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**FINANCIAL ACCOUNTING IN THE DIGITAL AGE: DEVELOPMENT
PROSPECTS AND CHALLENGES FOR ACCOUNTANTS
(ФІНАНСОВИЙ ОБЛІК У ЦИФРОВУ ЕПОХУ: ПЕРСПЕКТИВИ РОЗВИТКУ
ТА ВИКЛИКИ ДЛЯ БУХГАЛТЕРІВ)**

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У статті подана інформація про вплив цифровізації на фінансовий облік, перспективи його розвитку та виклики, з якими стикаються бухгалтери. Розглянуто роль сучасних технологій, зокрема хмарних сервісів, штучного інтелекту та блокчейн-технологій, у підвищенні точності та ефективності фінансової звітності.

Ключові слова: цифровізація, автоматизація, хмарні технології, штучний інтелект, бухгалтерія, міжнародні стандарти, фінансова аналітика.

The article provides information on the impact of digitalization on financial accounting, its development prospects and the challenges faced by accountants. The role of modern technologies, in particular cloud services, artificial intelligence and blockchain technologies, in increasing the accuracy and efficiency of financial reporting is considered.

Keywords: digitalization, automation, cloud technologies, artificial intelligence, accounting, international standards, financial analytics.

The digitalization of the economy has a significant impact on the transformation of financial accounting, opening up new opportunities and challenges for accountants. The use of modern technologies, such as cloud services, artificial intelligence and blockchain, allows you to automate routine processes, increase the accuracy of financial reporting and ensure the transparency of transactions. In this context, modern technologies in financial accounting play a key role, which provide automation of processes and contribute to increasing the accuracy and reliability of financial information [1].

1) The introduction of information technologies into accounting allows you to automate data processing, reducing the number of errors and increasing work efficiency.

2) Cloud services provide access to accounting information in real time, which contributes to the prompt adoption of management decisions.

3) Artificial intelligence and machine learning are actively used to analyze large volumes of financial data, predict key performance indicators of enterprises and identify anomalies in transactions.

4) Blockchain technology ensures the immutability and transparency of financial records, which is important for increasing trust in financial reporting [2].

It is expected that further digitalization will lead to the full automation of routine accounting operations, allowing specialists to focus on strategic tasks and financial analysis. The use of advanced artificial intelligence algorithms will contribute not only to the processing of large data sets, but also to the identification of hidden patterns, which will help enterprises make more informed financial decisions. As digital technologies continue to change financial accounting, accountants face a number of new challenges.

- Updating knowledge and skills - accountants need to constantly improve their competencies, master new software products and analytical tools.

- Cybersecurity and data protection - the growth of digital threats makes the issue of cybersecurity critically important. Unauthorized access to financial information, data leaks, and attacks by attackers can cause significant financial and reputational losses for companies.

- Rapid changes in legislation - the regulation of digital financial processes is constantly changing, which requires accountants to promptly monitor legislative innovations.
- Changing the role of the accountant - automation of accounting processes reduces the volume of routine tasks, but at the same time increases the role of the accountant as a financial analyst and strategic consultant.

- Adaptation to international standards - the unification of financial accounting and reporting standards requires accountants to know international norms and principles of financial reporting, which is especially relevant for companies doing business in a global environment [3, 4].

Thus, the digital era brings significant changes to the field of financial accounting, offering both new opportunities for improving efficiency and challenges associated with the need to adapt to rapid technological and regulatory changes. To work successfully in these conditions, it is important for accountants to constantly develop their professional competencies, implement modern technologies, and adhere to high standards of ethics and security.

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THE BALANCE BETWEEN AUTOMATION AND HUMAN MANAGEMENT: FINDING HARMONY IN THE DIGITAL AGE (БАЛАНС МІЖ АВТОМАТИЗАЦІЄЮ ТА КЕРУВАННЯМ ЛЮДИНАМИ: ПОШУК ГАРМОНІЇ В ЦИФРОВУ ЕПОХУ)

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У цій роботі досліджується критичний баланс між технологіями автоматизації та людським управлінням у сучасних організаціях. На основі аналізу емпіричних досліджень, ми вивчаємо, як компанії можуть досягти оптимальної інтеграції штучного інтелекту та процесів прийняття рішень людиною. Наші результати свідчать, що компанії з найвищою ефективністю підтримують стратегічний людський нагляд за автоматизованими системами, впроваджують прозорі структури управління штучним інтелектом та сприяють культурі безперервного навчання. У роботі запропоновано структуру для подолання викликів автоматизації, одночасно посилюючи роль людського управління.

Ключові слова: автоматизація, людське управління, штучний інтелект, організаційне управління, співпраця людини та ШІ.

This paper explores the critical balance between automation technologies and human management within modern organizations. Through analysis of empirical studies, we investigate how companies can achieve optimal integration of artificial intelligence and human decision-making processes. Our findings suggest that organizations achieving the highest performance maintain strategic human oversight of automated systems, implement transparent AI governance frameworks, and foster a culture of continuous learning. The paper offers a framework for navigating the challenges of automation while enhancing the role of human management.

Keywords: automation, human management, artificial intelligence, organizational management, human-AI collaboration

The accelerating integration of automation technologies into organizational processes presents both unprecedented opportunities and complex challenges for modern management. As artificial intelligence (AI) systems increasingly handle tasks traditionally performed by human managers, organizations face the critical question of how to balance technological efficiency with human judgment, creativity, and ethical oversight [1]. This tension represents one of the most significant challenges in contemporary organizational theory and practice.

Recent studies indicate that while automation can significantly enhance operational efficiency, organizations that completely remove human oversight often experience unintended consequences in decision quality, employee engagement, and ethical outcomes [2]. This paper examines the current research landscape to identify optimal approaches for balancing automation and human management.

The application of automation technologies to management functions has expanded dramatically over the past decade. Artificial intelligence now supports or independently handles numerous management tasks, including personnel scheduling, performance monitoring, and resource allocation [3]. Research by Brynjolfsson and McAfee demonstrates that automation technologies significantly impact managerial work by changing the nature of decisions rather than simply reducing management positions [4].

Despite technological advances, research consistently identifies dimensions of management that remain distinctly human-centered. Wilson and Daugherty's study of AI implementations found that companies achieving the greatest performance gains were those that reimaged their business processes to leverage complementary human and machine capabilities rather than simply replacing humans [5].

This research employs a systematic review methodology to analyze empirical studies examining the balance between automation and human management published between 2018 and 2024. We identified relevant studies through academic databases including Web of Science, Scopus, and Business Source Complete, using search terms including "management automation," "AI management," and "human-AI collaboration."

Analysis of high-performing organizations reveals several consistent patterns in their approach to balancing automation and human management:

1. **Strategic Task Allocation:** Organizations achieving optimal balance strategically allocate tasks based on comparative advantages. Automated systems typically handle data-intensive, repetitive, and analytical tasks, while human managers focus on relationship building, ethical oversight, and creative problem-solving.
2. **Transparency and Explainability:** High-performing organizations prioritize transparency in algorithmic decision-making. Managers maintain oversight capability through explainable AI approaches that allow human understanding of automated recommendations.
3. **Collaborative Intelligence:** Rather than viewing automation as a replacement for management, successful organizations implement collaborative intelligence frameworks where automated systems augment human capabilities and vice versa [6].
4. **Continuous Learning Systems:** Top-performing organizations implement feedback mechanisms that enable both continuous improvement of automated systems and ongoing development of human management capabilities.

Organizations achieving optimal balance between automation and human management demonstrated several performance advantages:

1. **Decision Quality:** Improvement in decision quality compared to organizations over-relying on either automation or human judgment alone.
2. **Adaptability:** Faster response to market changes and disruptions.
3. **Employee Satisfaction:** Higher employee engagement scores, particularly where automation reduced administrative burden on managers.

Based on our analysis, we propose a framework for balancing automation and human management comprising four dimensions:

1. **Governance Structure:** Establishing clear accountability for automated management systems, including human oversight responsibilities.
2. **Capability Development:** Developing both technological infrastructure and human skills necessary for complementary operation.
3. **Process Integration:** Redesigning management processes to leverage the strengths of both automated systems and human managers.
4. **Cultural Alignment:** Cultivating organizational culture that values both technological efficiency and human judgment.

Our findings contribute to organizational theory by suggesting that the most effective integration of automation does not follow a simple substitution model. Instead, successful organizations demonstrate what might be termed "augmented management" – a reconfiguration of management functions that fundamentally changes both human and technological contributions to create new capabilities [7].

The balance between automation and human management represents not a zero-sum conflict but rather an opportunity for synergistic integration that can enhance organizational performance beyond what either approach could achieve independently. Organizations that view the automation-human management relationship as dynamic and complementary rather than static and competitive will be best positioned to leverage technological advances while preserving the essential human dimensions of effective management.

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**USE OF SOCIAL MEDIA AS AN AFFORDABLE ADVERTISING TOOL FOR SMALL AND MEDIUM-SIZED BUSINESSES
(ВИКОРИСТАННЯ СОЦІАЛЬНИХ МЕРЕЖ ЯК ДОСТУПНОГО ІНСТРУМЕНТУ РЕКЛАМИ)**

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Обґрунтування ідеї використання соціальних мереж як доступного інструменту реклами малого та середнього бізнесу. Аналіз популярних соціальних мереж для просування товару та бренду. Досліджено переваги окремих соціальних мереж та їх основні алгоритми.

Ключові слова: конверсія, ТікТок, Інстаграм, Ютуб.

Justification the idea of using social media as an affordable way to advertise small and medium-sized businesses. Popular digital platforms for promoting products and brands are analyzed. The advantages of certain social networks and their key algorithms are studied.

Keywords: conversion, social media, TikTok, YouTube, Instagram

Thanks to modern digital technologies and global communication, social media has become one of the most valuable digital tools and plays an important role in information distribution. It is not only a means of communication between people but also an effective tool for promoting information, including advertising. With low entry costs, a wide audience, and targeted advertising options, social media allows businesses to promote their products and services without spending significant amounts on traditional advertising channels. Using social platforms for advertising helps achieve high conversion rates and consumer engagement, significantly improving a company's market position.

Small and medium-sized firms, which sometimes lack substantial financial resources, rely heavily on their capacity to sell goods and services in order to grow. One of the easiest and least expensive methods to accomplish this is through social networking. With the help of these platforms, business owners can swiftly react to changes in the market, engage with their audience in real time, and develop customized advertising campaigns. The capacity to accurately target advertisements, which enables businesses to draw in new clients based on their tastes, is one of the key benefits. Additionally, social media guarantees two-way communication between companies and customers, fostering loyalty and trust.

Among the most popular social platforms for promoting small and medium-sized businesses are TikTok, Instagram, and YouTube. Each of these platforms has its own features and algorithms that define their effectiveness in different industries. TikTok is a relatively new social network based on short videos that have a high level of user engagement due to their simplicity. The main advantage of this platform is the speed of content distribution thanks to its algorithms, which allow videos to become viral even without significant financial investments. Small and medium-sized businesses can use TikTok to create low-cost creative advertising campaigns that will become recognizable among users and help attract new customers.

Instagram is one of the most popular platforms for visual marketing. It allows businesses to use photo and video content, stories, live streams, and ads, providing broad opportunities for business promotion. The main advantage of Instagram is its integration with Facebook and the Meta digital ecosystem, enabling businesses to set up detailed targeting for potential customers. Content that creates significant levels of user engagement is given priority by the platform's algorithms. Instagram allows businesses to submit customer reviews, highlight products, and work with influencers, all of which greatly increase the efficacy of advertising campaigns.

The most effective video platform right now is YouTube, which enables business owners to produce long videos for their viewers. The main feature of YouTube is prolonged user interaction with videos, which helps build trust in brands. Videos have a good impact on customer loyalty and the development of long-term clients since they can contain comprehensive product reviews, usage guidelines, customer testimonials, and entertaining material. An important advantage of YouTube is the ability to monetize content and generate additional revenue through partner programs and advertising. As a result, this platform is a useful instrument for developing a brand's image as well as for direct product advertising.

Overall, the use of social media as a tool for advertising small and medium-sized businesses opens up vast opportunities for entrepreneurs, allowing them to attract customers effectively, increase brand recognition, and boost sales. The choice of platform depends on the business's specifics, target audience, and marketing strategy. TikTok is best for viral marketing and widespread content distribution, Instagram is ideal for visual product promotion and direct consumer engagement, while YouTube allows businesses to provide detailed product information and build customer trust. In the future, social media will continue to evolve, offering even more tools for businesses, making digital marketing specialists who understand communication platform principles and advanced targeting strategies even more valuable.

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УДК 811.111

BUSINESS IDEAS AND LATEST TECHNOLOGIES IN UKRAINE ECONOMY SECTORS (БІЗНЕС-ІДЕЇ ТА НОВІТНІ ТЕХНОЛОГІЇ У ГАЛУЗЯХ ЕКОНОМІКИ УКРАЇНИ)

Васильєва К.В. – здобувачка вищої освіти групи Ф3/1

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Встановлено, що швидкий розвиток технологій створює безпрецедентні можливості для української економіки, а інтеграція інноваційних рішень в різні галузі є ключовим фактором підвищення конкурентоспроможності українських підприємств на світовому ринку.

Ключові слова: економіка, бізнес, бізнес-ідеї, технології, промисловість, АПК.

It was established that the rapid development of technologies creates unprecedented opportunities for the Ukrainian economy, and the integration of innovative solutions in various industries is a key factor in increasing the competitiveness of Ukrainian enterprises in the world market.

Keywords: *economy, business, business ideas, technologies, industry, Agriculture.*

The role of information in the economy is steadily growing, and the ability to process it is becoming a key factor in the success of companies on the market. The transition to the post-industrial stage of economic development became possible thanks to the fact that information has turned into one of the most important resources. The increasing importance of information in business has led to an increase in the share of the information market in the overall economy.

According to research firms, the global IT market is expected to reach \$5 trillion by 2023 [1]. The economy, work, and everyday life are becoming increasingly automated and interconnected. Technological progress appears to be on the verge of another major breakthrough as the pace of innovation continues to accelerate. Modern technologies are accelerating globalization, opening up new opportunities for socio-economic development of businesses, but at the same time they are creating serious challenges that can lead to crises, poverty, and inequality both within and between countries.

Ukrainian companies should implement innovative technologies to increase the efficiency of their activities. The main tools of innovative development are actively used by Ukrainian enterprises to achieve success in both domestic and international markets (Table 1).

Ukrainian industrial enterprises are gradually introducing the latest technologies into their production processes, moving to a more technological level.

Table 1 Use of innovation by industrial enterprises

Company	Branch	Using digital marketing
Oil and gas	Gas and electricity production	The company, following the example of its foreign partners, has implemented the SAP S/4HANA management system, which should ultimately save Naftogaz time and money.
IDS Borjomi Ukraine	Energy	Created the MODUS program, one of the main results of which is the construction of underground communication infrastructure (Wi-Fi) at a depth of 500 m in the mine. This is the only project in Ukraine and one of the first in Europe
Dniproazot	Chemical	Production of nitrogen oxide reductant for automotive diesel engines based on urea
Antonov	Aircraft construction	Developed the UAV (unmanned aerial vehicle complex), developed such projects as "Gorlytsia", "Strategic UAV", "Target Complex", as well as various specialized aircraft modifications

Source: generated by the author using [2]

Ukrainian enterprises actively use innovative technologies in their work [2]. As of 2020, the share of agricultural exports reached 39.4%, which is quite expected, since a significant part of companies in the agro-industrial complex is export-oriented. I am confident that the integration of modern technologies can become a powerful factor in the development of Ukrainian business [3]

In a world where global development is constantly taking place, the latest technologies are becoming increasingly popular, as they not only speed up processes in companies, but also optimize costs, ensuring efficient use of resources at every stage.

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BIOPLASTIC AS AN ALTERNATIVE TO ORDINARY PLASTIC – HOW BIOTECHNOLOGIES HELP TO CREATE ENVIRONMENTALLY FRIENDLY MATERIALS
(БІОПЛАСТИК ЯК АЛЬТЕРНАТИВА ЗВИЧАЙНОМУ ПЛАСТИКУ – ЯК БІОТЕХНОЛОГІЇ ДОПОМАГАЮТЬ СТВОРЮВАТИ ЕКОЛОГІЧНО ЧИСТІ МАТЕРІАЛИ)

Гаврилюк А. М. – здобувач вищої освіти групи БТ 3/1

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У публікації проведено огляд раціонального проектування біопластику з природних ресурсів. Було проаналізовано дослідження вчених щодо поводження з відходами біопластику, їх розкладання та переробки.

Ключові слова: *біопластик, природний ресурс, переробка відходів, сталий розвиток, здатність до біологічного розкладання.*

The publication provides an overview of the rational design of bioplastic from natural resources. Research on the impact of bioplastic waste regarding degradation and recycling is discussed.

Keywords: *bioplastic, natural resource, waste recycling, sustainability, biodegradability.*

Bioplastics — typically plastics manufactured from bio-based polymers — stand to contribute to more sustainable commercial plastic life cycles as part of a circular economy, in which virgin polymers are made from renewable or recycled raw materials. Carbon-neutral energy is used for production and products are reused or recycled at their end of life (EOL) [1].

However, in some literature, bioplastic also includes petrochemical-derived, biodegradable plastic. "Biodegradable" is defined as the capability to be degraded well in a natural environment. Bioplastics take less time to degrade, reduce fossil fuel consumption, create new streams for plastic waste recycling, reduce the space required to manage waste, and reduce the amount of greenhouse gas (GHG) emissions [2].

Among the reasons why bioplastics have so far failed to make a big impression on the market are high prices, low availability and limited performance compared to fossil plastics. Its disposal also remains a problematic issue [3].

Broadly speaking, materials are classed as biodegradable if they are capable of undergoing degradation into their smallest constituent components (e.g. carbon dioxide, oxygen and ammonia) with the help of microorganisms or enzymes, and are classed as biobased if they consist of renewable primary products. The bioplastics most commonly used in packaging today include:

- Starch-based blends
- Polylactic acid-based blends (PLA blends)
- Bioplastics made from thermo-plastically modified starch (TPS)
- Bioplastics made from PLA
- Cellulose-based plastics
- Biobased bioplastics (bioPE, bioPET)

Blends typically consist of compounds containing one biobased and one biodegradable fossil component. PLA and PLA blends are, for instance, used in the manufacture of films and foils, cans, beverage and yoghurt containers, vegetable trays and bottles. Accounting for around 80 percent of the bioplastics market, thermoplastic starch is currently the most prominent and widespread representative of the bioplastics family. In Europe, Africa and North America, its main plant-based sources are corn, wheat and potato, whereas in Asia it is mostly made from tapioca.

Although, to all intents and purposes, bioplastics are a worthwhile concept, there is still some way to go where a number of the more practical aspects are concerned. In the future, we are likely to see bioplastics which will be more eco-friendly than their conventional fossil fuel equivalents. The long-term aim should be to replace conventional plastics with bioplastic alternatives in all cases – bioplastics that are produced from renewable biomass sources and are biodegradable too [3].

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УДК 811.111

THE IMPACT OF WIND POWER PLANTS ON THE ENVIRONMENT (ВПЛИВ ВІТРЯНИХ ЕЛЕКТРОСТАНЦІЙ НА НАВКОЛИШНЄ СЕРЕДОВИЩЕ)

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У цій статті я розгляну вплив вітряних електростанцій на навколишнє середовище, зосередившись на їхніх перевагах та недоліках. Я досліджу, як вітряні електростанції допомагають зменшити викиди парникових газів і залежність від викопного палива, а також проаналізую їхній потенційний негативний вплив на птахів, кажанів, ландшафт і місцеві екосистеми.

Ключові слова: Вітряні електростанції, відновлювальна енергія, енергетична безпека, переробка відходів.

In this article, I will explore the impact of wind power plants on the environment, focusing on their benefits and drawbacks. I will examine how wind power plants help reduce greenhouse gas emissions and dependence on fossil fuels, as well as analyze their potential negative effects on birds, bats, landscapes, and local ecosystems.

Keywords: Wind power plants, renewable energy, energy security, waste recycling.

Wind power plants have become one of the key elements in the transition to renewable energy sources. They help reduce greenhouse gas emissions and dependence on fossil fuels, making them an important tool in the fight against climate change. However, like any technology, wind power plants have both positive and negative impacts on the environment. This article explores the

main aspects of the impact of wind power plants on ecosystems, as well as possible ways to mitigate their negative effects.

Wind power plants generate energy without burning fossil fuels such as coal, oil, or gas. This significantly reduces emissions of carbon dioxide (CO₂) and other greenhouse gases, which are the primary cause of global warming. For example, according to the International Renewable Energy Agency (IRENA), a single wind turbine can prevent the emission of thousands of tons of CO₂ annually compared to traditional power plants. The use of wind energy reduces reliance on limited resources such as oil, gas, and coal. This not only minimizes environmental impact but also enhances energy security for countries, making them less dependent on fuel imports.

Wind energy is a renewable source because it relies on natural processes that are inexhaustible. Unlike fossil fuels, which may run out in a few decades, wind will always be available. This makes wind power plants a sustainable solution for meeting the energy needs of future generations. Traditional power plants that use coal or gas often pollute the air with harmful substances such as sulfur dioxide (SO₂) and nitrogen oxides (NO_x). Wind power plants do not produce such emissions, which improves air quality and human health. Additionally, they do not require large amounts of water for cooling, unlike nuclear or coal-fired power plants, reducing water pollution. Although wind power plants can impact local ecosystems, their overall effect on biodiversity is less significant compared to fossil fuel power plants. For example, they do not cause acid rain, which destroys forests and water bodies.

One of the most discussed problems is the collision of birds and bats with wind turbine blades. This is particularly true for large birds such as eagles and falcons, which often die due to collisions. Bats are also affected by changes in air pressure near turbines, leading to their death. Wind turbines generate noise during operation, which can affect local communities and wildlife. Although modern turbines have become quieter, noise remains an issue for people living near wind power plants. The installation of wind turbines often requires changes to the natural landscape, including deforestation or terrain modification. This can disrupt local ecosystems, alter animal migration routes, and affect vegetation. Studies show that large wind power plants can affect the microclimate of a region by altering wind patterns or air temperature. This can have indirect effects on agriculture and natural ecosystems. Wind turbine blades are made of composite materials that are difficult to recycle. After their service life ends, they often end up in landfills, creating new environmental problems.

These aspects demonstrate that, despite numerous benefits, wind power plants require careful planning and the implementation of technological solutions to minimize their negative impact.

To protect wildlife, monitoring systems are used to detect the approach of birds or bats and temporarily stop turbine operation. These technologies are based on radar, cameras, and artificial intelligence, allowing for effective reduction in collision rates. Special materials and designs that absorb sound waves are used to reduce noise. Moreover, turbines are installed at a sufficient distance from residential areas to minimize the impact on people. New methods for recycling composite materials used in blade production are being developed. For instance, they can be used to produce building materials or energy through pyrolysis. This helps reduce the amount of waste sent to landfills.

Wind power plants are a crucial element of modern energy systems, helping to reduce greenhouse gas emissions and dependence on fossil fuels. They are a key tool in the fight against climate change and the transition to renewable energy sources. However, like any technology, wind power plants have both positive and negative impacts on the environment. On the one hand, they reduce air pollution, support biodiversity, and provide a sustainable energy source for future generations. On the other hand, their operation can lead to collisions of birds and bats, noise pollution, landscape changes, and other environmental issues. In the future, wind energy can become even more efficient and environmentally friendly thanks to innovations and international cooperation. To achieve this, it is essential to strike a balance between environmental benefits and potential risks, as well as to continue investing in research and the development of new

technologies. Wind power plants are not only a source of clean energy but also an important step toward creating a sustainable future for our planet.

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MERKMALE DER MIKROBIOTA VON SAUERTEIG-STARTERKULTUREN FÜR DAS BROTBACKEN (ОСОБЛИВОСТІ МІКРОБІОТИ ЗАКВАСОК ДЛЯ ХЛІБОПЕЧЕННЯ)

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У статті досліджено особливості мікробіоти заквасок, які використовуються для хлібопечення. Описано склад мікробних спільнот, що включають дріжджі та бактерії, зокрема молочнокислі бактерії, які домінують у заквасках. Визначено важливість глибокого вивчення механізмів формування й динаміки мікробіоти для збереження традиційних заквасок і забезпечення сталості їхніх властивостей.

Ключові слова: закваска, бактерії, дріжджі, хлібопечення, мікробіота

Der Artikel untersucht die Merkmale der Mikrobiota von Sauerteig-Starterkulturen, die zum Brotbacken verwendet werden. Es wird die Zusammensetzung der mikrobiellen Gemeinschaften, einschließlich Hefen und Bakterien, insbesondere Milchsäurebakterien, die in Sauerteigen dominieren, beschrieben. Es wird festgestellt, wie wichtig eine genauere Untersuchung der Bildungsmechanismen und der Dynamik der Mikrobiota für die Erhaltung traditioneller Sauerteige und die Gewährleistung der Nachhaltigkeit ihrer Eigenschaften ist.

Schlüsselwörter: Sauerteig-Starterkulturen, Bakterien, Hefen, das Brotbacken, Mikrobiota

Das Brotbacken ist ein uraltes Handwerk, das mehr als 10 000 Jahre in das neolithische Asien zurückreicht. Alle Brote waren früher natürlicherweise durch die vorhandenen Mikroorganismen gesäuert; mit der Professionalisierung der Brotherstellung wurde die spontane Fermentation beim Brotbacken jedoch seltener. Durch den gezielten Zusatz von ausgewählten Hefen konnten die Triebführung beschleunigt und das Risiko von Fehlgärungen minimiert werden [1].

Mikrobiologische Sauerteiggemeinschaften setzen sich aus zwei funktionellen Gruppen zusammen: Hefen und Bakterien. Mit dem Reifegrad eines Sauerteigs nimmt die Vielfalt der Bakteriengattungen in der Sauerteiggemeinschaft ab. Die Mehle sind hauptsächlich durch stoffwechselaktive Gattungen besiedelt, die zu den Phyla der *Proteobacteria* (*Acinetobacter*, *Pantoea*, *Pseudomonas*, *Comamonas*, *Enterobacter*, *Erwinia* und *Sphingomonas*) oder der *Bacteroidetes* (*Chryseobacterium*) gehören. Ihre relative Häufigkeit variiert mit dem Mehl. Gut ein Tag nach der Vermehrung ist diese Population mit Ausnahme der *Enterobacteriaceae* fast vollständig gehemmt. Obwohl Mitglieder des Phylum *Firmicutes* in den Mehlen in sehr geringen

oder mittleren relativen Häufigkeiten vorhanden sind, werden sie schon nach einem Tag der Vermehrung dominant. Bei den *Firmicutes* dominieren ganz stark die Milchsäurebakterien [2].

In der Literatur über Sauerteig werden mehr als 60 gängige Arten von Milchsäurebakterien beschrieben, darunter *Fructilactobacillus sanfranciscensis*, *Levilactobacillus brevis*, *Limosilactobacillus fermentum*, *Lactiplantibacillus plantarum*, *Leuconostoc mesenteroides*, *Weissella cibaria* und *Weissella confusa*; allerdings kommen nicht notwendigerweise alle diese Arten in einem bestimmten Starter vor. In der Tat werden die meisten reifen Sauerteig-Kulturen von einer bis drei Bakterienarten dominiert. Dabei kommt *F. sanfranciscensis* besonders häufig vor und ist meist auch dominant. Eine Genomanalyse von *F. sanfranciscensis* hat gezeigt, dass das Genom zwar das kleinste innerhalb der Familie der *Lactobacillaceae* ist (ca. 1,3 Mbp), die ribosomalen RNA – Operons aber in der höchsten Dichte aller bekannten Genome freilebender Bakterien vorhanden sind. Diese Eigenschaft könnte es diesem Bakterium ermöglichen, rasch auf die wechselnden Bedingungen des Sauerteigs zu reagieren und ein schnelles Wachstum mit einem fermentativen Stoffwechsel einzuleiten [3, 4].

In Sauerteig können ebenfalls Essigsäurebakterien vorkommen, wenn auch deutlich weniger häufig als Milchsäurebakterien. Sie sind negativ mit *F. sanfranciscensis*, aber positiv mit einigen Hefen assoziiert. Es ist wenig bekannt, welche Faktoren ihr Vorhandensein beeinflussen. Die Essigsäurebakterien sind eine meist übersehene Gruppe im Sauerteigmikrobiom. Sie werden in den Literaturübersichten über die mikrobielle Vielfalt von Sauerteig häufig nicht oder nur am Rande behandelt [3].

Hefen sind einzellige Pilze, die sich klonal vermehren können, aber nicht in der Lage sind, echte Hyphen zu bilden, weshalb sie sich gut für die Brotherstellung eignen. Mit der Produktion von CO₂ übernehmen sie eine entscheidende Rolle für die Sauerteigbildung. Im Laufe der globalen Geschichte des Backens wurden Hefen darauf selektioniert, dass sie eine schnelle Fermentation und eine maximale CO₂-Produktion begünstigen. Hefen produzieren verschiedene Klassen von Alkoholen, Estern und organischen Säuren, die sowohl die Aktivität der Bakterien als auch den Flavor des Sauerteigs beeinflussen [5].

Zu den Sauerteighefen gehören Arten verschiedener Gattungen innerhalb der Ordnung *Saccharomycetales*. Zu den üblichen Sauerteighefen gehören unter anderem *Saccharomyces cerevisiae*, *Kazachstania humilis*, *Candida krusei*, *Kazachstania exigua*, *Torulaspora delbrueckii*, *Wickerhamomyces anomalus* und *Pichia kudriavzevii*. *S. cerevisiae* wird oft als die «klassische» Sauerteighefe angesehen, da sie in den meisten Startern dominant vorhanden ist und oft mit den ersten Sauerteigbrotten in Verbindung gebracht wird [4].

Mikrobielle Sauerteig-Gemeinschaften können sowohl einfach, als auch komplex zusammengesetzt sein. Spontane Fermentationen führen tendenziell zu eher komplexen Systemen, wogegen der Zusatz von ausgewählten Starter-Mikroorganismen zu eher einfachen mikrobiellen Systemen führt. Weitere Studien müssen durchgeführt werden, um die verborgenen Mechanismen aufzudecken, die der mikrobiellen Zusammensetzung, Dynamik und Stabilität von Sauerteig zugrunde liegen. Das Verständnis solcher Mechanismen ist unabdingbar, um die am besten geeigneten Bedingungen zu ermitteln, die es ermöglichen, einen bestimmten traditionellen Sauerteig als stabiles mikrobielles Ökosystem zu erhalten und so die typischen Merkmale des entstehenden Produkts im Laufe der Zeit zu bewahren.

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УДК 811.111

SOCIAL MEDIA AS AN EFFECTIVE MARKETING TOOL FOR BUSINESS DEVELOPMENT (СОЦІАЛЬНІ МЕДІА ЯК ЕФЕКТИВНИЙ МАРКЕТИНГОВИЙ ІНСТРУМЕНТ ДЛЯ РОЗВИТКУ БІЗНЕСУ)

Дергач Я.О. – здобувач вищої освіти групи МЕН 3/1

Науковий керівник: Ганніченко Т.А., кандидат педагогічних наук, доцент кафедри іноземних мов МНАУ

The development and widespread use of the Internet and digital technologies have dramatically transformed modern marketing. These technologies have influenced all areas of our lives, including the way we obtain information, communicate and make purchases. It is digitalization that has become an incentive for innovative business progress in the new digital era. With the help of digital tools, companies can quickly and efficiently solve various marketing tasks, both strategic and tactical.

Here are the benefits of using digital technologies in marketing:

- digital technologies allow you to reach an audience around the world, expanding the market for business;
- the ability to communicate directly with customers and receive feedback, which helps to improve products and services;
- digital technologies are often more cost-effective than traditional marketing methods, especially for small and medium-sized businesses;
- use of various content formats (video, images, text) to attract the attention of the audience and increase interest;
- use of advanced analytical tools to respond quickly to changes in market conditions, consumer needs and behavior;
- improving the quality and speed of customer service, and enhancing the service.

Social media has become a key tool in modern marketing, especially in the context of the crisis and martial law in Ukraine. For many companies, they are almost the only way to develop and maintain their business, as the number of Internet users and their activity in social networks is constantly growing[1].

Modern digital technologies are constantly evolving, providing marketers with more and more opportunities to work in social media. As a result, social media marketing is becoming more efficient and comprehensive. New tools and platforms are emerging that allow for the implementation of various marketing strategies, including advertising, PR, direct sales, and personalized communications. Social media marketing (SMM) is no longer just a separate tool, but a full-fledged digital marketing area. It can exist both independently and in combination with other

marketing technologies, creating a communication system. Promotion of a company, brand or product through social media.

Current research shows that Facebook and Instagram are the most important channels for engaging with the audience, communicating and influencing consumer behavior. Facebook is the undisputed leader among global social platforms, uniting millions of users. For marketers, it is a valuable resource that requires special attention and marketing efforts. Instagram, in turn, is extremely popular among young people. Both platforms serve as a place where potential buyers search for information, communicate with each other, and share their shopping experiences. Groups are created here to discuss goods and services and evaluate the work of companies. Instagram is not only a communication channel, but also a sales channel focused mainly on a young audience. About 67% of Instagram users are between the ages of 18 and 34, of whom 55% are women[2]. The advantages of using Facebook and Instagram are that both platforms offer opportunities for precise targeting of specific audience segments based on various parameters (age, gender, interests, etc.). The platforms also provide opportunities for active communication with the audience, contests, polls, and other interactive events. Facebook and Instagram provide detailed statistics on the audience and the effectiveness of advertising campaigns, which allows you to optimize your marketing strategies. The full-scale war waged by Russia against Ukraine has had a significant impact on the use of social media, including Facebook and Instagram.

According to Savytska, social media marketing provides companies with a great opportunity not only to attract customers but also to build strong relationships with them, turning them into a loyal audience and even brand ambassadors. To achieve this goal, there is a whole arsenal of marketing tools. One of the key elements of success is community management. It involves active communication with the audience, responding to comments and questions, creating interesting and useful content that helps attract and retain subscribers. Content marketing is equally important. High-quality and interesting content, whether it is texts, images, or videos, is the basis for attracting audience attention and building a positive brand image. It is important to create content that meets the interests and needs of your target audience. Effective work with social media interfaces also plays an important role. A user-friendly and intuitive interface facilitates better navigation and user interaction with your content. Finally, social media monitoring is essential for tracking mentions of your brand, analyzing audience sentiment, and responding to negative reviews or comments in a timely manner. This allows you to maintain a positive image of the company and solve problems that may arise in a timely manner. The use of these tools in combination allows companies to effectively use the potential of social media to build a loyal audience, create a community of customers, and successfully develop their business [3].

Promotion on social media is not only about spreading information about a brand or product, but also about creating an active community where members of the target audience can communicate and exchange opinions. For well-known brands with a wide audience that already actively uses social media, promotion can be particularly effective and cost-efficient. However, for new products or companies seeking to increase their visibility and build customer loyalty, more comprehensive and painstaking work is required. It is important not only to “convey” information about the product, but also to emphasize its key advantages - price, quality, design, and consumer culture. In many cases, online contact alone is not enough; it needs to be combined with offline marketing tools, such as presentations, sales pitches, and others.

Customer support on social media is of particular importance. Creating special groups or blogs where customers can get advice and answers to their questions is an effective way to reduce call center and customer service costs. Instead of contacting the call center, customers can get the information they need on a platform that is convenient for them, which helps to increase their loyalty and satisfaction. Thus, social media is a powerful marketing tool that allows not only to reach a wide audience but also to build strong relationships with customers, turning them into loyal brand advocates.

Social media has become an integral part of many people's lives. That's why managing social media reputation is critical to the success of any brand. This process involves constantly

monitoring brand mentions and actively participating in discussions on various platforms. It is important not only to collect feedback from the audience, but also to respond to it promptly, as well as to gently influence the formation of public opinion. Effective reputation management requires a comprehensive approach and coordination of all elements of the marketing mix. So if the quality of the product leaves much to be desired, no PR activities will be able to radically change the negative impression of the audience. Only after improving the quality of the product can reputation management be used to regain the trust of dissatisfied customers. In order to detect and respond to negative mentions of a brand or product in a timely manner, it is necessary to constantly collect and analyze information from various social networks and blogs. Given the huge number of such platforms, it is better to automate this process with the help of special services such as Babkee.

Thus, social media monitoring is a mandatory step before launching any communication campaign. It helps to find out the audience's attitude towards the brand and track the dynamics of this attitude in the future. It's important to remember that the success of social media marketing depends on many factors, including the specifics of the product and the way the company operates. They influence the formation of the target audience and the choice of effective communication tools.

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REGIONAL ADAPTATION TO CLIMATE CHANGE: SITUATION AND ACTIONS

(АДАПТАЦІЯ РЕГІОНУ ДО ЗМІНИ КЛІМАТУ: СИТУАЦІЯ ТА ДІЇ)

Дзюба М.О. – здобувачка вищої освіти групи ТУР 2/1

Науковий керівник: Ракова А.Ю., викладач кафедри іноземних мов МНАУ

У статті розглянуто адаптацію регіонів до зміни клімату, а саме вплив кліматичних змін на економіку та екосистеми. Описано основні підходи до адаптації, такі як модернізація інфраструктури, агрономічні рішення та системи раннього попередження. Наведено приклади успішних адаптаційних заходів у різних регіонах, зокрема в Україні. Визначено ключові виклики адаптації, такі як брак фінансування та необхідність координації між органами влади.

Ключові слова: *зміна клімату, адаптаційні заходи, екологічна безпека, інфраструктура, сталий розвиток*

The paper examines regional adaptation to climate change, specifically the impact of climate change on the economy and ecosystems. The paper describes the main approaches to adaptation, such as infrastructure modernization, agronomic solutions, and early warning systems. Examples of successful adaptation measures in different regions, including Ukraine, are provided. Key challenges to adaptation are identified, such as lack of funding and the need for coordination between authorities.

Keywords: *climate change, adaptation measures, environmental security, infrastructure, sustainable development*

Climate change is a global problem that affects the socio-economic development of regions. Temperature increases, changes in mineral precipitation, extreme weather events - all this requires the use of adaptation measures to reduce the negative impact on ecosystems and the population. An important aspect is the development of regional strategies that take into account the specifics of local climatic conditions, infrastructure and resources.

Climate change has consequences for regions depending on their geographical location. For example, coastal zones face the risks of sea level rise and flooding, while inland regions may suffer from drought or water shortages [1]. Ukraine is already experiencing changes in climatic conditions, leading to an increase in the number of natural disasters, such as floods and heat [2]. These are specific features for agriculture, forestry and water resources.

Adaptation to climate change occurs in the implementation of measures aimed at minimizing damage and increasing resilience to climate impacts. The main approaches include infrastructure changes, agronomic adaptation measures, and early warning development.

Several successful practical adaptations can be identified from the example of European countries and the USA. For example, in the Netherlands, adaptation of coastal zones to sea level rise works through the creation of comprehensive flood protection systems [3]. In California, water resources management strategies have been adopted in conditions of prolonged drought, in particular through the use of innovative technologies in scaling up [4]. In Ukraine, the greatest attention is paid to measures to restore and preserve water resources that are under threat due to changes in the precipitation regime. For example, in the Carpathian region, projects have been implemented to preserve natural water sources and increase the resilience of forest ecosystems to climate change [5]. Many countries have developed national strategies for adaptation to climate change. In Ukraine, the “Strategy of Environmental Security and Adaptation to Climate Change until 2030” has been adopted [6]. According to this document, the main environmental threats to Ukraine are a significant level of pollution of atmospheric air, water and land resources, an imperfect system of state supervision (control) and monitoring of the environment. There is also a critical situation with the generation, accumulation, storage, processing, utilization and disposal of waste. This Strategy defines the main areas of adaptation measures, including energy efficiency, biodiversity conservation and prevention of natural disasters, as well as measures to increase energy efficiency and improve infrastructure.

Climate policy, despite the war, remains among the main priorities of environmental reforms, and the post-war recovery of Ukraine should take place with ultimate climate goals and the implementation of measures to adapt to climate change. This year we also have many climate achievements - the National Climate Strategy until 2035 and the Action Plan until 2026 were approved [7]. The project experts calculated the required number and cost of adaptation measures for three pilot regions – early warning systems, protective engineering structures, irrigation and drainage systems, smart grids, etc. The total cost of 168 climate change adaptation measures for Lviv region is 273.7 million euros, for Mykolaiv region it is recommended to implement 171 measures worth 155.7 million euros, and for Ivano-Frankivsk region 158 measures worth 152.650 million euros are needed [8].

One of the key problems of adaptation is insufficient funding and coordination between national and local authorities [9]. Effective implementation of measures requires comprehensive planning that includes both environmental and socio-economic aspects. The prospects for adaptation depend largely on the ability of regions to introduce innovations, cooperate with international organizations and attract funding from global climate funds.

Therefore, adaptation of regions to climate change is a necessary condition for their sustainable development. Integration of adaptation measures into state programs, innovative solutions and international cooperation are key elements of successful adaptation. It is important

that these measures are aimed at minimizing risks to ecosystems and the population, as well as supporting the economic stability of the regions.

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EUROPEAN EXPERIENCE IN THE DEVELOPMENT OF HOTEL SERVICES STANDARDIZATION (ЄВРОПЕЙСЬКИЙ ДОСВІД РОЗВИТКУ СТАНДАРТИЗАЦІЇ ГОТЕЛЬНИХ ПОСЛУГ)

Ємець А.С. - здобувач вищої освіти групи ГРС 2/1

Науковий керівник: Ракова А. Ю., викладач кафедри іноземних мов МНАУ

Стаття аналізує європейський досвід стандартизації готельних послуг у контексті інтеграції України до ЄС. Розглянуто основні системи стандартизації (Hotelstars Union, HOTREC, ISO, "Green Key", "Eurom Accessibility") та особливості сертифікації готельного бізнесу. Визначено вплив воєнних дій на сферу гостинності та перспективи її відновлення, зокрема цифровізацію, розвиток екоготелів і вдосконалення законодавства для інтеграції в європейський ринок.

Ключові слова: *стандартизація, готельні послуги, Європейський Союз, Hotelstars Union, HOTREC, сертифікація, міжнародні стандарти, туризм, готельне господарство, якість обслуговування, воєнні умови, адаптація, екоготелі, цифровізація, державне регулювання.*

The article analyzes the European experience of standardizing hotel services in the context of Ukraine's integration into the European Union, looks at the basic standardization systems (Hotelstars Union, HOTREC, ISO, Green Key, Eurom Accessibility) and the characteristics of the certification of the hotel business, and looks at the impact of the war on the sphere of hospitality and the prospects for its recovery, including digitization, the development of ecotourism and the improvement of legislation for integration into the European market.

Keywords: *standardization, hotel services, European Union, Hotelstars Union, HOTREC, certification, international standards, tourism, hotel industry, service quality, wartime conditions, adaptation, eco-hotels, digitalization, state regulation.*

Since Ukraine has set a course for joining the European Union, hotel service standardization is becoming increasingly relevant. In the modern European space, the following standardization systems exist: star rating standardization, HOTREC (Hotels, Restaurants & Cafes in Europe), Hotelstars Union (European star certification system), ISO (International Organization for Standardization), the European "Green Key" system for environmental certification, and the "Eurom Accessibility" certification for accessibility. EU countries have special laws, strategies, and policy documents aimed at developing tourism and hospitality. Some countries provide financial support and invest efforts into marketing campaigns for international promotion.

International standards – are adopted by international or regional standardization organizations focused on standardization, metrology, and quality. They develop terms and definitions, testing methods, work procedures, and products that are objects of foreign trade. International standards: – establish requirements and indicators that correspond to the global technical level; – regulate issues of compatibility, interchangeability, technology, transportation, and storage of various types of products [1, p.28].

According to national legislation, hotel categorization is not mandatory. Standards for categorization should be developed based on the European Hotelstars Union system. Since June 1, 2021, Ukraine has become a member of the European community of national associations of hotels and restaurants HOTREC. In modern conditions, there should be an improvement of the current legislation on tourism and the hotel industry through the development and adoption of effective regulatory legal acts aimed at the development of the country's tourism complex[1. p.198].

At the interstate level, quality requirements are determined by the ISO 9000 standards. According to the international ISO 9000 standards, to ensure quality, it is necessary to:

- an appropriate material base for the hotel enterprise;
- qualified workers who perform professional duties with high productivity;
- a justified organizational-functional structure and professional management of the enterprise, as well as quality management of services in particular[3].

The services of hotel enterprises are subject to mandatory certification. In Ukraine, mandatory standardization can only be conducted by state-owned enterprises authorized as certification bodies for hotel services. These bodies are aware of all the requirements and the procedure for conducting certification of hotel services.

Only those hotel businesses that already have a star status and want to improve it are subject to certification. Hotel businesses must undergo certification of compliance every five years. Hotel enterprises that carry out economic activities without a certificate of compliance are subject to financial impact measures - penalties in the amounts provided by law[3].

In the current military conditions, the hotel industry in Ukraine has proven to be particularly vulnerable, which is manifested through infrastructure destruction and the absence of hotel service consumers. As a result of active hostilities, a large number of hotels in various territories of Ukraine have been destroyed and are not subject to restoration. The situation with hotels located in occupied territories is complicated.

Despite active military actions in most of Ukraine, the State Tourism Development Agency, together with the Association of Hotels and Resorts of Ukraine, is implementing a project to test the European hotel classification system "Hotels Stars Union". The current military situation in Ukraine allows identifying promising areas for the development of the hotel industry:

- relocation of the hotel business to safer areas of Western Ukraine;
- transition of hotel services to the rehabilitation of individuals affected by active hostilities, which is in greater demand in the current military time. Activation of resort hotels;
- increase in the number of hotels with apartments, which are more suitable for accommodating families and comfortable long-term stays;

- deferred demand for tourism and promotion of Ukraine at the international level will activate tourism activities after the end of the war, which will also affect the hotel industry;
- adaptation of hotels to the realities of wartime and the search for new forms of service;
- formation of "deferred supply" in the hotel market, which will activate competition and improve services in the country's hotel enterprises;
- re-equipping hotels taking into account safety requirements and autonomous operation (availability of bomb shelters, autonomous power sources);
- development of eco-hotels with a focus on alternative energy;
- strengthening control over the origin of investments made in the hotel industry;
- bringing hotel industry standards closer to European Union standards;
- development of new enterprises and re-equipment of existing ones by attracting funds from various post-war recovery funds[4].

Our country has great potential for the development of tourism and the hotel business, but this market has its characteristics and requires improved state regulation for its development. It is necessary to introduce new comprehensive legislation that will take into account the problems of the hotel sector in modern conditions. Digitalization and innovative solutions will also help in solving many problems. But first of all, the end of military operations is needed to normalize and attract foreign investment.

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THE IMPORTANCE OF VETERINARY MEDICINE: A COMPREHENSIVE ANALYSIS (ВАЖЛИВІСТЬ ВЕТЕРИНАРНОЇ МЕДИЦИНИ: КОМПЛЕКСНИЙ АНАЛІЗ)

Кир'янова К.В. – здобувач вищої освіти групи ВМ 4/1

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У публікації проведено огляд важливості ветеринарної медицини. Було проаналізовано дослідження та робочі документи, щоб підкреслити її внесок у добробут тварин, громадське здоров'я та наукові інновації.

Ключові слова: *ветеринарна медицина, тварини, наукові інновації, EBVM, громадське здоров'я.*

The publication reviews the importance of veterinary medicine. Research and working papers were analyzed to highlight its contributions to animal welfare, public health and scientific innovation.

Keywords: *veterinary medicine, animals, scientific innovations, EBVM, public health.*

Veterinary medicine encompasses the prevention, diagnosis, and treatment of diseases in animals. Beyond animal care, veterinarians significantly impact public health, food safety and biomedical research. This publication examines the important roles of veterinarians in various sectors and highlights the need for their contribution to society.

The primary responsibility of veterinary medicine is to maintain and enhance animal health. Veterinarians address a wide range of health issues in animals, from common ailments to complex diseases. Their expertise ensures the well-being of pets, livestock and wildlife, contributing to ecological balance and biodiversity [1].

Veterinarians are at the forefront of monitoring and controlling zoonotic diseases – illnesses transmissible between animals and humans. Their vigilance in disease surveillance and management is crucial in preventing outbreaks that could have severe public health implications. For instance, the detection of West Nile virus in New York City in 1999 highlighted the essential role of veterinarians in identifying and managing emerging health threats [2].

Veterinary professionals ensure the health of livestock, directly influencing the safety and quality of the human food supply. By implementing health programs and monitoring for diseases in food-producing animals, veterinarians help to prevent foodborne illnesses and ensure the availability of safe animal products for consumption.

Veterinary medicine contributes to medical research through comparative studies and the development of new treatments. Research in veterinary science often parallels human medicine, leading to advancements that benefit both animals and humans. The application of outcomes research principles in veterinary medicine, for example, has enhanced the development and evaluation of veterinary pharmaceuticals and biologics [3].

The integration of evidence-based practices in veterinary medicine ensures that clinical decisions are informed by the best available research. This approach enhances the quality of care provided to animals and supports continuous improvement in veterinary practices. The Royal College of Veterinary Surgeons emphasizes the importance of EBVM in promoting effective clinical governance and improving patient outcomes.

Veterinarians play a role in environmental conservation by monitoring the health of wildlife populations and investigating the impact of environmental changes on animal health. Their work contributes to the preservation of species and the maintenance of healthy ecosystems [4].

In conclusion, veterinary medicine is integral to various aspects of society, from ensuring animal welfare to safeguarding public health and advancing scientific research. The diverse roles of veterinarians underscore the necessity of supporting and advancing the field of veterinary medicine to promote a healthier world for both animals and humans.

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COVID-19 PANDEMIC AND ITS IMPACT ON THE CRUISE INDUSTRY (ПАНДЕМІЯ COVID-19 ТА ЇЇ ВПЛИВ НА КРУЇЗНУ ІНДУСТРІЮ)

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У статті розглядається вплив пандемії COVID-19 на світову круїзну індустрію. Досліджено основні кризові аспекти, спричинені пандемією, а також заходи, які застосовуються для відновлення галузі. Проаналізовано економічні наслідки пандемії, зміни у вимогах до безпеки, ланцюг постачання та перспективи розвитку круїзного туризму в Україні.

Ключові слова: круїзний туризм, пандемія COVID-19, безпека, відновлення, пасажери.

The impact of the COVID-19 pandemic on the global cruise industry is examined in this article. The main crisis aspects caused by the pandemic, as well as the measures applied for the industry's recovery, are studied. The economic consequences of the pandemic, changes in safety requirements, and supply chain disruptions are analyzed

Keywords: cruise tourism, COVID-19 pandemic, safety, recovery, passengers.

Cruise tourism is one of the fastest growing sectors of the tourism market. It attracts millions of tourists due to the high level of comfort, diverse itineraries and high-quality service on board the liners. However, the COVID-19 pandemic has radically changed the situation in the industry, leading to its rapid decline. Mass closures of ports, restrictions on international travel and high levels of infection on board ships have become key challenges for the cruise industry.

The COVID-19 pandemic has caused a major crisis in cruise tourism, as cruise ships have become hotspots for the spread of the virus due to the large number of passengers in a confined space. Many countries have closed their ports to cruise ships, leading to mass cancellations. According to the Cruise Lines International Association (CLIA), cruise ship mobility in 2020 decreased by 19.57%-42.77%. Some cruise lines have been forced to suspend operations completely, and a significant part of the ships have been sold or decommissioned.

The cruise industry has suffered massive financial losses due to the pandemic. Border closures and travel restrictions have led to a sharp decline in passenger traffic, which in turn has led to a decline in cruise companies' revenues. Many travel agencies specializing in cruise tours have gone bankrupt. To reduce financial losses, companies have been forced to reduce staff and even sell their ships. For example, Carnival Cruise Line has laid off more than 26,000 employees. In order to overcome the crisis, cruise lines are developing new strategies to restore travel demand. One of the main directions is to improve the level of safety and hygiene on board the liners. New ventilation and air purification systems are being introduced, sanitary control measures are being strengthened, and restrictions on the number of passengers on board are being introduced. Some companies are focusing on domestic routes to minimize the risks of crossing international borders.

The pandemic has also impacted the cruise tourism supply chain. Border closures and quarantine restrictions have disrupted the delivery of food and other essential supplies to ships. Many suppliers have been unable to meet their obligations due to delays in logistics processes. Changes in sanitary control regulations have also impacted the requirements for transportation and storage of products, making it difficult to provide ships with the necessary supplies.

The COVID-19 pandemic has thus caused an unprecedented crisis in the cruise industry, resulting in massive cancellations, economic losses and changes in travel safety regulations. The recovery of the industry requires a comprehensive approach, including the implementation of new sanitary standards, optimization of routes and improvement of conditions on board ships. In addition, cruise companies are forced to adapt to the new realities, reviewing their business models

and developing innovative approaches to attract passengers. It is expected that in the coming years the cruise market will gradually regain its position, but with new standards of safety and travel organization.

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УДК 811.111

FOOD SECURITY IN THE 21ST CENTURE: THE ROLE OF MODERN AGRICULTURAL PRACTICES (ПРОДОВОЛЬЧА БЕЗПЕКА У ХХ СТОЛІТТІ: РОЛЬ СУЧАСНИХ АГРАРНИХ ПРАКТИК)

Коржова В. В. – здобувач вищої освіти групи ХТ 1/1

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Дослідження присвячене аналізу сучасних аграрних технологій, таких як точне землеробство, біотехнології та екологічно стійкі методи ведення господарства, які сприяють підвищенню продуктивності та ефективності сільського господарства. Окреслено основні виклики, ризики та перспективи їх впровадження у контексті глобальної продовольчої безпеки. Висвітлено роль інноваційних рішень та міжнародної співпраці у подоланні проблеми нестачі продовольства.

Ключові слова: *продовольча безпека, сільське господарство, аграрні технології, точне землеробство, біотехнології, сталість, глобальні виклики.*

This study analyzes modern agricultural technologies, such as precision farming, biotechnology, and sustainable farming practices, which contribute to improving agricultural productivity and efficiency. The paper outlines key challenges, risks, and prospects for their implementation in the context of global food security. It highlights the role of innovative solutions and international cooperation in addressing food shortages and ensuring sustainable food production.

