projects, there are technological platforms.

In 2004, the European Research Advisory Council identified the concept of "European Technology Platforms" as one of the most important pan-European missions or managed initiatives aimed at strengthening Europe's potential through innovation. Since 2014, strategies and a set of measures for the development of research and innovation platforms within the framework of the Horizon 2020 programs have been formed in Europe and Ukraine. An analysis of the development trends of the European research and innovation space in the conditions of Ukraine [2] was carried out, the advantages and conceptual principles of the creation and functioning of technological platforms in the national technological system of Ukraine were proved [3].

The Cabinet of Ministers of Ukraine approved the Strategy for the Development of Innovative Activities for the Period Until 2030 (Decree dated July 10, 2019 No. 526-r). Before the beginning of the full-scale invasion of the Russian Federation in Ukraine, researchers and the public discussed with the authorities' representatives about the filling of regulatory and legislative declarations with specific content in order to create equal and mutually beneficial conditions for science and business cooperation with state support. This is evidenced by the works of scientists regarding the substantiation of the toolkit of technological platforms as a way of innovative development in Europe and Ukraine [4], [5]. Institutional support of technical platforms as a way of innovation is recommended to those obtaining scientific degrees as the basis of modern innovation management [6].

The authors of this study conducted a scientific and methodological substantiation of the conceptual foundations of the creation of a technological platform for the innovative development of the agro-industrial sector of Ukraine [7], [8], [9]. The principles of the technological platform of the public-private partnership of science and business have been developed on the basis of and with the participation of research and production institutions and enterprises of the National Academy of Agrarian Sciences of Ukraine, private basic farms, commercial enterprises, and investors. The conditions for the adaptation of European norms to Ukrainian realities, taking into account the peculiarities of the territorially branched network of agricultural producers and rural areas [10], are substantiated. It is proven that the proposed model of the technological platform ensures the preservation and effective use of the innovative potential of agrarian science, promotes the integration of science and business for the introduction of breakthrough and supporting innovations necessary for agricultural production.

The ineffectiveness of the legislative framework for regulating and stimulating the development of innovative infrastructure, which leads to the alienation of the private technological business sphere from the implementation of the tasks of

public-private platforms, is determined, the need to make changes to the regulatory framework for the functioning and development of innovative infrastructure, both in the economy as a whole, and in its agricultural sector. But in Ukraine, pro-European national innovation did not work system of support and promotion of innovations. In the conditions of the military crisis, except for the defense sector, changes for the better can be expected.

The difficult task of creating mutually beneficial economic and legal conditions for the cooperation of science and business on the path of high-tech development of agro-industrial complex can be solved with the use of new economic strategies and legal mechanisms provided by the relatively young science of bioeconomy. Experts A.M. Klymenko, V.V. Zhebka, well-known in Ukraine and in the agrarian sector, paid attention to the study of the problems of the formation and development of the bioeconomy [11], Baidala V.V. [12], Bugaichuk V.V., Grabchuk I.F. [13], Butenko V.M. [14].

The essence of the concept of bioeconomy, bioeconomic strategies, the state and prospects of the development of bioeconomy in Ukraine are presented in the works of Fedyna S.M, Kovalova B.L., and Ignatenko V.M. [15].

According to the definitions of Ukrainian scientists (Talavyrya M., Makedon G.), bioeconomy is a branch of knowledge at the intersection of economics and ecology, which studies the relationship between man and nature in the process of using natural resources and therefore relies on traditional disciplines: biology and economics. Also, bioeconomy (Bugaychuk V.) is considered as one of the aspects of economic activity, which takes into account the positive impact of biological processes and renewable bioresources on the health of the population, economic growth, expansion of the assortment necessary for humans and the production of bioproducts, obtaining profit from their effective use.

Researchers also pay attention to the strategic approaches of the European Commission, which since 2012 has been implementing the strategy "Innovation for sustainable growth: bioeconomy for Europe". European bioeconomy strategies are mostly focused on the combination of research (knowledge base), innovation (stimulation of innovative entrepreneurship, education (training of specialists) and management (integrated management of communications with society). These components, as well as the essence of the bioeconomy as a circular (cyclical) economy, provide new opportunities regarding the construction of cooperation between science and business for the creation and use of renewable biological resources necessary for the population and production, the use of bioadapted technologies in the system of rapidly changing bioeconomic processes, and the production of agro-food products necessary for mankind.

The European experience of institutional support for the development of a knowledge-based bioeconomy [16] provides for the creation of an innovative bioecosystem based on cluster models of the creation and transfer of biotechnologies from developers to producers of knowledge-intensive and marketable products.

The Institute of Innovative Bioeconomy [17], [18] focuses its research and development on key directions of high-tech agricultural development on the platform of innovative bioeconomy, which works as a cyclical system of ordering, mastering technologies, production and sale of innovative products on the basis of a cluster of public-private partnerships.

The problems of creating and effective functioning of integrated models of cooperation between science and business (technological platforms, clusters, parks and innovative infrastructure ecosystems of other types) are actively investigated in the works of foreign scientists and specialists [19].

This work considers the option of developing agricultural science on the business platform of innovative bioeconomy without direct state support, without waiting for institutional changes in the status of scientific institutions, protectionist measures to protect the interests of domestic science in conditions of market deregulation, technological expansions and local anti-crisis "initiatives".

## AIMS AND OBJECTIVES

The purpose of the research is to justify the platform of market adaptation of science to crisis conditions and the mobilization of scientific potential in the breakthrough directions of the development of the agrarian sphere on the basis of innovative bioeconomy and close cooperation between science and business.

