Methods of Biologization

The core of "biologization" includes the use of bio-fertilizers, bacterial preparations, and crop rotation management. These elements aim to activate the natural microbiological potential of the soil. Research shows that biological stimulants can replace up to 30% of synthetic nitrogen fertilizers without a significant drop in productivity. Beyond mere substitution of chemicals, these agents play a decisive role in plant survival and field performance.

Investigating the impact of biological products on the plant survival rate of winter spelt is highly relevant, as maintaining optimal crop density is a key factor in maximizing yields. The application of advanced bio-preparations helps minimize plant loss throughout the growing season, thereby enhancing the overall productivity of the crops [3].

Bio-preparations not only boost germination vigor but also enhance overall plant development, directly impacting both the quantity and quality of the grain. The integrated application of such agents is a vital component of sustainable crop production strategies [3].

In conclusion, the transition to sustainable spelt wheat cultivation through biologization is a strategic response to global food security and climate challenges. The integration of bio-preparations not only stabilizes yields and reduces chemical dependency but also significantly enhances the nutritional and technological properties of the grain. Implementing these methods is essential for developing eco-friendly agriculture and producing high-quality food products.

References:

1. Longin, C. F. H., & Würschum, T. (2016). Genome-wide association studies in spelt wheat. Journal of Agriculture and Food Chemistry, S. 2-3. Мова англ. (Дата звернення 22.02.2026)

2. Korhova, M. M. (2019) Productivity of winter wheat spelt in the South Steps of Ukraine Bulletin of Agricultural Science of the Black Sea Region. – 2019. – Issue 4. URL: https://dspace.mnau.edu.ua/jspui/handle/123456789/6794 Мова англ. (Дата звернення 22.02.2026)

3. Kondratiuk M.A. (2024) Influence of biological preparations on yield and quality of winter spelte grain in the conditions of the "stas" farms in the kozyatyn district of the vinnytska region, 20-25 URL: http://ir.polissiauniver.edu.ua/bitstream/123456789/16211/1/Kondratiuk_MA_KR_201_2024.pdf . Мова англ. (Дата звернення 22.02.2026)

УДК 811.111

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THE AGRICULTURAL SECTOR OF UKRAINE IN THE CONTEXT OF FULL-SCALE WAR

У роботі розглянуто вплив повномасштабної війни на розвиток аграрного сектору України. Проаналізовано скорочення обсягів виробництва сільськогосподарської продукції, порушення експортної логістики та втрати земельних ресурсів унаслідок бойових дій і мінування територій. Окрему увагу приділено змінам у структурі посівів, регіональному перерозподілу виробництва та особливостям функціонування ринку сільськогосподарських земель. Встановлено, що попри суттєві економічні втрати галузь зберігає потенціал до відновлення та подальшої модернізації.

Ключові слова: *аграрний сектор, повномасштабна війна, виробництво, експорт, ринок землі, продовольча безпека, відновлення.*

The paper examines the impact of full-scale war on the development of Ukraine's agricultural sector. It analyzes the decline in agricultural production, disruptions to export logistics, and losses of land resources as a result of hostilities and landmines. Particular attention is paid to changes in the structure of crops, regional redistribution of production, and the

peculiarities of the agricultural land market. It has been established that despite significant economic losses, the industry retains its potential for recovery and further modernization.

Keywords: *agricultural sector, full-scale war, production, export, land market, food security, recovery.*

The full-scale invasion by the Russian Federation on February 24, 2022, became a decisive factor in the profound structural changes in Ukraine's agricultural sector. Before the war, agriculture accounted for a significant share of GDP and foreign exchange earnings and ensured the stability of global food markets. In the context of military aggression, the sector suffered extensive production, infrastructure, and financial losses. Analytical support for damage assessment and recovery forecasting is provided by the KSE Agrocenter, a part of KSE Institute, in cooperation with government authorities [1].

In 2022, agricultural production volumes declined significantly: the gross harvest of grain crops decreased by approximately 40%, vegetables by about 25%, and fruits by more than 10%. The main reasons were the occupation of territories, the mining of agricultural land, the destruction of equipment and infrastructure, and the disruption of traditional logistics routes. The regions most affected were those experiencing active hostilities, where crop losses in some cases reached critical levels [1;2].

The blockade of seaports, through which most agricultural exports had previously been carried out, led to a sharp increase in transportation costs. The shift to land and river routes significantly increased the logistics component of production costs, thereby reducing the profitability of agricultural enterprises. As a result, some farmers reduced their acreage or changed the structure of their production.

