

**Name of the topic of the scientific and technical program:** BR10764919 Research of the influence of state policy in the agricultural sector on the development of cooperation processes in the agro-industrial complex, sustainable development of rural areas and ensuring food security.

**The relevance of the research** lies in the fact that Kazakhstan has pledged to achieve the 2030 Sustainable Development Goals (SDG 2030) by 2030, based on a comprehensive solution to the problems of the economy, ecology and social development. The strategic documents of Kazakhstan are also aimed at the sustainable development of the republic, including rural areas (RA). The transition of the agro-industrial complex (AIC) to sustainable development based on taking into account only declarative approaches (DA) has not yet given the desired effect, and none of the nine programs for the development of the AIC and RA have achieved their goals. Therefore, the proposed program provides for a *methodology* for the integrated use of DA with digital spatial and temporal data (STD), as well as sustainable development indicators (SDI) of SDG 2030. *Potential consumers* of the results of the research of the program are the subjects of the agro-industrial complex and government bodies.

**The purpose of the scientific and technical program:** Development of an organizational and economic mechanism for ensuring sustainable development of the agro-industrial complex within the framework of the implementation of the National Project for the Development of the Agro-Industrial Complex of the Republic of Kazakhstan until 2026 based on the integration of declarative, spatiotemporal approaches and the use of sustainable development indicators of the Sustainable Development Goals 2030.

**The expected results of the program.**

Upon completion of the program will/will be:

An assessment of the state of food security, identification of problems in the system of its preservation, regional imbalances, the level of achievement of the criteria defining it was given, and systems of indicators were developed that characterize their sustainability on the basis of declarative approaches, spatio-temporal data and economy, ecology and social of sustainable development indicators;

A strategic directions have been developed and measures have been substantiated for the sustainable provision of food security in the republic, including the creation of a system of high stability of food supply to the population of the republic, the spatial structure of which is based on the natural and economic resources of the agro-industrial complex, the number and structure of consumers, the cost of not only food production, but also its delivery, the prevailing price situation based on declarative approaches, spatio-temporal data and economy, ecology and social of sustainable development indicators;

Measures were developed and substantiated for the formation and functioning of balanced food markets, forecasting their conjuncture, including possible scenarios for equilibrium development and promising parameters of certain types of food markets (supply and demand volumes, acceptable price level to meet domestic demand and sustainable participation in the external market) , measures to remove barriers (significantly reduce the impact) in the system of interregional promotion of products and maintain a balanced market based on declarative approaches, spatio-temporal data and economy, ecology and social of sustainable development indicators;

Researched the social infrastructure of the village, economic components and indicators of the quality of life of the rural population, employment and incomes based on declarative approaches, spatio-temporal data and economy, ecology and social of sustainable development indicators;

Models for the integrated development of the social infrastructure of rural settlements and rural self-government were developed on the basis of declarative approaches, spatio-temporal data and economy, ecology and social of sustainable development indicators;

Organizational and economic measures have been developed to increase the profitability of domestic agricultural producers and overcome rural poverty, providing an increase in the economic activity of labor resources of the agro-industrial complex based on declarative approaches, spatio-temporal data and economy, ecology and social of sustainable development indicators;

An overview of the world experience in the development of the system of state regulation and support of agribusiness was presented and proposals were developed for adapting the positive experience to the conditions of the Republic of Kazakhstan on the basis of declarative approaches taking into account the spatio-temporal data and economy, ecology and social of sustainable development indicators;

Presented an economic assessment of the effectiveness of the mechanism for subsidizing agribusiness entities in the context of its industries on the basis of declarative approaches and spatio-temporal data;

A mechanism for subsidizing agricultural cooperatives has been developed in order to stimulate the amalgamation of small forms of farming (private household plots, small peasant farms) and transfer of private household plots to the status of individual entrepreneurs based on declarative approaches, taking into account spatio-temporal data and economy, ecology and social of sustainable development indicators;

A mechanism has been developed to stimulate the development of the infrastructure for promoting products from the manufacturer to the consumer by providing investment subsidies for the purchase of technological equipment (fattening site, MPP, slaughterhouses, etc.) based on declarative approaches taking into account spatio-temporal data and economy, ecology and social of sustainable development indicators;

A mechanism for subsidizing processing enterprises has been developed in order to increase the utilization of production capacities and the use of domestic agricultural raw materials based on declarative approaches, taking into account STD and spatio-temporal data and economy, ecology and social of sustainable development indicators;

Presented an economic assessment of the possibility of using the potential of private household plots for the development of entrepreneurship in the countryside and increasing the income of the rural population on a cooperative basis, taking into account declarative approaches, spatio-temporal data and economy, ecology and social of sustainable development indicators;

A mechanism has been developed to stimulate the transfer of private household plots to the status of individual entrepreneurs and the unification of small forms of farming into agricultural cooperatives of the vertical type on the basis of declarative approaches, taking into account declarative approaches;

A mechanism has been developed for uniting small forms of farms (private household plots, peasant farms) into horizontal agricultural cooperatives based on declarative approaches, taking into account spatio-temporal data and economy, ecology and social of sustainable development indicators;

A mechanism has been developed for the effective functioning of agricultural cooperatives with wholesale distribution centers at the district level and commodity and logistics centers at the regional level with the aim of stable sales and effective promotion of products from producer to consumer based on declarative approaches, taking into account, spatio-temporal data and economy, ecology and social of sustainable development indicators;

An information system has been developed for compiling dynamic models of input-output balance, developed using the method of economic cybernetics on the basis of declarative approaches, taking into account the spatio-temporal data and economy, ecology and social of sustainable development indicators;

The information system has been filled and improved for the compilation of dynamic models of the input-output balance on the basis of declarative approaches, taking into account the spatio-temporal data and economy, ecology and social of sustainable development indicators;

An assessment was given of the impact of agriculture, including agricultural production of the main types of agricultural products, on related sectors of the economy and social development of

rural areas in the Republic of Kazakhstan based on declarative approaches taking into spatio-temporal data and economy, ecology and social of sustainable development indicators.

For the implementation of all subprograms, young specialists will be involved, incl. at least 11 PhD students and 19 undergraduates, 8 recommendations were prepared, 7 certificates of registration of intellectual property rights were received, at least 6 articles were published in peer-reviewed foreign scientific journals with a non-zero impact factor and at least 11 publications in foreign and domestic editions recommended by KOKSON.

#### **Results obtained in 2021.**

Were studied:

- measures to ensure national food security, the formation and functioning of balanced food markets and forecasting their conjuncture according to international generally accepted indicators of food security based on the integrated use of declarative approaches (DA), declarative approaches, spatio-temporal data (STD) and economy, ecology and social (EES) of sustainable development indicators (SDI);

- measures for the development of social infrastructure and improvement of the quality of life of the rural population based on the integrated use of on DA, STD and EES SDI;

- ways for improving the system of subsidizing agribusiness entities, taking into account the experience of developed countries and its adaptation to the economic conditions of the agro-industrial complex of Kazakhstan on the basis of the integrated use of DA, STD and EES SDI;

- the effectiveness of combining small-scale commodity producers (peasant farms, private household plots) on the example of pilot projects and sustainably functioning cooperatives in priority areas of development of the agro-industrial complex and in the context of regions based on the integrated use of DA, STD and EES SDI;

- the impact of agriculture, including agricultural production of the main types of agricultural products, on related sectors of the economy and social development of rural areas in the Republic of Kazakhstan on the basis of dynamic input-output balance models developed using the method of economic cybernetics, STD and EES SDI.

**The main design and technical and economic indicators** - the development differs from previous solutions in the wide and deep use of the STD SDI SDGs.

**Degree of implementation** - the stage of studying problems on the topic of scientific and technical progress has been completed.

**The economic efficiency** of the studied processes using digital technology is higher than the simple use of declarative information.

#### **Results obtained in 2022.**

- a methodology for an integrated assessment of the sustainable development of the region was developed using demographic, economic, social, environmental and climatic indicators;

Analyzed and systematized:

- measures to ensure national food security (FS), the formation and functioning of balanced food markets and forecasting their conjuncture according to internationally generally accepted indicators of food security based on the integrated use of DA, STD and EES of the SDI;

- measures to develop social infrastructure and improve the quality of life of the rural population based on the integrated use of DA, STD and EES of the SDI;

- ways to improve the system of subsidizing subjects of the agro-industrial complex, taking into account the experience of developed countries and its adaptation to the economic conditions of the agro-industrial complex of Kazakhstan based on the integrated use of DA, STD and EES of the SDI;

- the effectiveness of the association of small commodity producers (peasant farms, private household plots) on the example of pilot projects and sustainable cooperatives in priority areas of development of the agro-industrial complex and in the context of regions based on the integrated use of DA, STD and EES of the SDI;

- the impact of agriculture, including the agricultural production of the main types of products, on related sectors of the economy and the social development of rural areas in the Re-

public of Kazakhstan based on dynamic models of the inter-sectoral balance developed using the methods of economic cybernetics, STD and EES of the SDI;

Based on the results of the research, the following were published: 3 articles in peer-reviewed foreign scientific journals with a non-zero impact factor and 5 articles in journals recommended by CCES; 3 recommendations were prepared, 7 copyrights for intellectual property were obtained; involved 8 undergraduates and 4 PhD doctoral students.

The main design and technical and economic indicators - the development differs from previous solutions using STD and SDI SDGs.

The degree of implementation - the stage of analysis and systematization of problems on the topic of scientific and technical progress has been completed.

The economic efficiency of the studied processes using digital technologies is higher than the simple use of declarative information.

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### FOREIGN PUBLICATIONS

in publications of the scientometric database Scopus:

1. Saule S. Shintaeva, Alexadr A. Pyagay, Makhabbat K. Iskakova et al. Impact of the Agreements of the Eurasian Economic Union on the Competitiveness Agrocultrual Sector of the Member States. // Problemy Ekorozwoju – problems of Sustainable Devolopment. – 2022. - 17 (1). – P. 211-221 <https://ekorozwoj.pollub.pl/index.php/1712021-2/impact-of-the-agreements-of-the-eurasian-economic-union-on-the-competitiveness-of-the-agricultural-sector-of-the-member-states/> (процентиль -57).

2. Muzdybayeva, T., Alipbeki, O., Chikanayev, A., Abdykarimova, S. Road pavement using geosynthetics on the territory of rural settlements International Journal of GEOMATE. – 2022. - 23(96). - P. 61–68 <https://www.scopus.com/record/display.uri?eid=2-s2.0-85135583940&origin=resultslist&sort=plf-f> (процентиль 39)

3. Darima ZHENSKHAN, Alexandr PYAGAY, Roza BESPAYEVA, Maulet KADRINOV, Zhibek OMARKHANOVA, Assiya TATIKOVA. The Current State of Food Security in Kazakhstan, in the Context of Eurasian Economic Union. Environmentally Overview in the Case of Climate Change's Scenarios Journal of Environmental Management and Tourism. Vol 13 No 6 (2022): JEMT, Volume XIII, Issue 6(62) <https://journals.aserspublishing.eu/jemt/issue/view/238> (процентиль 53)

### DOMESTIC PUBLICATIONS

in journals recommended by COXON MES RK:

1. Pyagai A.A., Shintaeva S.S. Evaluation of the effects of state integration on the agrarian sector of Kazakhstan // Bulletin of the Kazakh University of Economics, Finance and International Trade. - 2021. - No. 3 (44). - С.49-57 <https://profspo.ru/magazines/50394/2021/3> (In Russia) (Пягай А.А., Шинтаева С. С. Оценка эффектов влияния государственной интеграции на аграрный сектор Казахстана//Вестник Казахского университета экономики, финансов и международной торговли. - 2021. - №3 (44). - С.49-57 <https://profspo.ru/magazines/50394/2021/3>)

2. Pyagai A.A., Bспаeva R.S., Bugubaev R.O. Current state of food security in the Republic of Kazakhstan // Central Asian Economic Review NARXOZ university. No. 6 (141). - PP.18-28 <https://caer.narxoz.kz/jour/article/view/339> (In Russia) (Пягай А.А., Беспаяева Р.С., Бугубаев Р.О.. Современное состояние продовольственной безопасности в Республике Казахстан // Central Asian Economic Review NARXOZ university. №6 (141). - С.18-28 <https://caer.narxoz.kz/jour/article/view/339>)