To realize the set goal, the following tasks must be solved:

- reveal the possibilities of integration of science and business on the platform of innovative bioeconomy in the crisis economic and legal conditions of Ukraine;
- justify the bio-ecosystem of the platform and its operational mechanism of the partnership of science and business for the implementation of joint innovation and investment projects;

- propose a set of measures for the formation of a platform in the system of agrarian science on the basis of conducted tests and adopted organizational decisions on the example of the National Academy of Agrarian Sciences of Ukraine.

## METHODS

The basis of the methodology of research and development is based on the theoretical and methodological principles of innovative philosophy as the basis of the cognitive and creative worldview of the science of innovative activity, the systemology of the innovative process; creative innovating as a process of productive creativity, for the results of which there is a market demand and an equivalent economic offer; innovative consulting as a complex of scientific and market research, project development and transfer tools of intellectual business; venture entrepreneurship in the form of entrepreneurial infrastructure integrated with science, which ensures the development of science-intensive technologies, the organization of experimental production and the promotion of competitive science-intensive products on the market with the involvement of venture investments in profitable innovative business; knowledge-intensive market, which combines three market systems: scientific, innovative and entrepreneurial in the creation and transfer of scientific and technical, innovative and technological and production and consumer products on a business basis.

Mastering the theoretical and practical foundations of new areas of the knowledge economy is carried out using original methods and mechanisms united by the concept of innovative bioeconomy, including methodological assets: institutional case-method of innovation-investment-integration development of ecosystems; business-prime method of innovative modeling, design and technology transfer in the science-intensive agrarian sphere; pattern factory method of investment modeling, design and piloting of cluster business projects for high-tech development of agricultural industry; fast-plant is a method of quickly mastering the production of niche products on an industrial scale ("Just in time" technology).

## RESULTS

In the conditions of an unfavorable innovation environment, the absence of real reforms of the state scientific sphere, the presence of mostly uncontrolled processes on the market of circulation of technologies, seeds, planting material, it is necessary to find an effective model of integration of science and business in order to achieve common program goals for the production of competitive, commercially attractive and socially significant products. This can be a model according to which relations are built on contractual terms without the creation of joint enterprises of innovation and investment infrastructure. Innovative institutions do not have really financial and legal support in Ukraine. The unifying goal of partnership can be a joint project and a joint product, the creation and implementation of which have no legal prohibitions or economic impracticability. This model can be a platform aimed at:

- creation of a market-adapted technological base of cooperation between science and business for the implementation of joint innovative, investment, infrastructural projects of high-tech development of the agro-industrial complex;
- mobilization of the innovative potential of agrarian science to solve the issues of providing producers and the population with high-quality breeding and technological material, services for their effective technical and economic use;
- formation of an integrated business infrastructure based on the model of innovative bioeconomy for the transfer of scientific innovations, ordering, production and sale of agro-food products.

The mission of the platform is a comprehensive solution to the problem of revitalization and development of agricultural sectors on a high-tech basis by combining the potential of science and business.

### *Platform features:*

- an independent partnership aimed at the development of research;
- experimental, production segments of the relevant field, intensifying efforts to create and implement promising technologies, new products (services), attraction of market resources;
- regulation of the conditions of cooperation between science and business with the assistance of the authorities in the interests of the economy and society at the national, branch and regional levels;
- stimulation of the movement of the innovative product on external and internal, including regional markets through cluster mechanisms for creating innovations, introducing innovations for the production of socially significant and commercially attractive products.

*Tasks of the platform:*

- creation of an operational mechanism for coordination of participants: Competence Center, Marketplace, and Business Incubator regarding implementation of joint business projects;
- realization of common goals of platform participants is carried out in the form of business clusters, which are formed by providers of innovative investment business projects on contractual terms with project participants.

*The constituent platforms are formed from the potential of groups of participants:*

1. Scientific potential (developments-innovations) - academic and educational scientific institutions that conduct research, and create innovations, new samples and experimental batches of products.
2. Innovation potential (innovation transfer) – consulting institutions that research the technology market, create innovations and implement them in the form of innovation-investment business projects.
3. Production potential (production of products) - experimental and commercial agro-enterprises, farmers and households that master bioinnovations and produce agricultural knowledge-intensive and commercial products.
4. Commercial potential (sale of goods) - processing, trading, service commercial enterprises that supply material and technical resources, purchase, processing and sale of agro-food products.
5. Financial potential (financial resources) - grant missions, investment funds, credit and financial institutions that finance the development of agro-industrial facilities and commercial networks for the sale of agro-food products.

The combination of the components of the platform into a single dynamic system of creation and transfer of scientific and innovative developments, and resources for their implementation in the production and sale of products are provided by cyclic nature-harmonized models built on the principles of bioeconomy.

Bioeconomy is a bio-oriented economy based on the use of renewable biological resources (plants, animals, microorganisms), biotechnologies, their extended reproduction and cultivation of raw materials for energy-saving waste-free production of food, industrial and energy products in conditions of cyclic production and natural bioecosystems.

According to the consultative definitions of the EU and the concept of sustainable development, bioeconomy is a set of industries and processes that ensure the sustainable use of natural and renewable agricultural, water and forest resources, waste and secondary organic components with the use of resource-saving, energy-efficient, environmentally safe biotechnologies for reproduction, cultivation and processing bio-raw materials into valuable products, necessary for maintaining biological diversity and natural resources, providing industry and society with economically attractive and socially significant products.