At the same time, noticeable changes in specialization occurred. The production of certain crops oriented toward the domestic market, particularly buckwheat, increased. Vegetable growing and horticulture partially shifted to safer regions, leading to a new territorial distribution of agricultural activity. Thus, the war accelerated processes of regional restructuring in agricultural production.

A separate problem is land contamination with explosive remnants of war. Significant areas of agricultural land remain unusable, posing long-term risks to food security and economic stability. Demining requires substantial financial resources and time, and annual losses from idle land are estimated in billions of dollars [4].

The livestock sector also suffered considerable losses due to the destruction of production facilities, reductions in livestock numbers, and complications in feed supply. At the same time, production has been concentrated and enterprises relocated to relatively safe regions, demonstrating the sector's adaptive capacity.

The war has also affected the agricultural land market. The temporary suspension of state registries led to a decline in the number of transactions. Despite this decrease, land values in hryvnia terms have remained relatively stable, indicating sustained long-term investment interest in regions distant from the combat zone.

The systematization of challenges makes it possible to identify three main areas of negative impact: reduction of production capacity and resource base, increased financial constraints and rising costs, and disruption of logistics chains accompanied by a decline in export capacity [1].

At the same time, current challenges are stimulating a rethinking of the agricultural sector’s development model. There is an urgent need to diversify logistics routes, develop high value-added processing, introduce innovative technologies, and harmonize standards with EU requirements.

The war has acted as a catalyst for profound transformation within Ukraine's agricultural system. Despite massive losses, the sector continues to show adaptability and potential for recovery. Future development will depend on the pace of demining, stabilization of logistics, government support, and integration into global markets.

References:

1. KSE Institute. “War impacts on Ukrainian agriculture.” KSE.ua. https://kse.ua/ua/war-impacts-on-ukrainian-agriculture/
2. Visit Ukraine. “The impact of the war on the agricultural sector of Ukraine: analysis of the latest data from the State Statistics Service.” https://visitukraine.today/uk/blog/2169/the-impact-of-the-war-on-the-agricultural-sector-of-ukraine-analysis-of-the-latest-data-from-the-state-statistics-service
3. TNI Ukraine. “Ukrainian agriculture in wartime.” https://www.tni.org/uk/article/ukrainian-agriculture-in-wartime?utm_source=chatgpt.com
4. VoxUkraine. “Agriculture and the agricultural land market in Ukraine: the impact of war.” https://voxukraine.org/silske-gospodarstvo-ta-rynok-silskogospodarskyh-zemel-ukrayiny-vplyv-vijny

УДК 811.111

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RENEWABLE ENERGY: SOURCES AND TECHNOLOGIES

У статті подана інформація про відновлювальні джерела енергії та їхня перспектива використання в Україні. Можливості прогресу енергетичного сектору та застосування синтезу нових підходів та технологій для досягнення бажаного результату.

Ключові слова: *відновлювальна енергія, оптимізація, основні постулати.*

The article provides information about renewable energy sources and their perspectives of use in Ukraine. Possibilities for progress in the energy sector and the application of the synthesis of new approaches and technologies to achieve the desired result.

Keywords: *renewable energy, optimization, basic postulates.*

The current stage of development of the world and national energy sector is characterized by a global transition to low-carbon technologies. For Ukraine, the issue of developing renewable energy (RE) is a strategic priority, which is due to the need to ensure energy security, decentralize generating capacities under martial law and fulfill international climate commitments. According to the National Action Plan until 2030, Ukraine seeks to achieve a share of renewable energy sources (RES) in gross final consumption of at least 27%.

Energy potential and technologies of solar and wind energy.

Solar energy remains one of the most dynamic sectors. Ukraine has formed a powerful research and development base for the production of silicon-based photovoltaic converters. The main technological trends are:

* Introduction of highly efficient monocrystalline panels, which allows to significantly reduce the levelized cost of electricity (LCOE).

* Development of decentralized systems: use of solar power plants (SPP) for the needs of private farms and the agricultural sector (lighting, irrigation systems, drying of products).

* Integration of SPP into autonomous power supply systems of critical infrastructure facilities.

Wind power in Ukraine has significant industrial potential. Strategic plans provide not only for the development of onshore wind farms, but also for the construction of up to 100 MW of offshore wind capacity by 2030. An important aspect is the introduction of small-scale wind power for local energy supply of communities, which requires specific approaches to the design of small-scale wind turbines.

Bioenergy and small hydropower as tools for decentralization.

The use of biomass energy has a high potential to replace natural gas in district heating systems. The main areas include: