

BIOECONOMY CONCEPT AND POSSIBILITIES OF ITS IMPLEMENTATION IN UZBEKISTAN AGRICULTURE FOR MAKING IT MORE ATTRACTIVE FOR INVESTMENTS

Madina Raimjanova¹, PhD; **Dina Popluga**², PhD

¹Tashkent Institute of Finance;

²Latvia University of Life Sciences and Technologies, Faculty of Economics and Social
Development

Abstract. One of the most crucial elements in the development of Uzbekistan's agricultural sector is investment. When compared to 2002, the monetary number of investments in agriculture increased by 176.7 times, which had a beneficial impact on agricultural exports, value added, gross output, and food manufacturing. However, for more rapid and dynamic agricultural development even bigger investments are needed. This study analyses possibilities of implementing bioeconomy concept in Uzbekistan agriculture for making this sector more attractive for investments. In this study authors explain bioeconomy concept as set of activities where renewable bioresources are basis for all economic processes in agriculture, agricultural production is promoted by research and innovation, and where broad cross-sectoral and institutional focus is present. In this study, the authors have identified agricultural priorities in Uzbekistan, analysed direction and character of agriculture development in Uzbekistan depending on the number of investments, identified Uzbekistan's needs for bioeconomy development. In order to make agricultural sector more attractive for investments this study authors recommend that it is necessary to develop and implement a state program for the development of bioeconomy, containing a set of its goals and priorities, mechanisms for achieving and ensuring them, principles for selecting participants in the production process, as well as determining their powers and degree of responsibility.

Key words: agriculture, investments, bioeconomy, development, Uzbekistan.

JEL code: Q57

Introduction

Natural and environmental problems are extremely dangerous and global. No doubt they provide direct and strongest impact on the economy, which is directly based on the use of natural resources. However, natural resources (together with labour) form the basis of the national wealth of the country. These problems, together with population growth, as well as several other factors have created the need to search for new ways to save resources and develop the economy. One of them is bioeconomy.

Today, bioeconomy and biotechnology is one of the most dynamically developing and investment-attractive sectors of the world economy (Barañano L. et al., 2021). As rated by leading industry experts by 2030, biotechnology will provide 2.7% of the GDP of the developed countries. For developing countries, the contribution of biotechnology is even greater. By 2030, biotechnology will provide 80% of medical products, 35% of chemical industry and 50% of agricultural production. By 2050, the global bioenergy market will be 150 billion USD. 30% of the total world energy demand will fall on the use of renewable sources. The biomass market to meet the demand will amount to 150 billion USD by 2050. According to experts, the global biotechnology market in 2025 will reach USD 2 trillion level (Zharashuyeva L. M., Bischekova F. R., 2015). Advanced biotechnologies can play a significant role in improving the quality of life and human health, ensuring the economic and social growth of states (especially in developing countries). Modern biotechnologies can be applied in industry, energy, agriculture economy, medicine, ecology etc.

Bioeconomy and biotechnology it is the most highly technological part of the economy. In many countries, it has become widespread and developed (Frisvold G. B. et al., 2021; Muska A. et al., 2023; McCormick K., Kautto N., 2013); however, in Uzbekistan, it is only at the stage of formation, although our country has huge opportunities to succeed in this, but this will require investments.