The innovative bioeconomy of the agro-industrial complex opens up new opportunities for using the achievements of agrarian science in the plant, animal, and processing industries to provide innovative support for the functioning and development of bioeconomic systems and processes. Also, the bioeconomy requires and promotes the accelerated transition of agricultural science to an innovative model of innovations and innovations, according to which agrarian business (production, commercial) receives the necessary competitive science-intensive products on market conditions.

In the system of agrarian science, the Institute of Innovative Bioeconomy, which is a non-governmental scientific and consulting institution, has 22 years of experience in conducting scientific research and innovative practices in the science-intensive agrarian field, is engaged in theoretical research and applied development of innovative development on the basis of bioeconomy. The Institute is the main institution for the implementation of the state program of scientific research "Scientific foundations of innovative bioeconomy in agriculture" (PND No. 42 of the National Academy of Sciences, 2021-2025).

The Institute carries out modelling of integrated formations of cooperation between science and business on the basis of public-private partnership, development and implementation of innovative, investment, and infrastructural business projects for the development of the high-tech agricultural sphere. In the conditions of a reduction in state funding of agricultural science and education, with the aim of directing scientific potential to carry out priority research on the problems of innovative bioeconomy, financed from non-state sources, integrating the innovative potential of agricultural science into the market environment, the Institute launched a set of measures to implement scientific research programs of innovative practices with construction of cluster systems for the production of competitive agro-food products on the platform of innovative bioeconomy.

The bioecosystem of the platform should take into account the cyclical principle of bioeconomic processes, which are usually represented in the form of industry or regional models of circulation of bioresources, biotechnologies, bioproducts.

To build a platform of innovative bioeconomy, we will consider the cycles of interaction between science and business as stages of creating innovative products.

Cluster projects of innovative bioeconomy require long-term relations between scientific and business partners. The key, in our opinion, is the availability of orders for specific consumers for each product demanded by the market. The bioeconomic approach does not involve first making a product and then looking for who needs it. On the basis of a specifically defined product order for paying consumers, a cyclogram of a cluster project is formed.

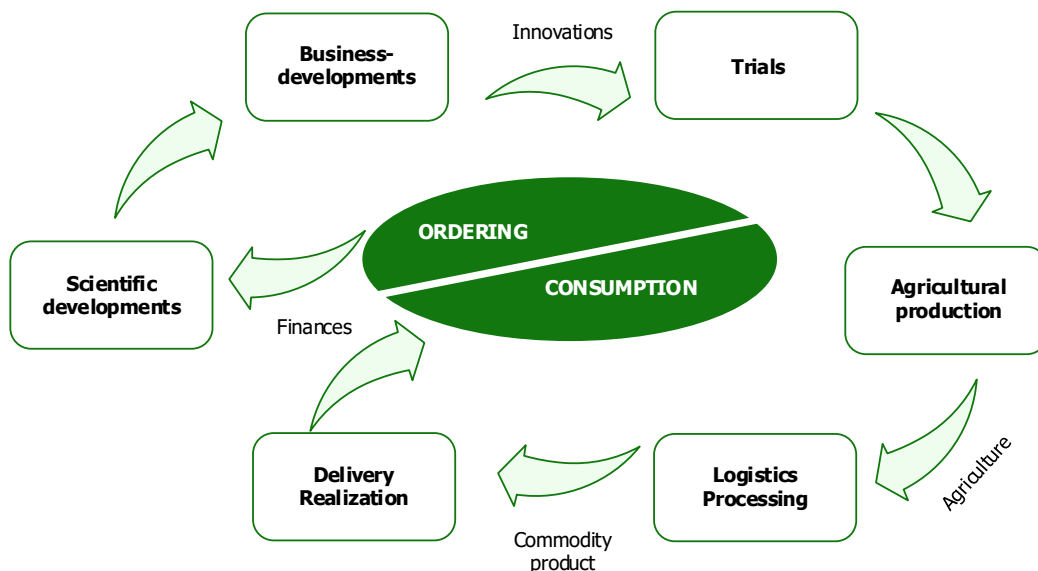
For the production of high-quality innovative products, it is necessary to develop relations with:

- supporting scientific institutions, which have the processing required by production, research and experimental base, specialists for implementation orders for scientific developments and their support at the appropriate level;
- consulting business developers who have scientific innovations in market innovations and specialize in the design of high-tech business projects, as well as provide certain types of services (legal, financial, printing, information, etc.);
- basic research stations and economically stable farms that have a modern production base, specialists for testing and breeding breeding and technological resources, farming systems, machinery and equipment for the production of innovative products.

At each phase of the creation and development of biotechnologies, extended reproduction of bioresources for the production of innovative products, economically agreed conditions are important, without which innovative products may not be competitive in terms of price-quality ratio.

The production and sale of commercial products using innovative technologies require the establishment and maintenance of permanent connections of the following stages of the bio-economic process (Figure 1):

- producers of agricultural products (agricultural enterprises, farms, households in the relevant regions, which are able to produce varietal products of the required quality and quantity under the order and forward supply of resources);
- procurement, logistics and processing enterprises that carry out storage, transportation, and processing of agricultural raw materials into commercial products needed by consumers;
- a commercial network of suppliers for the production of material and technical resources, information-marketing and packaging services, delivery services and other services, as well as wholesale and retail trade operations on local, regional and international markets.