3. Alipbeki O.A., Makenova S.K., Agumbaevna A.E., Soltan G.Zh. The relationship of agricultural and industrial sectors in the regions of Kazakhstan on the basis of natural zoning and the integration of declarative, spatio-temporal data, indicators of sustainable development//Bulletin of Science of the Kazakh Agrotechnical University. S. Seifullin. - 2022. - No. 2 (113).-P.1-

S.56-66. <http://bulletinofscience.kazatu.edu.kz/index.php/bulletinofscience/issue/view/34/18>. (In Russia)

(Әліпбеки О.Ә., Макенова С.К., Ағумбаевна А.Е., Солтан Г.Ж. Взаимосвязь сельскохозяйственной и промышленной отраслей в регионах Казахстана на основе природного зонирования и интеграции декларативных, пространственно-временных данных, индикаторов устойчивого развития // Вестник науки Казахского агротехнического университета им. С. Сейфуллина. - 2022. - №2 (113). - Ч.1-С.56-66)

<http://bulletinofscience.kazatu.edu.kz/index.php/bulletinofscience/issue/view/34/18>)

4. Aituganov K. K., Kurmanova G. K., Kulmagambetova A. S., Zhanbusinova M. Kh., Daniyarova M. T., Kenzhagaliev E. M. Ways of combining small forms of farming into agricultural cooperatives // Bulletin of Science of the Kazakh Agrotechnical University them. S. Seifullina.-2022.-№1 (112).-P.73-82.

<http://bulletinofscience.kazatu.edu.kz/index.php/bulletinofscience/issue/view/32/15>. (In Russia) (Айтуганов К. К., Курманова Г. К., Кульмагамбетова А. С., Жанбусинова М. Х., Даниярова М. Т., Кенжағалиев Е. М. Пути объединения малых форм хозяйствования в сельскохозяйственные кооперативы // Вестник науки Казахского агротехнического университета им. С. Сейфуллина.-2022.-№1 (112).-С.73 -82.

<http://bulletinofscience.kazatu.edu.kz/index.php/bulletinofscience/issue/view/32/15>)

5. A. A. Pyagai, R. S. Bepaeva, R. O. Bugubaeva The current state of food security in the Republic of Kazakhstan. // Central Asian Economic Review. - 2021. - (6). - P.18-28. <https://doi.org/10.52821/2789-4401-2021-6-18-28>. (In Russia) (А. А. Пягай, Р. С. Беспаева, Р. О. Бугубаева Современное состояние продовольственной безопасности в Республике Казахстан. // Central Asian Economic Review. – 2021. - (6). - С.18-28. <https://doi.org/10.52821/2789-4401-2021-6-18-28>)

guidelines:

6. Guidelines for ensuring food security in Kazakhstan. /Alipbeki O.A., Pyagay A.A., Zhenskhan D., Kadrinov M.Kh. - Nur-Sultan: Kazakh Agrotechnical University. ISBN 978-601-257-399-2 - 2022. - 66 p. (In Russia) (Методические рекомендации по обеспечению продовольственной безопасности Казахстана. /Әліпбеки О.Ә., Пягай А. А., Женсхан Д., Кадринов М. Х. - Нур-Султан: Казахский агротехнический университет. ISBN 978-601-257-399-2 - 2022. – 66 с.)

7. Recommendations for the unification of small forms of management (personal subsidiary plots and peasant farms) into cooperatives. /Aytuganov K.K., Alipbeki O.A., Pyagay A.A., Kurmanova G.K., Kulmaganbetova A.S., Zhanbusinova M.Kh., Daniyarova M.T., Kenzhagaliev E.M. . - Astana 2022: Kazakh Agrotechnical University. ISBN 97-601-257-399-5 - 2022. - 52 p.) (In Russia) (Рекомендации на объединение малых форм хозяйствования (личных подсобных хозяйств и крестьянских фермерских хозяйств) в кооперативы. /Айтуганов К.К., Әліпбеки О.Ә., Пягай А. А., Курманова Г.К., Кульмаганбетова А.С., Жанбусинова М.Х., Даниярова М.Т., Кенжеғалиев Е.М. . – Астана 2022: Казахский агротехнический университет. ISBN 97-601-257-399-5 - 2022. – 52 с.)

8. Guidelines for state regulation of the agro-industrial complex of Kazakhstan. / Kasimbekova M. A., Vaimagambetova Z. A., Mataibaeva G. Zh. Under the general editorship of Alipbeka O.A. - Nur-Sultan: NJSC "Kazakh Agrotechnical University named after. S. Seifullin. - 2022. - 52 p. (In Russia) (Методические рекомендации по государственному регулированию агропромышленного комплекса Казахстана. / Касимбекова М. А., Баймагамбетова З. А., Матайбаева Г. Ж. Под общей редакцией Әліпбеки О.Ә. - Нур-Султан: НАО «Казахский агротехнический университет им. С.Сейфуллина». - 2022.- 52 с.)

### **Results obtained in 2023.**

- methodological approaches have been developed for assessing the long-term development and forecasting land use of the administrative-territorial region based on the integral application of the PVD, economic, environmental and social indicators of sustainable development (EES ISD);

- measures have been developed and justified to ensure national food security (FS), the formation and functioning of balanced food markets and forecasting their situation according to internationally generally accepted indicators of food security based on the integrated use of DP, PVD and EES IUR;
- measures have been developed to develop social infrastructure and improve the quality of life of the rural population based on the integrated use of DP, PVD and EES IUR;
- proposals have been developed to improve the system of subsidizing agricultural entities, taking into account the experience of developed countries and its adaptation to the economic conditions of the agro-industrial complex of Kazakhstan based on the integrated use of DP, PVD and EES IUR;
- the effectiveness of the association of small commodity producers (peasant farms, private household plots) has been studied and scientifically substantiated using the example of pilot projects and sustainable functioning cooperatives in priority areas of development of the agro-industrial complex and across regions based on the integrated use of DP, PVD and EES IUR;

Based on the research results, the following were published: 2 articles (the third article successfully passed the second round of review) in peer-reviewed foreign scientific publications with a non-zero impact factor and 7 articles in publications recommended by KOKSNVO; 5 recommendations were prepared, 5 intellectual property rights were obtained; 10 master's students and 5 PhD doctoral students are involved.

Main design and technical and economic indicators - the development differs from previous solutions in the use of PVD and SDG IRM.

Degree of implementation - the implementation of research results into the activities of the State Institution "Socio-Economic Department" of the Burabay region and the State Institution "Agricultural Administration" of the Zhambyl region.

The economic efficiency of the studied processes using digital technologies is higher than the simple use of declarative information.

Scope of application: agriculture.

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### List of published works for 2023:

#### DOMESTIC PUBLICATIONS

in journals recommended by COXON MES RK:

1. Alipbeki, O.; Mussaif, G.; Alipbekova, C.; Kapassova, A.; Grossul, P.; Aliyev, M.; Mineyev, N. Untangling the Integral Impact of Land Use Change, Economic, Ecological and Social Factors on the Development of Burabay District (Kazakhstan) during the Period 1999–2021. *Sustainability* **2023**, *15*, 7548. <https://doi.org/10.3390/su15097548> (G1. процентиль 87) (на английском языке).

2. O. Alipbeki<sup>1\*</sup>, Ch Alipbekova<sup>1</sup>, G Mussaif<sup>1</sup>, N Mineyev<sup>1</sup>, M Aliyev<sup>1</sup>, B Akhmetov<sup>1</sup>, and R Turegeldiyeva. The driving forces of changes in land use of a Peri-urban area: the case of Tselinograd district, Kazakhstan *E3S Web of Conferences* **386**, 05013 (2023) *GISCA 2022 and GI 2022* <https://doi.org/10.1051/e3sconf/202338605013> <https://www.e3s-conferences.org/articles/e3sconf/abs/2023/23/contents/contents.html> (G3. процентиль 25) .

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