¹ E-mail: tmikon@tfi.uz

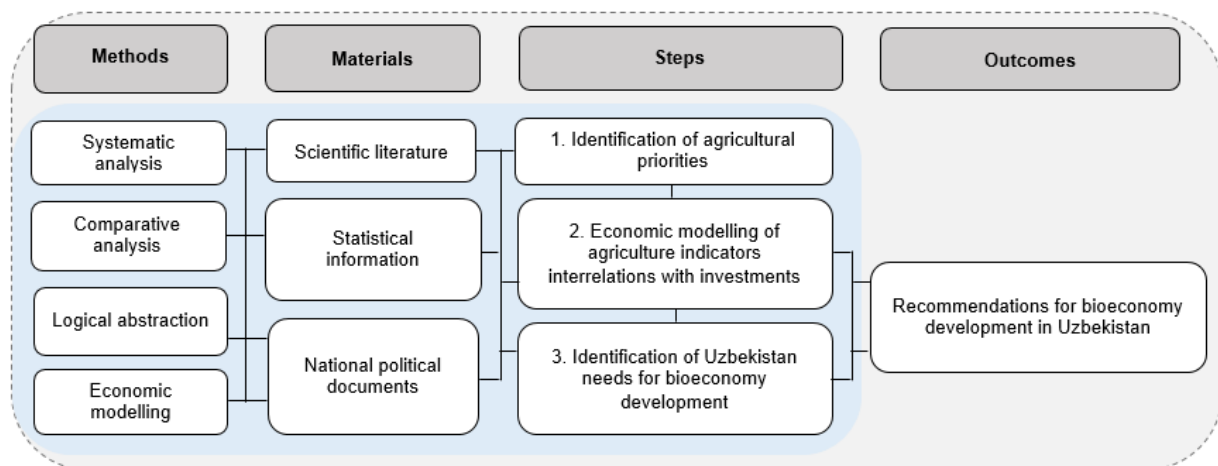
² E-mail: dina.popluga@lbtu.lv

In recent years, some authors (Babaeva N.M., 2019) have already highlighted the topicality of reforms needed in the Uzbekistan agricultural sector and the distribution of investments within the sector and offers scientific recommendations on the effective organization of the agricultural economy. There can be also observed very active scientific discussion (Maksumkhonova A. M., 2019) on the concept of "investment" in the agricultural sector, and A. M. Maksumkhonova discloses the structure of investment in the agro-industrial complex. She determines investment potential on the basis of a factor approach, were as the most important factors affecting success of investments she has identified:

- the district's economic potential (natural and climatic factors, infrastructure etc.);
- efficiency indicators (labour resources, fixed and working capital, fertilizers etc.);
- anticipated effects of capital investments.

However, so far in Uzbekistan little attention has been paid on promoting and understanding agriculture as one of the bioeconomy sectors that promises technical and productive solutions for regional agricultural development and activities based on biological resources (Mez L. E., Rodriguez A. G., 2022).

Such situation analysis sets the aim for this study - to analyse possibilities of implementing bioeconomy concept in Uzbekistan agriculture for making this sector more attractive for investments. In order to reach this aim, the study was carried out by the following steps: identification of agricultural priorities in Uzbekistan; determination of direction and character of agriculture development in Uzbekistan depending on the amount of investments; identification of Uzbekistan needs for bioeconomy development (Fig. 1).



Source: authors' construction

Fig. 1. Schematic overview of methodological steps and planning of this study

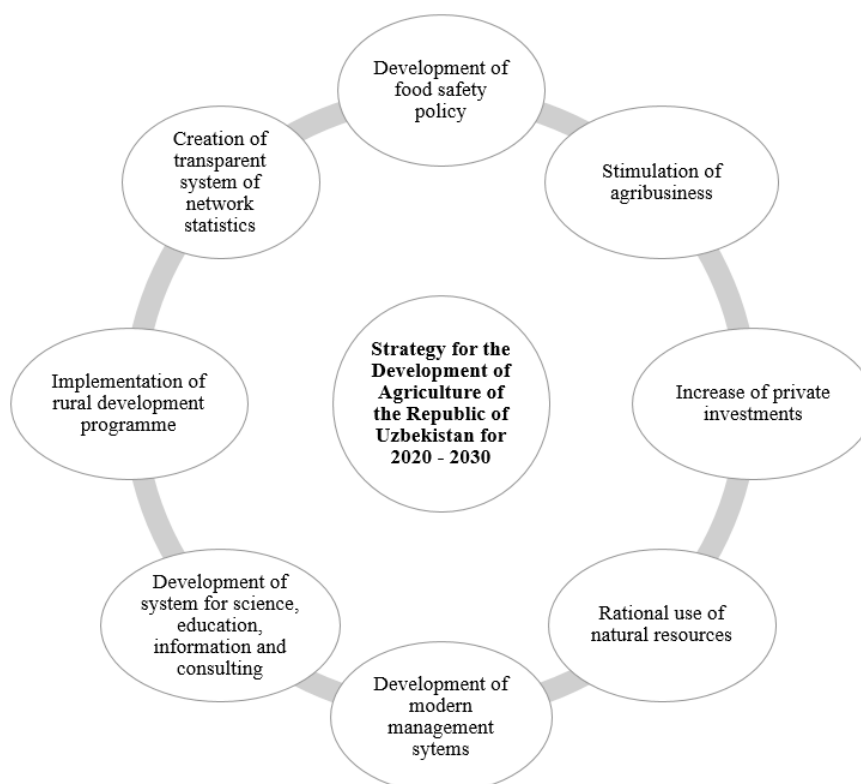
This study was based on systematic analysis, comparative analysis, logical abstraction techniques, and economic modelling were widely used. The main materials used in this study were: scientific literature; Uzbekistan political documents and statistical information from Agency of statistics under the President of the Republic of Uzbekistan (stat.uz); the World Bank data (<https://data.worldbank.org/indicator>) and trade statistics for international business (trademap.org). The main outcomes of this study are the recommendations for bioeconomy development in Uzbekistan from the perspective of promoting private investments in agricultural business.

Research results and discussion

1. Agriculture development priorities in Uzbekistan

Any sector of the national economy, including the recovery and development of the agricultural sector, can expand and flourish with the help of investments. Investments in the agricultural industry are seen as an important tool for fostering consistent, long-term growth and revenue growth while enhancing the value of agricultural products. As a result, investments in the agricultural industry are the most effective and crucial tool for the growth of the current economy. The Uzbek government is creating a number of initiatives to draw both domestic and foreign investors to this significant area of the country's economy. Investments in the agriculture sector do not yield immediate income. For example, land needs preparation, planting, cultivation, harvesting, storage, and possibly processing. Invested funds can make a profit, but not as quickly as, for example, trade investments.

Investment in agriculture can have a variety of effects, such as diversifying production, bettering land and water allocation for irrigation, producing a chain with a higher value added, fostering the growth of cooperative relationships, widely introducing market mechanisms and information and communication technologies into the sector, and utilizing scientific advancements to boost employees' potential. Recognition of these investment impacts were presented and approved under the Decree of the President of the Republic of Uzbekistan "On Approving the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020 - 2030 years" No. PD-5853, 23 October 2019 (Decree of the President of the Republic..., 2019).



Source: author's summarization based on the Decree of the President of the Republic..., 2019

Fig. 2. Priority directions of Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020 - 2030

In Figure 2, the authors reveal the priority directions of the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020 – 2030. As one of the priority directions is set the goal to create the mechanisms that increase the inflow of private investments to support the modernization, diversification

and sustainable growth of agri-food industry. In this regard, the President of Uzbekistan, Shavkat Mirziyoyev Miromonovich on 24 January 2020 in his yearly message to lawmakers and the Uzbek government declared his understanding of the value of agricultural investment. He said: "...agriculture, which is one of the most crucial sectors for ensuring economic expansion, job creation, and population incomes, must be developed on the basis of a strategic approach".

Given the significance of agriculture to the Uzbekistan economy, special steps will be made to greatly expand production, resulting in fruit and vegetable exports valued at USD 2 billion, and to grow this amount by a factor of three to four over the course of the following five to seven years. Additionally, 3 trillion UZS will be set aside in the state budget for 2023 to support the growth of horticulture, viticulture, seed production, animal husbandry, agronomy, the broad adoption of water-saving technology, research, and the training of trained employees in the area (Majlis M.F., 2020).

To identify the role of investments in the current rate of agricultural growth, further the authors have analysed the direction and character of agriculture depending on amount of investments.

Table 1

The impact of investments on agricultural development in Uzbekistan, 2002-2022

Year	Investments in agriculture, bln.UZS	Agriculture gross output, bln.UZS	Agriculture, value added, bln.UZS	Food production index, %	Agriculture export, thousand USD
2002	102.2	3255.3	2244.2	38.51	140486.0
2003	98.5	4083.3	2801.8	41.76	194784.0
2004	113.6	4615.8	3242.3	43.61	368258.0
2005	138.2	5978.3	4192.8	46.62	431318.0
2006	164.4	7538.8	5298.0	52.03	592249.0
2007	200.9	9304.9	6550.2	53.7	546679.0
2008	261.2	11310.7	7673.0	56.6	400335.0
2009	385.9	13628.6	9200.0	61.42	459742.0
2010	531.0	30856.7	21251.3	66.01	689232.0
2011	942.5	45285.9	30658.6	70.84	894713.0
2012	1089.2	55750.0	36954.7	76.81	639746
2013	1335.6	66435.3	42636.8	83.27	741783.0
2014	1448.0	81794.3	53613.2	89.15	733675.0
2015	1375.5	99604.6	64680.3	96.22	562049.0
2016	1646.4	115599.2	74779.0	114.63	746812.0
2017	2004.3	148199.3	90983.9	102.93	973350.0
2018	3561.1	187425.6	113660.7	105.03	1128751.0
2019	15141.0	216283.1	130306.9	104.36	1533268.0
2020	18025.5	250250.6	151250.9	106.28	1481928.0
2021	18934.9	303415.5	183518.5	N/A	1456421.0
2022	19900.0	347600.0	N/A	N/A	1631600.0

Source: authors' calculations based on the data from www.stat.uz; <https://data.worldbank.org/indicator> and <https://www.trademap.org/>

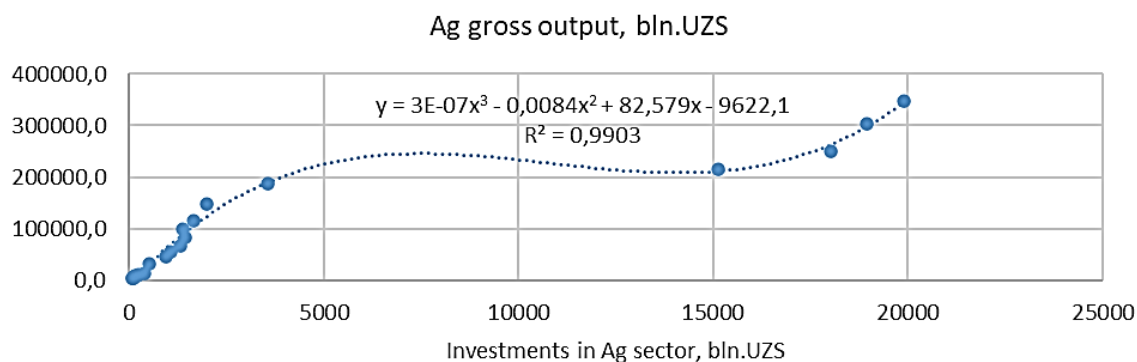
Direction and character of agriculture development in Uzbekistan depending on the amount of investments

In Table 1 the authors have summarized the data that reflect the impact of investments on main agricultural development indicators, such as agriculture gross output, value added, export and food production.

As shown in Table 1, the number of investments in agriculture increased five times between 2002 and 2010, from 102.2 billion UZS to 531 billion UZS. This sum reached 18,025.5 billion UZS in 2020, which means it increased 33.9 times compared to 2010 levels.

One of the most crucial reasons for the development of Uzbekistan's agricultural sector is investments in the processing industry, agriculture, and the industries that provide equipment for the first and second agricultural sectors (The Third agricultural sector). Among the agro-industrial complex listed sectors, agriculture holds a distinctive place because it provides the raw materials for processing industries and thus forms the backbone of the sector's steady activity.

In this study, the relationship between agricultural investment and gross agricultural product was examined (Fig.3). The entire value of gross agricultural output in 2020 amounted to 250,250.6 billion Uzbek som and increased by 76 times compared to 2002, while investments in agriculture increased by 176.7 times between 2002 and 2020.



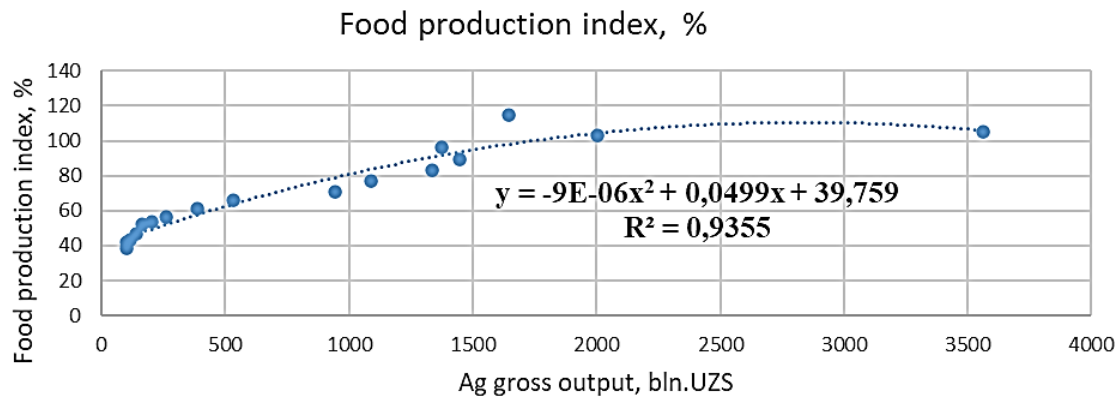
Source: authors' calculations based on the data from Table 1

Fig. 3. **Economic model of gross output of agriculture in Uzbekistan, 2002-2022**

As it can be seen from the model in Figure 3, $R^2=0.9903$ implies a very high correlation between investment in agricultural sector and gross agricultural output.

The main reason for the development of the agrarian sector, which is a crucial part of the economy of Uzbekistan, is providing the domestic market with food products, thus achieving independence in production and ensuring food security. Effective implementation of a food security strategy solves social problems such as providing the population with jobs, improving the welfare of the population and improving urban and rural areas. The development and implementation of the state policy on food security is underway in Uzbekistan thus providing food safety, improving the diet, and producing food products in the required quantity.

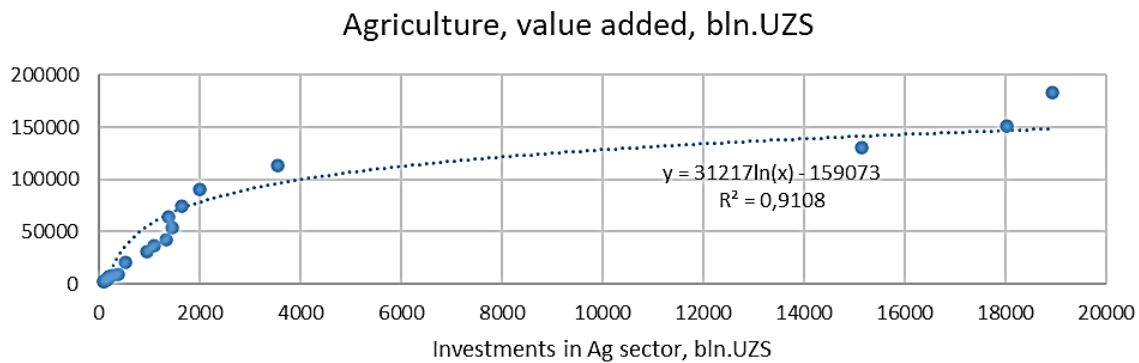
Figure 4 implies a strong correlation ($R^2=0.9355$) between investment in agriculture and food production. It is crucial for Uzbekistan to create a conducive environment for agribusiness and a solid value chain. Accordingly, agricultural products must be bought and sold according to market principles, quality control infrastructure must be built, exports must be promoted, and competitive high-value agri-food products must be produced. The economic model shows a very strong correlation ($R^2=0.9108$) between investment in agriculture and value added in agriculture, which is represented in Figure 5. The impact of investment in agriculture and the value chain created in agriculture is very high implying that investment in agriculture is paying off.



Source: authors' calculations based on the data from Table 1

Fig. 4. Economic model of food production index in Uzbekistan, 2002-2022

The economic model of agricultural production export of Uzbekistan (Fig. 6) shows that investments in agricultural sector so far have played a clearly contributing role that is confirmed by a very strong correlation ($R^2=0.9082$) between these two indicators.

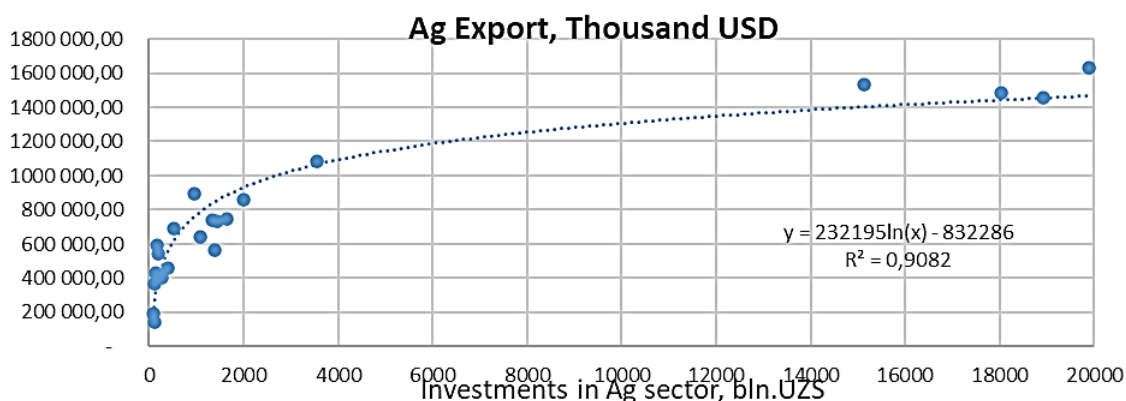


Source: authors' calculations based on the data from Table 1; <https://data.worldbank.org/indicator> and <https://www.trademap.org/>

Fig. 5. Economic model of value added in agriculture of Uzbekistan, 2002-2022

All generated economic models (Fig. 3-6) confirm that the amount of investments positively correlates with main indicators characterizing agricultural development - agriculture gross output, agriculture value added, agriculture export and food manufacturing. However, the authors foresee that for more rapid and dynamic agricultural development even bigger investments are needed.

To achieve this aim, Uzbekistan has implemented market mechanisms and a cluster approach to the agricultural sector, thus giving priority to the rapid development of key industries, like modern greenhouse farms, fish farming, beekeeping, poultry farming and others. Additionally, the practice of secondary autumn planting of vegetable crops and homestead farming has been expanded. These priority areas support comprehensive structural reform and will attract both domestic and international investors.



Source: authors' calculations based on the data from Table 1; <https://data.worldbank.org/indicator> and <https://www.trademap.org/>

Fig. 6. Economic model of agricultural product export of Uzbekistan, 2002-2022

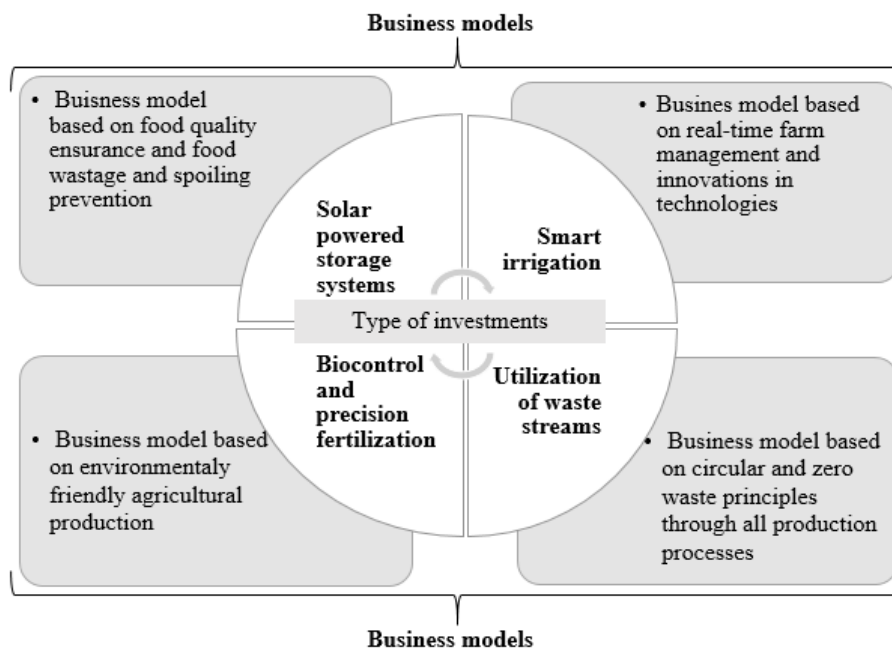
In addition, according to the experience of other countries (Giger M., et al., 2022; German, L. et al., 2016; Henson S. and Humphrey J., 2010) in developing business environment in agriculture that is attractive for private and foreign investors, more attention should be paid to promoting such types of investments that help to achieve the goals set by Uzbekistan. According to the findings of M. Giger and co-authors (2022), some researchers see the future in large-scale mechanized, high-input commercial agriculture, while others emphasize the importance of small-scale family agriculture that can easily adopt to climate change and local food system changes. However, there is a group of researchers and initiatives that believe that agriculture needs to meet the challenges of decarbonizing the sector, thus enabling it to adapt to climate change and to function in a nature-positive way, where investments in technology innovations are playing critical and potentially catalytic role (Casey J. et al., 2021). In this context, the authors suggest that investments in bioeconomy – as a set of activities where renewable bioresources are the basis for all economic processes in agriculture and agricultural production are promoted by research and innovation – could be a special type of investments suitable for sustainable and dynamic agricultural development in Uzbekistan. For this purpose, the authors suggest to identify those focus areas and business models for investments in Uzbekistan agriculture that will attract private investors looking for solution-oriented technology investments.

According to situation analysis in Uzbekistan (Babaeva N.M., 2019; Maksumkhonova A.M., 2019; Rashidov O.I., 2010; Zharashuyeva L.M., Bischekova F.R., 2015) and study results from other similar studies (Casey J. et al., 2021; German L. et al., 2016; Giger M. et al., 2020; Meza L.E. and Rodríguez A.G., 2022), the authors have identified potential types of investments and appropriate business models for promoting agriculture development in Uzbekistan (Fig. 7). These types of investments are targeted for more active sustainable bioeconomy concept incorporation in agriculture.

- **Investments in solar powered storage systems**, like cooling, drying, ventilation of harvested agricultural production during its storage time. Such type of investments will give contribution in developing such business model that is based on food quality assurance and food wastage and spoiling prevention.
- **Investments in smart irrigation development** will give contribution in developing business model based on real-time farm management and innovations in sensors, control instruments of irrigation equipment.
- **Investments in biocontrol and precision fertilization** will foster development of business model based on environmentally friendly agricultural production. This type of investments is targeted for

finding solutions how to minimize inputs for crop protection and how to respond for consumer growing demand for healthy food.

- **Investments in utilization of waste streams** through all agricultural value chain stages. This type of investments will give contribution in developing business model based on circular and zero waste principles in different production stages.



Source: authors' construction based on Casey J. et al., 2021

Fig. 7. **Potential types of investments and business models for promoting agriculture development in Uzbekistan**

Main findings of this study reveal that bioeconomy concept can serve as a background for setting targeted types of innovations and business models that will be responsible for utilization of investments and returns for investors. In order to make it happen this study authors recommend that it is necessary to develop and implement a state program for the development of bioeconomy, containing a set of its goals and priorities, including types on investments and new business models, mechanisms for achieving and ensuring them, principles for selecting participants in the production process, as well as determining their powers and degree of responsibility.

Conclusions, proposals, recommendations

- 1) Under the present conditions prevailing in the agro-industrial complex in Uzbekistan, especially in the rural regions, most interest is focused on finding investments that would stimulate the development of agriculture.
- 2) During the previous years, work has been done to reform Uzbekistan's agricultural sector. For instance, the public administration system has been improved, market relations have been widely implemented, the legal foundations of relationships between entities that produce, process, and sell agricultural products have been strengthened, the industry has attracted investments, resource-saving technologies have been introduced, and modern equipment has been provided for agricultural producers.
- 3) Contemporary methods, such as the adoption of sustainable bioeconomy concepts in agricultural production, can help to address critical issues relating to investment in Uzbekistan's agricultural industry and create appropriate conditions for stable, effective, and expanding agricultural production. The

existing forms and techniques of investment must be improved in order to maximize the investment potential in Uzbekistan's agricultural industry. The proposals expressed for improving the present mechanism of financing agricultural investments aim to effectively address the issues at hand and recommend that agricultural producers attain a substantially new level of investment activity that guarantees cost-effective production.

4) In order to develop bioeconomy in Uzbekistan, the authors have identified the following needs:

- a clear understanding of the need to support and develop biotechnology at the level of government, business and society, the formation of a legislative, institutional and social framework that will support bioeconomy;
- demonstrating the advantages of bioeconomy for humans and nature, using the advantages of bioeconomy to increase competitiveness, improve ecology and development of agriculture;
- close interaction of participants through all bioeconomy chain – agricultural workers, industry, legislators, end-consumers.

Bibliography

1. Agency of statistics under the President of the Republic of Uzbekistan (2023). Retrieved from: <http://stat.uz>
2. Babaeva, N. M. (2019) Effective usage of investments in agricultural economy of the Republic of Uzbekistan. "Economy and Innovative Technologies" Scientific electronic journal.
3. Barañano, L., Garbisu, N., Alkorta, I., Araujo, A., Garbisu, C. (2021). Contextualization of the Bioeconomy Concept through Its Links with Related Concepts and the Challenges Facing Humanity. *Sustainability*, 13, 7746.
4. Casey, J., Bisaro, A., Valverde, A., Martinez, M., Rokitzki M. (2021). Private finance investment opportunities in climate-smart agriculture technologies. UK Foreign, Commonwealth and Development Office, 75 p. Retrieved from: <https://www.casaprogramme.com/wp-content/uploads/2021/10/Private-finance-investment-opportunities-in-climate-smart-agriculture-technologies.pdf>
5. Decree of the President of the Republic of Uzbekistan "On Approving the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020 - 2030 years" No. PD-5853, October 23, 2019. Retrieved from: <https://lex.uz/docs/4567337>
6. Decree of the President R.Uz. DP-3671 (2018). Retrieved from: <https://lex.uz/docs/3688052>
7. Frisvold, G.B., Moss, S.M., Hodgson, A., Maxon, M.E. (2021). Understanding the U.S. bioeconomy: A new definition and landscape. *Sustainability*, 13, 1627
8. German, L., Cavane, E., Siteo, A., Braga, C. (2016). Private investment as an engine of rural development: a confrontation of theory and practice for the case of Mozambique. *Land Use Policy*, 52, pp. 1-14
9. Giger, M., Mutea, E., Kiteme, B., Eckert, S., Anseeuw, W., Zaehring, J.G. (2020). Large agricultural investments in Kenya's Nanyuki Area: Inventory and analysis of business models. *Land Use Policy*, Volume 99, 104833, ISSN 0264-8377
10. Henson, S., & Humphrey, J. (2010). Understanding the complexities of private standards in global agri-food chains as they impact developing countries. *The journal of development studies*, 46(9), 1628-1646.
11. Majlis, M. F. (2020). Message of the President of the Republic of Uzbekistan Shavkat Mirziyoyev to the Oliy Majlis. Retrieved from: <https://uza.uz/ru/posts/poslanie-prezidenta-respubliki-uzbekistan-shavkata-mirziyoyev-25-01-2020>
12. Maksumkhonova, A.M. (2019). Investments as a factor in the development of the agricultural sector of the Republic of Uzbekistan. *Bulletin of Science and Education No. 2 (56)*. Part 2, 40-43.
13. McCormick, K., Kautto, N. (2013). The Bioeconomy in Europe: An Overview. *Sustainability*, 5, 2589-2608.
14. Meza, L.E. and Rodríguez, A.G. (2022). Nature-based solutions and the bioeconomy: contributing to a sustainable and inclusive transformation of agriculture and to the post-COVID-19 recovery. *Natural Resources and Development series*, No. 210 (LC/TS.2022/43), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), 108 p.
15. Muška, A., Popluga, D., Pilvere, I. (2023). Assessment of the Concentration and Structure of the Bioeconomy: Regional Approach. *Emerging Science Journal*, Volume 7, Issue 1, pp. 60-76.
16. Asrarovna, R. M. (2020). Agricultural investments as the main factor increasing the agricultural sector's competitiveness. *ECONOMIC SCIENCE FOR RURAL DEVELOPMENT 2020*, 118.
17. Rashidov, O. I., Rashidova, I. A., & Shatokhin, M. V. (2010). Analysis of the relationship between investments and GRP in the regions of the Central Chernozem. *Economic sciences*, 1, 62.
18. The World Bank (2023). Retrieved from: <https://data.worldbank.org/indicator>
19. Trade statistics for international business (2023). Retrieved from: <http://trademap.org>
20. Zharashuyeva, L.M., Bischekova, F.R. (2015). Bioeconomy as a new and promising trend in the economy. *BIOECONOMY AND ECOBIOPOLITICS*, 8-10.