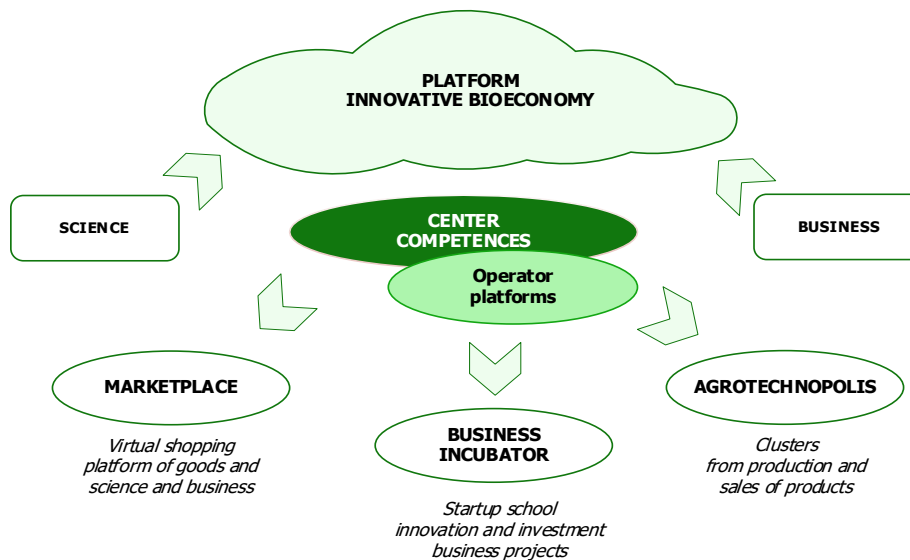


**Figure 1. Bioecosystem of the platform.**

Cyclical processes of the innovative bioeconomy require not only the rapid development of innovative and marketable products needed by consumers, but also ensuring the satisfaction of consumer demand in the necessary assortment of

products on a permanent or long-term basis, which must correspond to brand characteristics and be delivered in the required quantity, quality, and time to the interested consumption segments.

For the functioning of the platform as a system of contractual relations of the participants, a flexible operating mechanism has been developed (Figure 2), which works without the creation of additional joint ventures and infrastructural institutions that do not have financial and legal support from the state and do not give advantages to innovative business.



**Figure 2. Operating mechanism.**

The function of the platform operator is performed by a non-governmental scientific and consulting institution - the Institute of Innovative Bioeconomy, which is certified by the state as a specialized scientific centre for researching the innovative potential of agricultural science, creating integrated models of public-private partnership of science and business, as well as a business centre for the implementation of joint innovation and investment projects on high-tech development of agricultural industry.

The platform operator engages specialists in the Competence Center for program-targeted areas of innovative bioeconomy for the creation and support of the implementation of high-tech agribusiness cluster projects. The competence centre works on a public basis and consists of creative teams representing interested scientific, consulting, production and commercial structures - participants in the joint business.

Communication with the participants of the platform and executors of joint projects is carried out by the marketplace, created on the organizational base of the platform operator. The trademark "Ukrainian Selection" has been registered to mark the platform's participants and products on the market. The information and communication function is performed by the site portal in the e-commerce mode, on which electronic auctions of original products of agrarian science and related goods/services are carried out. The trading and logistics platforms of the marketplace are created on the basis of platform participants who serve trade operations on contractual terms.

Modelling, designing and piloting of business is carried out by a business incubator created by the platform operator with the participation of consulting partners and investors. Business testing is carried out in the form of startups on the basis of institutions and enterprises that form a testing ground for startups. Successful startups are scaled by developing, investing and providing innovative, investment, infrastructure projects. The bank of projects accumulates and replicates project templates, which are transformed into project solutions with contractual support according to the "pattern factory method" (international standard). The accelerator is responsible for the competitive selection of performers and the implementation of projects, which accompanies venture business practices by concluding contracts with providers (customers, investors) of projects.

Implementation of cluster business projects on the platform of innovative bioeconomy is carried out by project providers. Providers conclude a contract for project implementation, attract business resources and ensure the order, production and sale of innovative and commercial products under contracting agreements with project-defined executors.

The formation of the community of the Society of Interested Participants (stakeholders) of the platform is carried out by the Center of Competences of Innovative Bioeconomy sectors of the organization and implementation of joint projects (Figure 3).

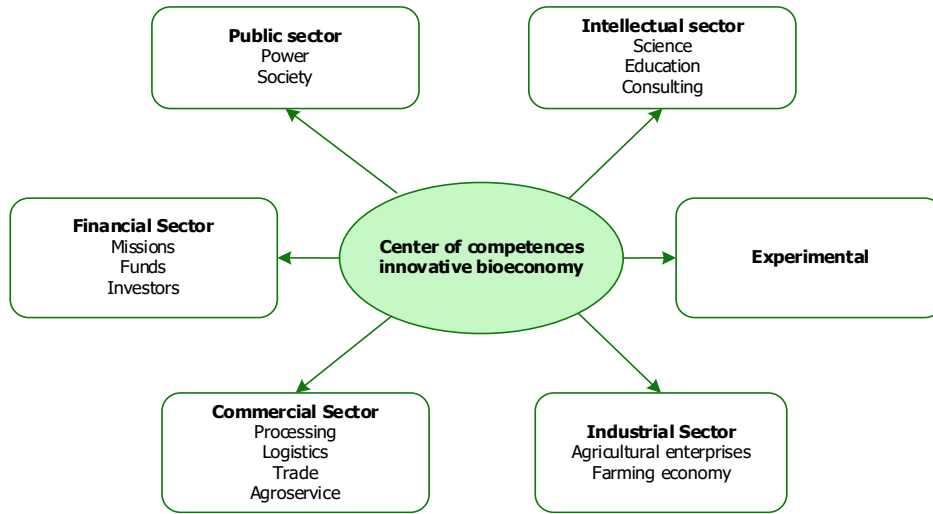


Figure 3. Stakeholders.

In the public, intellectual, experimental, industrial, commercial, and financial sectors, supporting institutions and basic enterprises are defined, whose representatives are part of the Competence Center on a permanent basis and have the priority right to initiate and participate in the implementation of projects. Other participants are invited to participate in the justification of the subject and target projects within the limits of their competence and interest. Participants communicate online or offline, and event administration and information exchange are carried out by the platform operator. Communication of participants at all stages of joint activity, formation and implementation of project decisions, procurement and sale of branded and other products (goods, services) is carried out using the platform's marketplace (Figure 4).

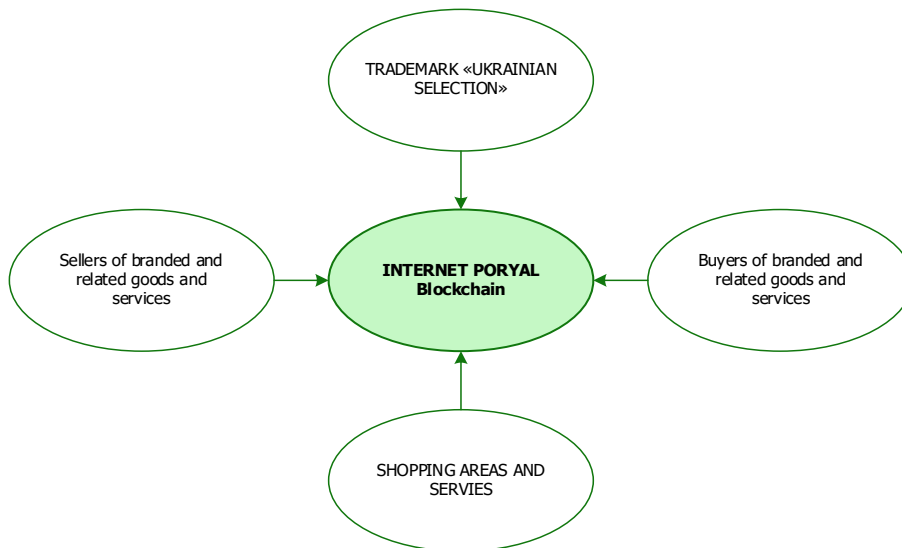


Figure 4. Marketplace.

The Marketplace unites participants affiliated with the "Ukrainian Selection" trademark, which represents original agricultural science products that have a certificate of conformity and quality and are grown and processed in accordance with the brand's requirements and the preferences of regular consumers. The Internet portal of the marketplace, which provides market services to participants according to categories, distributes advertising and informational materials, commercial requests and offers. Presentation and sale of products on the marketplace are carried out on electronic trading platforms.

The operation of participants' resources and goods is carried out in the format of business projects, which are provided by the platform's business incubator.

Functionally, the working mechanism of the Business Incubator (Figure 5) is built on cyclical processes of modelling, designing and piloting joint business projects on a professional consulting basis with the participation of representatives - experts from the scientific, innovative, production, commercial, and financial spheres.

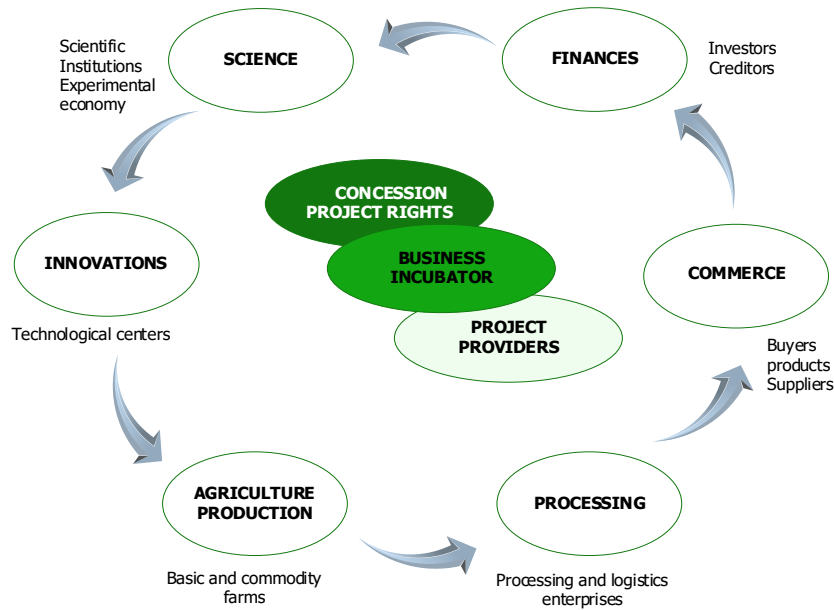


Figure 5. Business incubator.

The development of the project is financed by the involved investors, the cost compensation is carried out by the project provider, who acquired the concession rights to implement the project on a business basis. Commercial concession contracts for the project are concluded by the platform operator with project providers.

The scheme of business provision of innovation and investment projects on contractual cluster terms (Figure 6) provides for the purchase by the provider of a complex of rights, project developments and resources with a package of contractual support of the operator and supporting institutions.

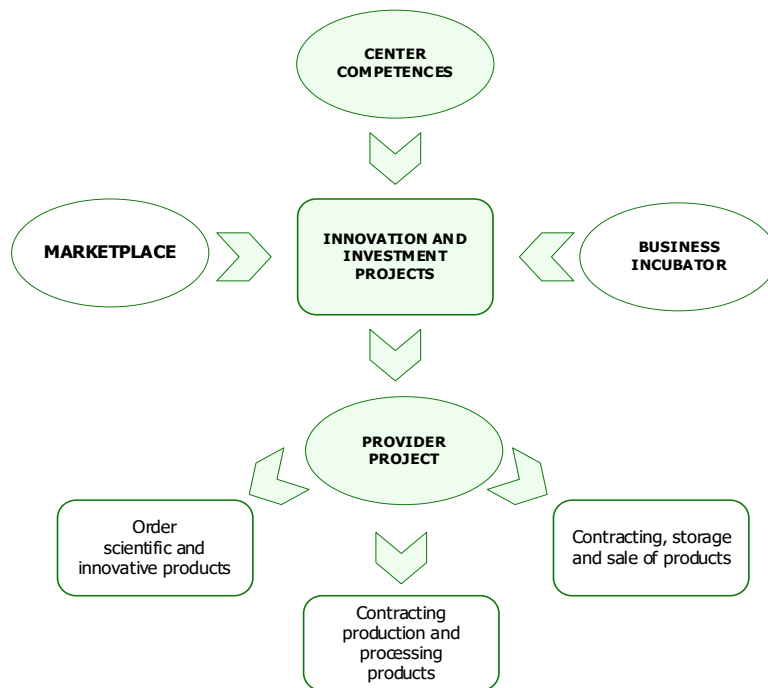


Figure 6. Project accelerator.

The provider implements project solutions through contracting and implementation of innovative and commercial products with specified executors of individual project tasks.

Implementation of projects is carried out by the provider according to the principle of operation of the accelerator. The business incubator is developing a project. The rights to the project are transferred to the project provider from the moment of execution of the commercial concession agreement between the operator and the project provider. The Center of Competence involves experts from supporting institutions and basic enterprises in the implementation of the project. The Marketplace provides priority services to the provider and project executors, and promotes order formation and consumer demand for the project's products. The provider orders and buys scientific and innovative products on contractual terms, contracts on forward terms the production of commodity products, which are supplied to interested buyers. The set of contractual obligations forms a system of flexible cluster relations of technology executors, product manufacturers and sales agents.

Thus, ordering, development of technologies, cultivation of innovative products, production of agricultural, food and processing products, and their delivery to consumers through trade networks and directly is carried out according to the cluster model (Figure 7), the driving force of which is business companies - project providers.

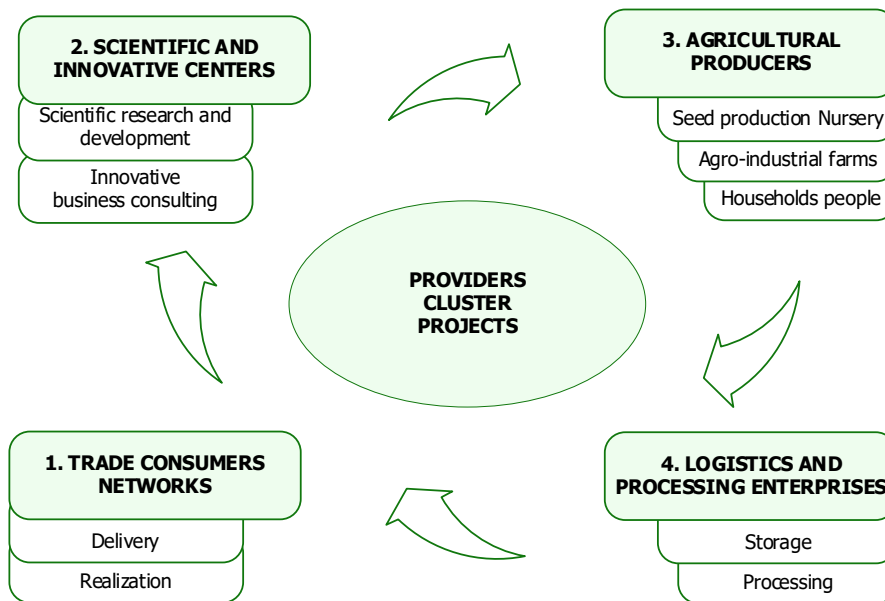


Figure 7. Project cluster.

The provider orders and distributes scientific and innovative products - technologies under contracting agreements, orders the cultivation of agricultural products under forward contracts, and ensures its storage and processing in accordance with consumer requests for commodity products of branded categories. A cluster of suppliers and producers of innovative and marketable products can be formed under a one-time or permanent order, which is a flexible form of contractual obligations that allow participants to choose the form and scope of obligations depending on opportunities and desires without losing independence. At the same time, the provider has the right to select performers on a competitive basis to ensure the competitiveness of cluster products. Performers who violate contractual obligations may receive a "ban" from further participation in projects and presentations on the innovative bioeconomy platform under the brand trademark "Ukrainian Selection".

The presented model of cooperation between science and business on the platform of innovative bioeconomy allows participants, regardless of the form of ownership, on contractual terms, to realize their intellectual and production potential in a market business format for the promotion of competitive scientific and innovative products (biotechnologies, bioresources, services) to the market in a closed market-oriented cluster bioecosystem. That is, for a system in which science performs important bio-economic functions of producing scientific and innovative products demanded by consumers, receiving money for the payment of remuneration to scientists and the development of the research and experimental base from non-state sources.

It has been proven that in the existing conditions, the contractual association of science and business on a cluster-type business platform is one of the real institutional tools that will make it possible to preserve agricultural science and ensure its demand by agricultural producers. The Institute of Innovative Bioeconomy researched the basics of bioeconomy as a

platform for the market integration of science and business, developed and tested models and mechanisms for mobilizing the innovative potential of scientific institutions and its implementation in cluster agricultural formations for the reproduction and distribution of seeds and planting material on forward conditions of public-private partnership.

Approbation of the bio-economic model was carried out on the basis of clusters of agro-technopolises "Podilya" and "Dniprovye" for the selection and technological support of the agricultural sector in the conditions of a military crisis on the basis of innovative bio-economy and regional smart specialization.

A series of startups have been implemented to test science-intensive businesses based on the use of scientific bioinnovations in the field of potato growing, horticulture, vegetable growing, production of cereals, legumes, oil, essential oil, medicinal products, flavoured additives, health drinks and organic sublimates. Startups for growing a line of ornamental plants and energy crops for the production of biofuel, as well as for the production of natural sugar substitutes, are being developed. Promising project directions are the release of a line of health products based on honey, as well as poultry meat and eggs, and other products of animal origin.

As a result of the approval of the bio-economic model in 2023, UAH 5 million was raised for the purchase and transfer of seeds and planting material, a cooperative production of innovative products was organized on an area of 50 hectares, and products based on domestic selection were produced in the amount of UAH 54 million. A 3- to 5-fold increase in seed prices was achieved, and revenue from the sale of products under the "Ukrainian Selection" brand in the Kyiv and Vinnytsia regions exceeds revenue from sales in retail chains by 20-50%.

The developed cluster bio-economic model of realizing the innovative potential of agrarian science allows in crisis conditions:

- attract funds from non-state sources for the reproduction and distribution of breeding and technological resources in the ratio: 25% - science, 75% - business;
- to double the financing of scientific institutions due to receiving advance payments for the order of innovative products by business providers;
- up to 70% to increase the specific weight of the contracted innovative products produced under the order of the participants of cluster formations;
- to increase the level of additional income from the sale of innovative developments (resources/services) by 40% due to guaranteed royalty payments and a share of the reward received from the sale of the final products of the cluster.

The formation of the innovative bioeconomy platform, as a system for the development of agricultural science on the basis of public-private partnership, is in an active phase (Figure 8).



Figure 8. Formation of the platform.

To ensure Ukraine's food security in crisis conditions:

- the project of the business platform "Ukrainian Selection" was developed regarding the high-tech development of the agricultural industry in the conditions of the martial law economy based on the use of the innovative potential of agrarian science and the investment capital of agrarian business;
- the concept of the implementation program of the principles of the business platform "Ukrainian Selection" was developed, aimed at the integration of science and business with the aim of promoting the selection and technological achievements to the market on the business basis of helping to overcome crisis phenomena and laying the foundation for the revival of the agrarian sector of the economy;
- the Agrotechnopolis cluster model for the development of agricultural regions based on innovative bioeconomy and smart specialization was introduced with the participation of scientific institutions of the National Academy of Sciences located in Kyiv, Vinnytsia, and other regions;
- a portfolio of innovative proposals from agrarian science was formed and introduced for implementation to support the recovery and effective functioning of agrarian industries and regions, providing the population with food due to the use in agricultural production of the achievements of agrarian science and technical assistance of international partners and resources of innovative, investment-active agribusiness.

The projects are implemented by the Institute of Innovative Bioeconomy on the basis of and with the participation of the Institute of Potato Growing, the Institute of Fodder and Agriculture of Podillia, the Institute of Bioenergy Crops and Sugar Beet, the Institute of Horticulture, the Institute of Vegetable and Melon Growing, the Institute of Climate-Oriented Agriculture, the model has been approved by other institutes and research stations of the National Academy of Sciences during 2023.

The Competence Center of the platform, a business incubator of projects, is operating. From 2024, the platform's marketplace will be implemented. Also, 10 clusters for the production of niche products have been formed in the Agrotechnopolis system of the platform.

## DISCUSSION

The scientific-analytical report of the Ministry of Education and Science of Ukraine (DNU UkrINTEI) based on the results of the monitoring study of the scientific and scientific and technical activity of Ukraine in 2022 shows that Ukraine has a high innovation index in obtaining rights to intellectual property objects, but a very low rating in matters of stimulation innovative activities of small and medium-sized businesses.

In Ukraine, in 2022-2023, the e-Work business support grant program was introduced (CMU Resolutions No. 738 of June 21, 2022 and No. 739 of June 24, 2022). However, scientific state institutions cannot participate in this program. The State Innovative Financial and Credit Institution under the Ministry of Strategic Industries of Ukraine formally operates, there are other declared institutions supporting innovative activities, but domestic scientific and educational institutions, especially in the agricultural sector, do not manage to become participants in their programs and projects.

Thus, it can be considered that Ukraine has formed a legal framework for the development of the innovative sphere, but it is not financially supported by the state budget and is not welcomed by non-state funds for the promotion of business development. Therefore, agricultural science is forced to look for ways of mutually beneficial partnerships with private businesses in order to gain access to alternative sources of funding.

Projects implemented by the Institute of Innovative Bioeconomy on the basis of and with the participation of the Institute of Potato Growing, the Institute of Fodder and Agriculture of Podillia, the Institute of Bioenergy Crops and Sugar Beet, the Institute of Horticulture, the Institute of Vegetable and Melon Growing, the Institute of Climate-oriented Agriculture, other institutes and research stations of the National Academy of Sciences are working on the proposed innovative model during 2023.

The competence centre of the platform should be effective - a business incubator of projects. From 2024, the platform's marketplace will be implemented. Also, 10 clusters for the production of niche products have been formed in the regional agropolices of the platform. Therefore, the proposed innovative platform is relevant and effective for agricultural producers and consumers.

## CONCLUSIONS

In Ukraine, the national system of legislative and financial provision of innovative infrastructure for the implementation of scientific achievements in a business format does not work. In the conditions of a military crisis, it is difficult to expect changes for the better in non-defense industries. This also applies to such important areas as agriculture, which is responsible for food security and export opportunities of the state.

Agrarian science must support the agricultural sector, for this, we need effective models of realizing its scientific and innovative potential in cooperation with high-tech business. In order to ensure the adaptation of agrarian science to the crisis conditions of the functioning of the economy of Ukraine in wartime, to mobilize the innovative potential of scientific institutions to ensure the food security of the state, to attract additional resources to preserve the development of agrarian science at the expense of non-state sources, to integrate agrarian science and agricultural production on a mutually beneficial basis through public-private partnership. The Institute of Innovative Bioeconomy has developed a set of measures for the development of agricultural science on the platform of innovative bioeconomy.

The set of measures for the formation of a platform in the system of agrarian science on the basis of conducted tests and adopted organizational decisions on the example of the National Academy of Agrarian Sciences of Ukraine will include:

- creation of a market-adapted technological platform for the cooperation of science and business for the implementation of joint innovative, investment, and infrastructural projects of high-tech development of the agrarian sector;
- mobilization of the innovative potential of agricultural science to solve the issues of providing producers and the population with high-quality breeding and technological material, services for their effective technical and economic use;
- formation of an integrated business infrastructure on the platform of innovative bioeconomy for the transfer of scientific innovations, ordering, production and sale of agro-food products.

The implementation of the platform will open opportunities for the integration of science and business on the platform of innovative bioeconomy in the crisis economic and legal conditions of Ukraine, namely:

1. Science - will increase the effectiveness of the implementation of scientific developments due to obtaining innovations in the infrastructure of the transfer market; expands the complex of integrated relations with agricultural and commercial agribusiness regarding the implementation of joint high-tech projects.
2. Business - gets access to projects for the production of knowledge-intensive products based on the effective use of innovations, expands the range of products and sales markets due to the implementation of cluster production models and the attraction of investments in highly productive agribusiness.
3. The state will promote the revival and development of agricultural industries based on the effective combination and use of the potential of science and business, creating conditions for financial support of integrated sustainable agro-technological and business formations.

Prospects for further research are the approbation of the platform in the system of agricultural education and science, taking into account the requirements of the time.

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## ADDITIONAL INFORMATION

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## FUNDING

*The Authors received no funding for this research.*

## CONFLICT OF INTEREST

*The Authors declare that there is no conflict of interest.*

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## РОЗВИТОК СІЛЬСЬКОГОСПОДАРСЬКОЇ НАУКИ НА ПЛАТФОРМІ ІННОВАЦІЙНОЇ БІОЕКОНОМІКИ

Економіка України перебуває в кризовому стані, викликаному війною. Аграрний сектор в екстремальних умовах намагається виконувати свою функцію із забезпечення продовольчої безпеки держави, підтримки її експортного потенціалу, незважаючи на обмежені ресурси та логістичні проблеми. Аграрна наука в умовах дефіциту бюджетного фінансування намагається знайти шляхи використання науково-експериментальної бази, розроблених сортів і технологій для сприяння стабілізації та відродженню агропромислового виробництва в галузі та регіонах. Необхідні ефективні моделі реалізації інноваційного потенціалу аграрної науки на засадах бізнесу.

Мета дослідження – обґрунтування платформи ринкової адаптації науки до кризових умов і мобілізації наукового потенціалу на проривних напрямках розвитку аграрної царини на засадах інноваційної біоекономіки й тісної співпраці науки та бізнесу.

Для реалізації поставленої мети в роботі оцінено можливості інтеграції науки та бізнесу на платформі інноваційної біоекономіки в кризових економіко-правових умовах України; обґрунтовано біоекосистему платформи партнерства науки й бізнесу та механізм її функціонування для реалізації спільних інноваційно-інвестиційних проєктів. Для запровадження обґрунтованої біоекосистеми запропоновано комплекс заходів щодо формування платформи в системі аграрної науки на основі проведених випробувань та ухвалених організаційних рішень за прикладом Національної академії аграрних наук України.

Співпраця аграрної науки та бізнесу на основі запропонованої платформи державно-приватного партнерства забезпечує мобілізацію наукового потенціалу для розв'язання актуальних проблем інноваційного розвитку аграрного виробництва, сільських територій шляхом створення й трансферу проривних і підтримуючих біоінновацій, виробництва конкурентоспроможної інноваційної агропродовольчої продукції.

**Ключові слова:** аграрна наука, агробізнес, платформа інноваційної біоекономіки, державно-приватне партнерство, кластерна модель виробництва інноваційної продукції

**JEL Класифікація:** O13, O32, Q16, L23