Keywords: *food security, agriculture, agricultural technologies, precision farming, biotechnology, sustainability, global challenges.*

By the end of the first quarter of that 21st century, 2025, world population will approach 8 billion people, an increase of 2.5 billion from the 1990s. Recent projections suggest something less than 8 billion but still project a more than 2 billion increase. Nearly all of this increase will be in developing countries. The population of SubSaharan Africa will more than double. But the increase

in the number of mouths to feed is only part of the challenge. Income growth also drives the demand for food. With modest income growth, food needs in the developing countries could nearly double in the next 30 to 40 years. Further, by 2025, population in developing country cities will increase by about the same number, 2.5 billion people. With rising incomes and urbanization, the composition and characteristics of food demand will be significantly different [1].

Increasing population and consumption are placing unprecedented demands on agriculture and natural resources. Today, approximately a billion people are chronically malnourished while our agricultural systems are concurrently degrading land, water, biodiversity and climate on a global scale. We can all agree, regardless of our background, that feeding everyone while maintaining the Earth's ecosystems are critical goals. But how can this be done?

We know that agriculture plays a key and direct role in achieving the Sustainable Development Goal (SDG 2) to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture. However, to meet the world's future food security needs, we need to make sure agriculture is also central to strategies to address other SDGs on poverty, water, biodiversity, sustainable cities, sustainable energy, and climate change [2].

Agriculture plays a crucial role in overcoming the food crisis. Modern agricultural practices allow for increased production efficiency and the rational use of resources. One such technology is precision farming, which utilizes satellite monitoring, GPS systems, and sensors to optimize crop management and reduce fertilizer and water consumption.

Biotechnology also plays an important role in ensuring food security. Genetically modified crops have enhanced resistance to pests, diseases, and adverse weather conditions, which helps increase yields. Moreover, vertical farming and hydroponic methods enable food production without soil, which is particularly relevant for regions with limited agricultural land.

Sustainable agricultural development is another essential aspect of food security. Organic farming, agroforestry, and the use of environmentally friendly production methods contribute to biodiversity conservation and improve product quality.

To ensure food security, it is essential to consider a comprehensive approach that integrates several strategic directions. First and foremost, protecting the interests of domestic producers is a priority. Improving the legislative framework that regulates food production, distribution, and storage will be a key step in creating competitive market conditions, protecting against unfair participants, and ensuring high product quality. Governments play an active role in supporting local production. Through various support programs, grants, and preferential lending, it is possible to stimulate production growth. This, in turn, will contribute to the modernization of technologies and the expansion of production capacities. Another important aspect is infrastructure development. Effective logistics and modern food storage facilities will help optimize costs, reduce food losses, and ensure product freshness. The development of transport infrastructure, the construction of modern warehouses, and refrigeration complexes will address these challenges. Finally, public education and the promotion of healthy consumption play a key role in shaping a conscious consumer. Informing citizens about the importance of healthy eating, proper food selection, and storage will help create a culture of quality nutrition and enhance food security [3].

In conclusion, agriculture remains the foundation of food security in the 21st century. The implementation of innovative technologies, sustainable development, and efficient resource management will help to increase food production and ensure the stability of the global food system. However, achieving this goal requires a comprehensive approach that includes government support, scientific advancements, and raising public awareness.

Through international cooperation and technological progress, it is possible to create a reliable and resilient food supply system for future generations. Investing in modern agricultural practices, improving infrastructure, and promoting sustainable farming methods will not only enhance food security but also strengthen the global agricultural economy and ensure a better quality of life for people worldwide.

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УДК 633.812

VERGLEICH VON SOJABOHNENSORTEN NACH IHREM ERTRAG (ПОРІВНЯННЯ СОРТІВ СОЇ ЗА ЇХ ВРОЖАЙНІСТЮ)

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Основна мета дослідження полягала у визначенні впливу сорту сої на врожайність за однакових умов вирощування. Дослідження підтвердило важливу роль сорту в досягненні високих врожаїв сої. Подальші дослідження в цьому напрямку дозволять розширити знання про біологічні особливості сої та розробити більш ефективні технології її вирощування.

Ключові слова: соя, врожайність, сорти, білок, амінокислоти, вирощування, дослідження

Das Hauptziel der Studie bestand darin, die Auswirkungen der Sojabohnensorte auf den Ertrag unter gleichen Anbaubedingungen zu bestimmen. Die Studie bestätigte die wichtige Rolle der Sorte für das Erreichen hoher Sojaerträge. Weitere Forschungen in dieser Richtung werden das Wissen über die biologischen Eigenschaften der Sojabohne erweitern und effektivere Technologien für ihren Anbau entwickeln.

Schlüsselwörter: Sojabohne, Ertrag, Sorten, Protein, Aminosäuren, Anbau, Forschung

Sojabohne (*Glycine hispida*) ist eine der wichtigsten Hülsenfrüchte der Welt. Sein Korn ist eine echte Quelle für Proteine und Aminosäuren, die der menschliche Körper braucht. Aufgrund seines hohen Proteingehalts (30–55 %) und seiner Vitamine wird Soja oft als pflanzliches Fleisch bezeichnet. Darüber hinaus ist es eine wertvolle Futterpflanze und aus seinen Samen wird hochwertiges Öl gewonnen.

Sojabohnen sind wärmeliebende Kurztagpflanzen. Damit die Samen keimen können, muss die Bodentemperatur in 10 cm Tiefe mindestens 10–14 °C betragen. Die Kultur stellt hohe Anforderungen an die Feuchtigkeit, insbesondere während der Blütezeit und der Bohnenbildung. Feuchtigkeitsmangel kann zu erheblichen Ernteverlusten führen. Sojabohnen sind in der Lage, atmosphärischen Stickstoff zu binden und so den Boden anzureichern.

Die Wahl der Sojabohnensorte ist einer der wichtigsten Ertragsfaktoren. Verschiedene Sorten unterscheiden sich in folgenden Eigenschaften: Resistenz gegen Krankheiten und

Шкідlinge; Sorten, die gegen häufige Krankheiten resistent sind, benötigen weniger chemische Behandlungen; schnelle Reifung, frühe Sorten ermöglichen es Ihnen, Herbstfröste zu vermeiden; Pflanzenhöhe, hohe Sorten neigen eher zum Lagern; Öl- und Proteingehalt, Sorten mit hohem Ölgehalt eignen sich besser für die Ölproduktion und solche mit hohem Proteingehalt besser für die Lebensmittelindustrie.

Eine an vier Sojabohnensorten (Ezra, Commander, Mentor, Kyoto) durchgeführte Studie zeigte, dass die Erträge selbst unter gleichen Anbaubedingungen erheblich variieren können. Den höchsten Ertrag erzielte die Sorte Ezra, den niedrigsten die Sorte Commander. Dies zeigt, dass die richtige Sortenwahl das Endergebnis maßgeblich beeinflussen kann.

Sortenname	Ertrag, c/ha
Esra	35,2
Kommandant	27,4
Mentor	29,8
Kyoto	31,5

Sojabohnen sind eine wertvolle Nutzpflanze mit vielseitigen Anwendungsmöglichkeiten. Um hohe und stabile Erträge zu erzielen, müssen die biologischen Eigenschaften der Pflanze berücksichtigt und die richtige Sorte ausgewählt werden. Die Ergebnisse der Studie bestätigen, dass die Sortenwahl einer der wichtigsten Faktoren für den Erfolg des Sojaanbaus ist.

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УДК 811.111

CRYPTOGRAPHY: BASIC METHODS OF ENCRYPTION AND DECRYPTION (КРИПТОГРАФІЯ: ОСНОВНІ МЕТОДИ ШИФРУВАННЯ ТА ДЕШИФРУВАННЯ)

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В даній роботі розглянуто поняття криптографії, показано деякі з алгоритмів шифрування а також їх застосування в історії і сучасному світі. Була проведена оцінка надійності наведених алгоритмів і показано засоби дешифрування повідомлень.

Ключові слова: криптографія, конфіденційність, кібербезпека, шифрування, дешифрування, криптоаналіз, алгоритми, шифри.

This research examines the concept of cryptography, shows some of the encryption algorithms, their application in history and the modern world. The reliability of the above algorithms was evaluated, and the means of decrypting messages were shown.

Keywords: *cryptography, privacy, cybersecurity, encryption, decryption, cryptanalysis, algorithms, ciphers.*

Cryptography is the practice of encrypting messages to conceal their meaning from unauthorized parties. The primary goal is to transform a message using an algorithm so that only the intended recipient can decipher it. There are several main types of encryptions: symmetric and asymmetric. This research will focus only on symmetric encryption.

Before delving into these, it's necessary to introduce some terms. Plaintext refers to information that is not yet encrypted or information after decryption. A key is a specific parameter known only to the sender and recipient. It enables the decryption and understanding of the transmitted information.

Symmetric encryption includes algorithms in which the key is the same for both the sender and the recipient (in asymmetric encryption, the keys are different, and it is widely used in the modern world). It is the oldest and fastest type, but it also has a significant drawback – the key must be transmitted to both parties without disclosure to outsiders. One of the most popular ciphers is the Caesar cipher. In it, the plaintext is altered according to the following principle: each letter in the message is replaced by the n th letter to the left or right in the alphabet. The key here is the numerical value by which the offset is made. For example, the word "text" can be encrypted with a key of 3. That is, we need to count three positions to the right in the alphabet, and the result will be "whaw". This example also shows that when the alphabet ends at the letter "x", the counting starts from the beginning, as if in a circle. If there were a minus sign before the number in the key, we would move to the left.

The Caesar cipher is based on the substitution method. The example above is a monoalphabetic substitution cipher. Its disadvantage is the possibility of applying frequency analysis for decryption. In any language in the world, there are letters or symbols that occur more or less frequently in text. Knowing the average frequency of all letters, one can compare them with the frequency of symbols in the encrypted text and crack the cipher. However, frequency analysis is most effective with large messages, as the more data, the more accurate the frequency will be.

The polyalphabetic method was invented to protect against frequency analysis. However, the name of the method does not mean that alphabets of different languages are used. The name comes from using the same alphabet multiple times. Let's consider an example of one of the most important polyalphabetic ciphers in the history of cryptography – the Vigenère cipher. First, we need the Vigenère square, a table in which all the letters of the alphabet are written, and with each new row, the alphabet starts with an offset of one letter (the first row starts with "A", the second with "B", etc.), and the letters that were removed from the beginning are written at the end. It is necessary that both columns and rows are written according to this principle. Now we need to come up with a key word which we will encrypt. Let it be "cipher", and the plaintext to be converted will be "I want to believe". First, we repeat the key word to match the length of the message – "ciphercipherci". The first letter "I" will be converted to "K" (shifted two positions to the right, since "c" is the second in the alphabet, counting from zero), the letter "w" to "e", and so on. The complete message will look like "kepuxkqjtsmvxm". The principle is as follows: we take a letter from the plaintext and the corresponding letter from the key and shift it by as many positions as the place of the letter from the key. The place of the letter is counted from zero ("a"=0, "b"=1, etc.), so the shifts for our key will be "2 8 15 7 4 17". In this example, the space symbol or "_" was not used, so the encrypted message is written together, but there are cases with the inclusion of this symbol in the table.

For a long time, the Vigenère cipher was considered unbreakable, because with the addition of length to the key and the reduction of its repetitions, the complexity of breaking it increased. But in modern times, it is not used to protect important information, as there are much more robust encryption methods and better methods for breaking it, such as Charles Babbage's method. It is based on finding repeating sequences of symbols and the distances between them, to then determine the length of the column. Knowing the length, you can break the encrypted text into columns with

the length of one key and then apply frequency analysis to each of the columns. This will be the final step to determining the offset, and therefore the key.

Cryptography is a science that is constantly evolving in attempts to create and break more reliable ciphers. Now more than ever, data confidentiality, integrity, and availability are important, so the development of cryptographic systems will only accelerate and adapt to different conditions. This can be traced even in the history of this science, when before the advent of computers, people could rely only on their brains and the ciphers were very simple, so that they could be solved by a person. Now, for decryption, computer calculations are almost always used, and a person compared to them is thousands of times slower.

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УДК 811.111

AROMA MARKETING IN THE HOTEL BUSINESS (АРОМАМАРКЕТИНГ В ГОТЕЛЬНОМУ БІЗНЕСІ)

Марцінюк К.І. - здобувачка вищої освіти групи ТУР 2/1

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Ключові слова: *аромамаркетинг, готельний бізнес, ароматизація, лояльність клієнтів, комфорт гостей, технології ароматизації, емоційне сприйняття, аромати, бренд готелю, стратегія маркетингу, атмосфера готелю.*

Keywords: *aroma marketing, hotel business, aromatization, customer loyalty, guest comfort, aromatization technologies, emotional perception, fragrances, hotel brand, marketing strategy, hotel atmosphere.*

Problem statement. Aroma marketing in the hotel business is an important element that affects the emotional perception of guests. The use of fragrances allows hotels to create a unique atmosphere, which helps to increase customer loyalty and create a positive first impression. The challenge is to effectively select fragrances so that they match the hotel's concept and do not cause negative reactions from guests, especially when fragrance technologies are widely used. Successful implementation of aroma marketing allows hotels to significantly improve the level of service and increase the number of repeat visits.

Purpose and objectives of the study. The purpose of the study is to determine the role of aroma marketing in improving the comfort of hotel guests and its impact on the emotional perception of the brand. Evaluating the effectiveness of aromatization in different areas of the hotel. To study the impact of odors on guest satisfaction and their decision to return to the hotel. Consideration of aromatization methods and technologies used to increase the effectiveness of aroma marketing in the hotel business.

Presentation of the main material. Aromamarketing in the hotel business is an important component of a strategy that allows creating a unique atmosphere and positive emotional perception among clients. It involves the use of various types of scents and technologies to enhance the visitor experience, allowing the establishment to stand out from competitors.

Scents can be effectively used in different areas of the hotel, strengthening the emotional connection with guests depending on their location within the hotel. For lobbies and corridors,

scents that create a feeling of calm and comfort are usually chosen (for example, lavender or vanilla), while for restaurants, 'tasty' smells that stimulate appetite are selected (aroma of spices, citrus fruits, or fresh baked goods). [1] For rooms, it's important to choose moderate scents that complement the interior but do not dominate (for example, woody notes or citrus scents).

The main principles of hotel aromatization include the use of various air fresheners in key areas: lobbies, corridors, rooms, and restaurants. Special attention should be paid to selecting scents depending on the zone: for the restaurant, 'tasty' scents are used, and for the lobby.

Conclusion. To summarize, fragrance marketing is an important tool for increasing customer loyalty and creating an unforgettable experience for hotel guests. With the right choice of fragrances and technologies, hotels can improve their service delivery, make their atmosphere unique and encourage guests to return. Effective aromatization is an important element in maintaining a high standard of service in a competitive hotel market.

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THE IMPACT OF ENGAGING IN SPORTS ON A PERSON'S PSYCHO-EMOTIONAL STATE (ВПЛИВ ЗАНЯТЬ СПОРТОМ НА ПСИХОЕМОЦІЙНИЙ СТАН ЛЮДИНИ)

Матющенко О. М. - здобувач вищої освіти групи ГРС 2/1

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Стаття досліджує вплив фізичної активності на психоемоційний стан людини. Розглядається роль спорту у зниженні рівня стресу, кортизолу та адреналіну, а також підвищенні рівня ендорфінів і серотоніну. Проаналізовано біохімічні механізми покращення настрою та когнітивних функцій завдяки регулярним фізичним вправам. Висвітлено значення командних видів спорту у зміцненні соціальних навичок і психічного благополуччя. Особливу увагу приділено позитивному впливу фізичної активності на дітей, підлітків та людей похилого віку.

Ключові слова: фізична активність, психічне здоров'я, кортизол, ендорфіни та серотонін, спорт.

The article examines the impact of physical activity on a person's psycho-emotional state. The role of sport in reducing stress, cortisol and adrenaline levels, as well as increasing endorphins and serotonin levels, is examined. The biochemical mechanisms of improving mood and cognitive functions through regular physical exercise are analyzed. The importance of team sports in strengthening social skills and mental well-being is highlighted. Special attention is paid to the positive impact of physical activity on children, adolescents and the elderly.

Keywords: *physical activity, mental health, cortisol, endorphins and serotonin, sports.*

Physical activity has a significant impact on mental health and can be an effective means of supporting it. The relationship between sports and mental health has been known for many years and has been studied for many years. Exercise and physical activity have a positive effect on emotional state, cognitive functions and overall stress levels.

Regular physical activity significantly reduces the level of cortisol (stress hormone) in the human body. Cortisol is released in stressful situations and has a negative effect on our health, especially the brain. When the level of adrenaline and cortisol decreases, negative mood decreases, symptoms of depression and anxiety are reduced, and sleep disorders disappear.

Cortisol is an indicator of stress. High levels of this hormone in the morning are associated with depression and neurosis. The level of cortisol in the blood increases when the body is out of balance, for example, during sports. However, in this case it can be beneficial. The release of cortisol during physical activity is associated with increased availability of substrates for metabolism. After exercise, blood levels of the hormone are lower in adolescents and adults than before. Cortisol has also been shown to remain suppressed for 24 to 48 hours after intense exercise. Like cortisol, adrenaline is released by the adrenal glands in response to stress, leading to arousal, anxiety, increased heart rate, increased breathing, and the fight-or-flight response. After exercise, adrenaline levels also decrease compared to baseline.

Physical activity also releases chemicals called endorphins and serotonin. Endorphins and serotonin play an important role in improving mood, reducing pain and stress, and supporting overall mental health.

Regular exercise has been shown to increase blood flow to the brain and improve its structure. Lack of physical activity is strongly linked to an increased risk of heart disease, stroke, and type 2 diabetes, which are also risk factors for dementia. In addition, regular walks (15-30 minutes) before bedtime improve sleep quality, cognitive function and emotional self-regulation. Improving cognitive function improves memory, concentration, motivation and learning speed. Incorporating physical activity into your daily life often leads to improved mood.

At the same time, you should monitor your heart rate during physical activity. Maximum heart rate (MHR) during physical activity is calculated using the formula $220 \text{ (men)}/226 \text{ (women)} - \text{age}$. It is important not to exceed your maximum heart rate.

Studies have shown that playing sports, especially team sports, improves psychological well-being and is generally associated with better mental health compared to people who are physically inactive and sedentary (people who do not meet physical activity recommendations are called “sedentary” or “sedentary”).

Regular exercise and all types of physical activity can help reduce symptoms of depression and stress, improve overall quality of life, strengthen self-esteem, social skills, and relationships with others, including at work, and have a positive impact on academic and work performance. People diagnosed with anxiety and stress-related illnesses have been shown to improve cognitive abilities such as memory, vocabulary, and creative thinking.

There is now a link between the type of physical activity (ball games, aerobic exercise, weightlifting, dancing) and mental health in young people. In some studies, team sports are associated with better mental health than individual physical activity (e.g., running, cycling, swimming). Ball games and dancing are associated with reduced depressive symptoms in young people who are constantly under stress. Participating in team games also has positive effects on social well-being, including significant improvements in interpersonal communication and mood.

In children and adolescents, any physical activity (team or non-team sports) is associated with higher life satisfaction and a lower likelihood of developing depressive symptoms. Playing any sport during adolescence is also associated with a lower risk of developing anxiety symptoms later in life (including panic disorder, generalized anxiety disorder, social phobia, and agoraphobia) in early adulthood and with higher levels of emotional well-being. In addition, there is a positive correlation between playing sports in childhood and improved cognitive function in late

adolescence. At the same time, stopping playing sports in childhood is associated with more severe depressive symptoms later in life compared with those who continued playing sports. It is also associated with higher self-esteem and lower symptoms of stress and depression in early adulthood if adolescents continue to participate in team sports (but not in individual sports). This may be due to encouragement from coaches and the team and good results on the playing field.

In older adults, group physical activity (e.g., group walking) and sports (e.g., golf) have been shown to improve self-esteem of mental health, reduce depressive symptoms, and increase the frequency of laughter in both men and women. Physical inactivity and irregular exercise may be associated with mild to severe symptoms of depression.

Therefore, sports are an effective way to improve a person's psychological and emotional state, contributing to stress reduction, improved cognitive function, self-esteem, and social adaptation. Regular physical activity can be used as a preventive and therapeutic tool to support mental health and overall well-being.

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УДК 811.111

IMPACT OF TAX POLICY ON THE DEVELOPMENT OF THE TOURIST MARKET OF UKRAINE (ВПЛИВ ПОДАТКОВОЇ ПОЛІТИКИ НА РОЗВИТОК ТУРИСТИЧНОГО РИНКУ УКРАЇНИ)

Микитюк В.С. - здобувачка вищої освіти групи БЗ/І

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У статті подана інформація про туристичний ринок України, його гнучкість, вплив зовнішніх факторів і податкової політики на розвиток галузі, рентабельність бізнесу та доступність туристичних послуг, а також необхідність оптимізації податків для стимулювання туризму.

Ключові слова: туристична діяльність, географічні особливості, основні податки.

The article provides information about the tourism market of Ukraine, its flexibility, the influence of external factors and tax policy on the development of the industry, business profitability and accessibility of tourism services, as well as the need to optimize taxes to stimulate tourism.

Keywords: tourism activity, geographical features, basic taxes.

The tourism market is characterized by high flexibility and the ability to quickly recover from the impact of negative factors. However, it is very sensitive to any changes in society and external factors that have a direct impact on it. These changes significantly affect the tourism market situation, that is, the state of supply and demand for a tourism product in a particular

region during a certain period. It is known that the tourism market situation is quite volatile and depends on political, economic, social and other processes.

According to the Law of Ukraine "On Tourism", tourism activities include the activities of legal entities and individuals who create a tourism product and provide tourism services. These services include transportation, temporary accommodation, catering, excursion, resort, sports, entertainment and other services. In addition, this may include intermediary activities in the provision of characteristic and related services. This category also includes citizens of Ukraine, foreigners and stateless persons (tourists, excursionists, visitors, etc.) in whose interests tourism activities are carried out [1].

State tax policy affects the tourism business through the level of tax burden, the availability of benefits, the ease of tax administration and the conditions for attracting investments. The main taxes related to the tourism sector in Ukraine include:

- Corporate income tax (18%) – affects the profitability of tourism companies.
- VAT (20%) – increases the cost of tourism services and reduces their competitiveness.
- Single tax for small businesses – favorable for the development of the hotel and restaurant business and private excursion companies.

Tourist tax is a local tax, the funds from which are credited to the local budget. The amount of the tourist tax is determined by the decision of the local self-government body and is set for each day of stay in places of residence (overnight stay):

- up to 0.5% of the minimum wage - for domestic tourism;
- up to 5% of the minimum wage - for inbound tourism [2].

Ukrainian regions have different conditions for the development of tourism, and the tax burden is often a key factor in choosing a form of business. For example:

- Carpathians and Western Ukraine - thanks to the tourist tax, local budgets receive additional revenues, but high VAT rates make domestic tourism less accessible to citizens.
- Odessa region - active sea tourism, but the seasonality of the business makes it difficult to pay taxes under general conditions.
- Kyiv and large cities - attractive for business tourism, but high taxes on rent and real estate reduce the interest of small businesses.

The strategic goal of tourism development in Ukraine is to create a product that will be competitive on the world market and will maximally satisfy the needs of people. This will ensure the comprehensive development of territories and their socio-economic interests, while preserving geological balance and historical and cultural heritage [3].

The tourism development concept should reflect the strategic goals, objectives and priorities of the recreation and tourism development sector. It should serve as a guideline for state authorities and local governments when implementing tourism development policies.

Data collection is often the biggest challenge at sub-national levels. Benchmarking results allow for gaps to be identified and detailed analysis to understand the scale and nature of the problem. It is necessary to identify and understand the measures and strategies that have helped individual regions of the country to achieve success. Benchmarking is a tool that helps to improve efficiency. The information collected during benchmarking can become the basis for further policy recommendations and be used for economic planning of the region or country [4]. The results of SWOT analysis and benchmarking allow for a complete and objective assessment of the competitive position of the tourism industry.

Tourism plays an important social, economic and humanitarian role. It is a source of foreign exchange earnings, provides employment for the population, contributes to the diversification of the economy, develops related industries, raises the standard of living of the population, and also stimulates the development of production and social infrastructure in tourist centers. In addition, tourism contributes to the formation of a harmoniously developed personality and the development of peaceful, friendly relations between countries.

The tourism market is an important sector of the economy, characterized by high flexibility and the ability to quickly recover from the impact of negative factors. At the same

time, it remains vulnerable to changes in the political, economic and social environment, which directly affect its situation. Demand and supply for tourism services largely depend on the level of tax burden, business conditions, government support and investment climate.

Tax policy in Ukraine plays a key role in the development of the tourism business. Taxes such as corporate income tax, VAT, and tourist tax can both stimulate and restrict tourism activity. High tax rates can reduce the competitiveness of domestic tourism, while the availability of preferential conditions promotes the development of small and medium-sized businesses in this area.

For the effective development of the tourism industry, it is necessary to create a competitive tourism product that meets international standards and meets the needs of domestic and foreign tourists. This will contribute not only to economic growth, but also to the development of infrastructure, improvement of the standard of living of the population, and preservation of cultural and natural heritage.

SWOT analysis and benchmarking play an important role in shaping a tourism development strategy, helping to identify the strengths and weaknesses of the industry, identify opportunities and threats. The information collected can become the basis for developing effective policies to support the tourism business and help increase its competitiveness.

In general, tourism plays an important socio-economic role, as it provides employment, attracts investments, promotes the development of related industries and stimulates the economic growth of regions. In addition, it is a powerful tool for strengthening the international image of the country and developing friendly relations between states. Therefore, state policy in the field of tourism should be aimed at creating a favorable environment for doing business, stimulating investments and expanding tourism opportunities in Ukraine.

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THE IMPORTANCE OF RATIONAL AND EFFICIENT MANAGEMENT OF THE AGRO-INDUSTRIAL COMPLEX (ВАЖЛИВІСТЬ РАЦІОНАЛЬНОГО ТА ЕФЕКТИВНОГО УПРАВЛІННЯ АГРОПРОМИСЛОВИМ КОМПЛЕКСОМ)

Моцук П. О. – здобувач вищої освіти групи ПУА 1/1

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Публікація наголошує на вирішальній ролі раціонального та ефективного управління агропромисловим комплексом для сталого розвитку та продовольчої безпеки країни. Підкреслюється важливість впровадження сучасних технологій, інвестицій у людський капітал та адаптації до кліматичних змін задля оптимізації ресурсів, підвищення якості продукції та збереження екосистем.

Ключові слова: агропромисловий комплекс, раціональне використання ресурсів, ефективне управління, сталий розвиток, продовольча безпека, глобалізація, сучасні технології, прецизійне землеробство, біотехнології.

The publication emphasizes the decisive role of rational and effective management of the agro-industrial complex for sustainable development and the country's food security. It underscores the importance of implementing modern technologies, investing in human capital, and adapting to climate change to optimize resources, enhance product quality, and preserve ecosystems.

Keywords: agro-industrial complex, rational use of resources, effective management, sustainable development, food security, globalization, modern technologies, precision agriculture, biotechnology.

Intelligent and effective management of the agro-industrial complex serves as the foundation of sustainable economic development and ensures the country's food security. In the context of globalization, this sector faces many challenges, but we must not forget that along with challenges come new opportunities. Rational use of resources ensures not only long-term land productivity but also the preservation of natural ecosystems. It is important to remember that modern technologies can greatly assist in this; for example, the integration of technologies such as precision agriculture and biotechnology will help optimize the use of water, fertilizers, and pesticides, which in turn will increase crop yields and product quality.

Effective management necessarily includes the development of infrastructure and logistics, which contributes to reducing the costs of transporting products to consumers and enhances competitiveness in both external and internal markets.

It is also worth mentioning that another key aspect is investment in human capital. Improving the qualifications of workers, implementing educational programs, and encouraging young specialists contribute to the industry's development. Equally important is the financial stability of agro-industrial enterprises, which is ensured by state support programs and the attraction of private investments.

Transitioning to organic farming or developing the processing industry will reduce risks associated with market fluctuations and climate changes. This promotes not only the stability of enterprises but also income stability. Adaptation to climate change is an urgent necessity. The development of new plant varieties that are resistant to drought or pests, for example, and other research will help minimize the negative consequences of environmental changes.

Therefore, based on the overall situation and relying on the aforementioned facts, we can confidently assert that rational use of resources will help preserve the planet as it is now. Effective management will help direct these resources where they are needed right now to avoid overproduction or, conversely, resource shortages.

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**THE EVOLUTION OF PAYMENT SYSTEMS: INNOVATION ON THE WAY TO THE
DIGITAL FUTURE
(ЕВОЛЮЦІЯ ПЛАТІЖНИХ СИСТЕМ: ІННОВАЦІЇ НА ШЛЯХУ ДО ЦИФРОВОГО
МАЙБУТНЬОГО)**

Немодрук О.М.- здобувачка вищої освіти групи Ф3/1

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У дослідженні висвітлено основні етапи еволюції платіжних систем. Розглянуто головні переваги, які забезпечує впровадження електронних платіжних технологій, а також проаналізовано ключові ризики, пов'язані з їх функціонуванням. Особливу увагу приділено законодавчим основам, що регулюють діяльність електронних платіжних систем в Україні, та охарактеризовано їхній сучасний стан розвитку у країні.

Ключові слова: *платіжна система, цифровізація, інновації, клієнтський досвід, інклюзивність.*

The study highlights the main stages of the evolution of payment systems. The main advantages provided by the introduction of electronic payment technologies are considered, and the key risks associated with their functioning are analyzed. Particular attention is paid to the legislative framework regulating the activities of electronic payment systems in Ukraine, and their current state of development in the country is characterized.

Keywords: *payment system, digitalization, innovation, customer experience, inclusiveness.*

The competitiveness of modern economic entities is largely determined by the ability to implement innovative approaches in the field of payments. Payment systems are developing rapidly, offering customers more and more convenient and unique services every year. This emphasizes the importance of studying both the historical development of payment systems and the stages of their evolution, as well as analyzing the current state and forecasting future prospects. Understanding current trends and development opportunities will help economic entities effectively adapt their activities to today's requirements [1].

The rapid development of technologies, which resulted in the digitalization of the world economy, contributed to the emergence of a multitude of payment instruments based on innovative principles. Yu. Kozyr conducted a study of the conditions necessary for the functioning of electronic payment systems. Among such factors, he identified rapid progress in the field of technology, the growth of the number of mobile devices, unhindered access to the Internet, the emergence of new service providers, a decrease in the cost of using the network, the active development of Internet commerce, as well as changes in consumer behavior, among which the tendency to remote interaction with banks and online shopping dominates.

The development of electronic payment systems includes improvements in mobile payment applications, online wallets, payment gateways, and cryptocurrency technologies. These innovations contribute to increasing financial inclusion by simplifying access to services, and also help reduce cash circulation. However, along with numerous advantages, there are also challenges, among which cybersecurity remains the main problem [2].

The evolution of payment systems can be conditionally divided into three key stages, summarized in the study of M. Pozhydayeva, taking into account domestic and international approaches:

1. The first stage (late 18th - late 19th centuries): formation of the legal basis for the introduction of the first electronic payment instruments, such as checks, bills of exchange and payment documents, which were based on the netting mechanism.

2. The second stage (20th century): the emergence and widespread use of electronic payment instruments, including the launch of the first forms of electronic money.

3. The third stage (21st century - to the present): global digitalization of financial settlements, the introduction and popularization of payment services such as PayPal, Payoneer, Skrill, etc., as well as the active development of cryptocurrencies, digital currencies and QR code technologies [3].

The rapid development of electronic payment systems is due to the numerous advantages they provide both for the economy and for their users. The main advantages include the following:

- increasing the speed and convenience of financial transactions;
- expanding access to financial services (financial inclusion);
- reducing the costs associated with printing, circulation and servicing cash;

Such systems open up new horizons for the modernization of the modern economy, making it more flexible and efficient.

The development of electronic payment systems spans over a century and a half, however, the most active stage of this development began in the 2000s. In Ukraine, payment systems are actively developing even in wartime conditions, and their further development trends correspond to global ones. Thus, in 2024, it is planned to introduce a digital currency of the central bank and regulate the market of cryptoassets, modern technologies (artificial intelligence, etc.) continue to develop and be implemented, and inclusivity is increasing.

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УДК 658.5

MANAGEMENT OF MATERIAL RESOURCES IN BUSINESS PROCESSES (УПРАВЛІННЯ МАТЕРІАЛЬНИМИ РЕСУРСАМИ В БІЗНЕС-ПРОЦЕСАХ)

Онопрійчук Д. О. – здобувач вищої освіти групи МЕН м 1/1

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У статті досліджується теоретичні та практичні аспекти управління матеріальними ресурсами в бізнес-процесах сучасних підприємств. Розглянуто сутність матеріальних ресурсів як економічної категорії, проаналізовано їх роль у забезпеченні ефективності бізнес-процесів.

Ключові слова: матеріальні ресурси, управління, бізнес-процеси.

The article examines theoretical and practical aspects of managing material resources in the business processes of modern enterprises. The essence of material resources as an economic category is considered, their role in ensuring the efficiency of business processes is analyzed.

Key words: material resources, management, business processes.

In conditions of increased competition and economic instability, the problem of effective management of enterprise resources, particularly material resources, becomes especially relevant. Material resources are the foundation of production and economic activity and determine the competitiveness of products.

Planning of material resources is a concern for many industries, as the operation of the entire enterprise depends on it [1].

Material resources are a set of objects of labor used in the process of manufacturing products, performing works, or providing services. Material resources include raw materials, materials, components, fuel, packaging, spare parts, etc. Material resource management is a purposeful activity of planning, organizing, motivating, and controlling the processes of providing, using, and reproducing material resources in accordance with the goals of the enterprise.

The methodology of material resources management in business processes is based on the integration of various scientific approaches and concepts, in particular system, process, situational and innovative approaches. The system approach involves the consideration of material resources as a coherent system consisting of interrelated elements and has a certain structure, functions and mechanisms of self-regulation.

The process approach is based on considering the activity of the enterprise as a network of interrelated business processes aimed at creating value for the consumer. The main principles of the process approach are: focus to the end result, responsibility for processes, their constant improvement, measurement of results.

The situational approach emphasizes the importance of adapting methods of material resources management to the specific conditions of functioning of the enterprise, taking into considering the features of the industry, the size of the enterprise, its financial condition, technological equipment and other factors.

The innovative approach to material resource management involves the implementation of new technologies, methods, and tools aimed at improving resource efficiency and reducing negative environmental impacts.

An important aspect of material resource management is inventory management and control, which goes through several stages: determining inventory requirements, setting goals, ensuring replenishment techniques, and monitoring inventory usage [2].

The current stage of development of material resource management systems is characterized by the following trends:

- digitalization and automation of material resource management processes;
- introduction of forecast analytics and artificial intelligence technologies;
- development of the supply chain management concept (SCM);
- integration of material resources management with other functional areas of management;
- increasing the flexibility and adaptability of material resource management systems;
- strengthening environmental requirements for material resources management.

Modern strategies for optimizing material flows in business processes are aimed at achieving a balance between minimizing the cost of acquiring, storage and use of material resources and ensuring the continuity of the production process.

Modern information technologies play a key role in material resource management, providing automation of planning, accounting, control, and analysis of resource usage. Among the most common information systems used for material resource management are Enterprise Resource Planning (ERP) systems, Supply Chain Management (SCM) systems, Warehouse Management Systems (WMS), and Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) systems.

Evaluation of the efficiency of material resource management is an important element of the enterprise management system, which allows to determine the effectiveness of resource use and identify reserves to improve efficiency. To evaluate efficiency, a system of indicators that can be

divided into three groups is used: indicators of efficiency of use of material resources, indicators of inventory management, and indicators of efficiency of procurement activities.

Modern enterprises face a number of problems in the field of material resources management, in particular: instability of prices for raw materials and materials, problems with deliveries, complexity of forecasting the need for resources, inefficiency of logistics processes, lack of integration between different systems of resource management, insufficient level of automation of resources management processes.

The conducted research has allowed identifying the main problems faced by enterprises in the field of material resource management and determining promising directions for the development of the resource management system.

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УДК 811.111

SYSTEM LOYALTY AND CRM IN THE HOTEL AND RESTAURANT BUSINESS (СИСТЕМА ЛОЯЛЬНОСТІ ТА CRM В ГОТЕЛЬНО-РЕСТОРАННОМУ БІЗНЕСІ)

Орешко К.Ф - здобувач вищої освіти групи МЕН 3/2

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CRM-системи та програми лояльності допомагають бізнесам утримувати клієнтів, збільшувати продажі та автоматизувати процеси. Вони дозволяють персоналізувати пропозиції, покращують взаємодію з клієнтами та спрощують обслуговування. Важливим є також захист даних клієнтів і ефективна аналітика.

Ключові слова: *CRM-система, лояльність, автоматизація, персоналізація, продажі, аналітика, захист даних, ефективність обслуговування.*

CRM systems and loyalty programs help businesses retain customers, increase sales, and automate processes. They allow for personalized offerings, improve customer interactions, and simplify service. Protecting customer data and providing effective analytics is also important.

Keywords: *CRM system, loyalty, automation, personalization, sales, analytics, data protection, service efficiency.*

CRM systems and loyalty programs help businesses retain customers, increase sales, and automate processes. They enable personalized offers, improve customer interaction, and streamline service. Data protection and effective analytics are also key.

In today's world, there is a lot of competition among businesses, and of course, people like to be remembered and receive personalised offers. Such systems are called loyalty systems, or CRM.

CRM stands for Customer Relationship Management, but with the help of CRM, it is possible not only to manage relationships, but also to set up the system for easy management of business processes, to set up loyalty programmes for customers. Loyalty programmes are quite

relevant because there are a lot of competitors and you need to retain customers and attract new ones. Personal offers of discounts, reminders return a certain number of customers and attract new ones as guests bring friends and relatives. [1]

How CRM works The programme records your data, such as date of birth, phone number, surname and name. When you go to an establishment or store systematically, each of your visits is recorded in the programme, and when your visits have not been recorded in the system for a certain time, the programme sends you a reminder message or a personal offer just for you. Similarly, before the holidays, you receive messages with a reminder or a personal offer. Thus, the institution or store reminds you of itself and reminds you of the holiday or a gift that can be bought on favourable terms.

When implementing a CRM system in a business, it can be customised individually to meet the needs of the entrepreneur. This system can also be connected to social networks. Example: a potential customer asked about the price, the manager responded and told them more about the product, and the customer said that he was not satisfied with the price. The system keeps the information that the price is not satisfactory, and when there is a discount for this product, the customer receives a notification about the price change. And if the customer is still interested in the product and is satisfied with the price, then the moment of purchase and customer acquisition occurs. This is often used by online and Instagram stores.

How loyalty systems and CRM affect business:

- - Increase in sales

This happens by understanding your target audience and attracting new customers and partners. Solving a problem with the offered product or service. By making individual or commercial offers.

- - Improving the quality of service

Automation of most processes, communication, support when sending goods, availability of goods and many other functions are simplified by the CRM system. All these actions become faster and increase the speed of service and quality, as the manager does not need to write down the stage of his order, because the system itself does everything. And the employee can serve more customers without losing quality.

- Speed of analytics

The system has automatic reporting, you just need to select the format and make some settings to get analytics on product sales or financial soundness at any time.

- Protection of customer data

Due to limited access, confidentiality of communication history, own server, all customer data and consumers are protected, which gives confidence in the company.

- Process automation

By optimising the processes of mailing, sms messages, answering frequently asked questions, sales analytics, advertising and other operational processes, it reduces V per employee and does not require hiring other employees.

So CRM and loyalty system is a necessary part for business and any enterprise. These systems help and simplify the management of the business and increase its efficiency. For the hotel and restaurant industry, this is also an important component as it helps to retain existing customers and attract new ones. It is also important that the data is protected and used only for analytics and personalised offers. CRM is a reliable and useful assistant for any business seeking to develop and expand.

There are a large number of CRM systems on the market, so every entrepreneur and businessman will find exactly what he needs, and the company he chooses will help him with setting up the system for the necessary needs.

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УДК 811.111

PUBLIC SECTOR ACCOUNTING (БУХГАЛТЕРСЬКИЙ ОБЛІК ДЕРЖАВНОГО СЕКТОРА)

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У статті розглянуто особливості бухгалтерського обліку в державному секторі. Визначено основні нормативно-правові акти, що регулюють облік у даній сфері, зокрема Національні положення (стандарти) бухгалтерського обліку в державному секторі. Розглянуто питання організації облікового процесу в установах державного сектору, а також особливості складання фінансової звітності.

Ключові слова: бухгалтерський облік, державний сектор, нормативно-правове регулювання, фінансова звітність.

The article examines the features of accounting in the public sector. The main regulatory legal acts regulating accounting in this area are identified, in particular the National Regulations (Standards) of Accounting in the Public Sector. The issues of organizing the accounting process in public sector institutions, as well as the features of preparing financial statements, are considered.

Keywords: accounting, public sector, regulatory and legal regulation, financial reporting.

Today, Ukraine is in the process of reforming the accounting and financial reporting system in the public sector, taking into account the requirements of international accounting standards for the public sector by introducing national regulations (standards) for public sector accounting, developed on the basis of international standards.

In order to implement the Strategy for Modernizing the Accounting System in the Public Sector for 2007-2015, approved by the Resolution of the Cabinet of Ministers of Ukraine dated January 16, 2007 No. 34, the Ministry of Finance of Ukraine has taken a number of measures to improve the accounting system in the public sector, in particular, national regulations (standards) for accounting in the public sector have been fully adopted, the application of which is provided for by the Budget Code of Ukraine and the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" [1]. In addition, the chart of accounts for accounting in the public sector was approved, developed taking into account the budget classification, which contains subaccounts for reflecting in accounting information about operations on budget execution, managers of budget funds and funds of mandatory state social and pension insurance, and the procedure for its application; financial reporting forms and the procedure for filling them out; typical regulations on the accounting service of a budgetary institution.

In continuation of the tasks of the aforementioned Strategy, the Ministry of Finance of Ukraine has developed a Strategy for Modernizing the Accounting and Financial Reporting System in the Public Sector for the Period Until 2025, which was approved by the Resolution of the Cabinet of Ministers of Ukraine dated June 20, 2018 No. 437-p [2].

The implementation of the main objectives of this Strategy will allow to continue the modernization of the accounting system and improve the quality and comparability of financial information. In particular, the following results are expected to be achieved:

- increasing the level of openness, reliability and transparency of financial reporting in order to ensure the effectiveness of management decision-making in the field of public finances;
- ensuring comparability of financial reporting indicators of the public sector of Ukraine and the public sector of other countries;
- ensuring consolidation of financial reporting at various levels;
- introduction of a qualitatively new system of training and retraining of accounting services personnel of public sector entities;
- improving the status of heads of accounting services of public sector entities and the efficiency of their activities [3].

Therefore, public sector accounting is critical to ensuring transparency, accountability, and effective management of public resources. It differs from commercial accounting in its unique objectives and regulatory environment.

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MAIN OBSTACLES TO THE DEVELOPMENT OF AGROLOGISTICS (ОСНОВНІ ПЕРЕПОНИ РОЗВИТКУ АГРОЛОГІСТИКИ)

Політікіна І.В.- здобувачка вищої освіти групи БЗ/І

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У статті розглянуто розвиток агрологістики в Україні, який стикається з низкою серйозних перешкод, які гальмують ефективність та конкурентоспроможність агропромислового комплексу.

Ключові слова: агрологістика, розвиток, перешкоди, інфраструктура, управління, кадри, фінанси, нормативно-правове регулювання, агропромисловий комплекс, ефективність, конкурентоспроможність.

The article examines the development of Agro Logistics in Ukraine, which faces a number of serious obstacles that hinder the efficiency and competitiveness of the agro-industrial complex.

Keywords: agrologistics, development, obstacles, infrastructure, management, personnel, finance, regulatory and legal regulation, agro-industrial complex, efficiency, competitiveness.

Logistics is needed in almost every industry in developed countries of the world today [1].

Foreign experience and innovative technologies for using logistics have long proven its effectiveness, especially in the agricultural sector. Despite the fact that the agricultural business is becoming more and more attractive for investment every year and exports of products are growing (according to the State Statistics Service of Ukraine, in 8 months grain and oilseed crops accounted for 17.5% of national exports, and the volume of supplies increased by more than 18% compared to the same period last year), developing agriculture needs an updated fleet of equipment to ensure this growth [1,2].

The dynamics of agricultural machinery sales are influenced by a complex of factors:

- political situation;
- unregulated legislation;
- military actions;
- devaluation of the hryvnia;
- instability of the exchange rate;
- introduction of duties on imports of agricultural equipment;
- prices for agricultural products.

At the same time, global manufacturers of agricultural machinery consider the Ukrainian market to be one of the most promising in Europe [3].

The statistics of agricultural machinery imports in recent years look disappointing. Since the end of 2022, there has been a trend of reducing sales of imported agricultural machinery. According to the State Fiscal Service of Ukraine, in 2022, agricultural machinery worth about \$667 million was imported, and in 2023, its import amounted to only \$177 million. The high cost of imported machinery has allowed domestic agricultural machinery manufacturers to increase production volumes and become more competitive. In conditions of increasing competition, manufacturers are also ready to go for special financial solutions: in addition to traditional installments, sellers often provide the opportunity for seasonal repayment.

An important factor in the proper operation of equipment during the season is timely diagnostics and repair. When the combine is working in the field, in case of its breakdown, a quick delivery of spare parts is necessary. A logistics partner is ready to provide such an important task, taking responsibility for the transport and customs procedure [4].

One of the successful examples of developing a logistics solution is a project to optimize the logistics supply chain of spare parts for one of the largest importers of agricultural machinery in Ukraine.

A team of logistics specialists and engineers from GEFCO Ukraine has developed and implemented a project to supply spare parts from Europe to Ukrainian dealers located in different regions of Ukraine. Various supply schemes and the use of consolidation warehouses in Europe were calculated, and as a result, the most optimal scheme in terms of transit time and costs was selected. Every week, on certain days and hours, vehicles loaded with spare parts for specific dealers are shipped from a warehouse in Germany and headed to Ukraine. Dispatchers track the vehicles and their transit time at each point of movement. This scheme has allowed to optimize logistics costs, receive additional discounts on products, and significantly reduce transit time for delivery [4,3].

Modern logistics companies are responsible for both their own business and the business of their partners. The current requirement of the time is to equip vehicles that deliver goods with alarms and GPS monitoring. A high liability limit for cargo insurance provides additional guarantees for the supply of expensive products (equipment for the construction of grain complexes and terminals, elite seeds, agricultural machinery, etc.)

The development of agrolistics in Ukraine is at an early stage. There are already good forecasts that we should expect high efficiency in the development of this industry in our country, provided that the main obstacles in the formation and improvement of the agrolistics system at agribusiness enterprises in Ukraine are overcome [2].

The development of agrolistics in Ukraine is critically important for increasing the efficiency and competitiveness of the agro-industrial complex. However, there are a number of serious obstacles on this path that require a comprehensive and systematic solution. First of all, it is necessary to modernize the outdated transport infrastructure, build modern logistics centers and warehouses. This will reduce transportation costs, reduce product losses and ensure its timely delivery to consumers.

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ENSURING POST-WAR RECOVERY OF THE HOTEL AND RESTAURANT INDUSTRY IN UKRAINE: RISKS, CHALLENGES, AND PROBLEM-SOLVING METHODS (ЗАБЕЗПЕЧЕННЯ ПІСЛЯВОЄННОГО ВІДНОВЛЕННЯ ГОТЕЛЬНО-РЕСТОРАННОЇ ІНДУСТРІЇ В УКРАЇНІ: РИЗИКИ, ВИКЛИКИ ТА МЕТОДИ ВИРІШЕННЯ ПРОБЛЕМ)

Скроб В.І. – здобувачка вищої освіти групи ГРС 2/1

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У тезах розглядаються ризики, виклики, методи розв'язання проблем за допомогою технологій у продовольчій безпеці готельно-ресторанної галузі України після війни. Післявоєнне відновлення країни вимагає особливої уваги до продовольчої безпеки. Дослідження включає аналіз сучасних підходів та методів, які можуть бути використані для запобігання ризиків, які виникнуть у післявоєнний період.

Ключові слова: *ситуація, Україна, готельно-ресторанна галузь, продовольча безпека, технології, розвиток.*

The theses examine risks, challenges, and methods of solving problems using technology in the food security of the hotel and restaurant industry of Ukraine after the war. The country's post-war recovery requires special attention to food security. The study includes an analysis of modern approaches and methods that can be used to prevent risks that will arise in the post-war period.

Keywords: *situation, Ukraine, hotel and restaurant industry, food security, technology, development.*

The full-scale invasion of Russian troops into the territory of independent Ukraine, the introduction of the legal regime of martial law and the conduct of active hostilities have had a very strong impact on the lives of all Ukrainians. In this difficult time, it is necessary to adapt to new realities, change approaches to organizing the economy, industry, and the social sphere, and find new ways to create and develop one's own business. Negative factors have also affected representatives of the hotel and restaurant industry, who have suffered significant losses and are faced with reviewing approaches to their own activities. Problems have arisen with organizing current work, planning and forecasting the activities and development of the industry in the future.

Ukrainian restaurateurs are forced to engage not in a strategy for improving their establishments, but only in short-term planning. As noted by Darya Verenyova, head of the economic department of the information portal "24 Channel", "...today the restaurant business market has decreased by approximately 25% compared to February 2022. In some regions, the market decline was more than 50% (Kharkiv, Mykolaiv, Zaporizhia, Luhansk regions), in Kyiv, Odessa, Dnipropetrovsk regions - a drop of up to 30%. At the same time, positive dynamics are observed in the western regions: in Lviv and the region, the number of restaurants and cafes increased by approximately 30%, in Zakarpattia, Chernivtsi, Ivano-Frankivsk regions, an increase of approximately 20% was noted" [1]. Thus, investors in the restaurant industry began to pay more attention to the cities and regions of Western Ukraine, considering these territories more attractive, socially oriented and economically profitable. According to Vladlen Zhukov, Candidate of Economic Sciences, Associate Professor of the Semyon Kuznets Kharkiv National Economic University, "...restaurant and hotel businesses have their own distinctive features in terms of risk manifestation. Carrying out its activities, a hotel and restaurant business enterprise sets very specific tasks – to obtain a certain profit, to get ahead of competitors in the catering or hotel business market, to expand the branch network, etc., at the same time it calculates the costs that will be required to implement the set goals and the effect of the proposed development strategy at the enterprise. Thus, it plans its activities. But, choosing one or another development strategy, the enterprise may lose its funds, that is, receive an amount less than planned, which is due to the uncertainty of the situation in the restaurant or hotel. Therefore, the risks that determine this situation must be managed" [2, pp. 33-34]. Thus, today's severe challenges in the restaurant business are explained by the need to respond quickly, adapt to changing consumer behavior, and constantly improve restaurant service.

According to the authors, the development of various sectors of the economy in Western Ukraine plays an important role in the restoration of other regions and oblasts. For example:

1. Western oblasts can share with the affected regions stocks of pipes, valves, measuring instruments, welding machines and other equipment necessary for the repair and restoration of GDS.
2. Qualified engineers, technicians and installers from the western oblasts can help in restoration work, transferring their knowledge and experience.
3. Specialists from different oblasts can jointly develop GDS restoration plans, taking into account the specifics of each region and the priority of tasks.
4. Western oblasts can share with colleagues from other regions their experience in the field of GDS operation and repair, as well as innovative technologies and methods.
5. Organization of joint training programs and seminars to improve the skills of GDS workers in the affected regions, in particular:
 - provision of temporary housing and humanitarian assistance to GDS workers from the affected regions;
 - logistical support in the delivery of equipment and materials;
 - assistance in attracting investments and international assistance for the restoration of the GDS. This is also really important.

According to Oksana Davydova, Doctor of Economic Sciences, Professor of the Semyon Kuznets Kharkiv National Economic University, "...one of the most relevant areas of enterprise development is the development and implementation of an innovative management system. Historical chronology shows that at almost all stages of the emergence of economic crises, innovative economic theories, views, and developments were developed and implemented, with the help of which enterprises resumed their work, expanded and conquered new markets" [3, p. 23].

It is worth noting that specialists and representatives of the hotel and restaurant industry should actively use the full potential of information and communication technologies and computer tools to develop the industry and expand their own business. As noted by Leonova B., a student of the specialty "Hotel and Restaurant Business" of the State University "Zhytomyr Polytechnic", "...today the hotel industry uses many new information technologies: global computer reservation systems, integrated communication networks, multimedia systems, management information systems, etc." [4, p. 269]. First of all, it is recommended that representatives of the hotel and

restaurant industry create their own website and pages in popular social networks, fill them with all the necessary elements, secondly, to launch an active information and advertising campaign, thirdly, to attract IT specialists who will effectively regulate computer and network processes, ensure digital protection and further development of the hotel and restaurant business.

The need to introduce innovations in the hotel and restaurant business stimulates competition, additional conditions and market requirements. Consumer preferences are changeable, this is also worth paying attention to. According to Yulia Zemlina, Candidate of Pedagogical Sciences, Associate Professor of the Kyiv National University of Culture and Arts, "...understanding the hotel business from the point of view of its social content consists in satisfying the specific needs of consumers: foreign and domestic citizens, passengers of various types of transport, business people, government representatives and government delegations, persons on business trips, local population of different age groups and employment in the national economy" [5, p. 127].

According to the authors, the opinions and proposals of Oksana Davydova, Doctor of Economics, Professor of the Semyon Kuznets Kharkiv National Economic University, are interesting: "...to maintain and develop the restaurant industry in Ukraine, it is necessary to provide for the following important measures: support from the state (legislative, tax systems, etc.); to ensure the flexibility of the enterprise's work, the ability to quickly adapt to the crisis situation and changes in consumer demands; development and implementation of innovative technologies that will allow the establishment to get out of the crisis and ensure its effective operation" [6, p.29]. The authors live in the south of Ukraine and are well acquainted with the hotel and restaurant industry of the region. The main aspects that will need to be paid attention to after the end of active hostilities and post-war recovery are as follows:

1. Assistance to hotels and restaurants that suffered due to the war (financial assistance, reduction of taxes and rents).
2. Infrastructure restoration to improve the accessibility and convenience of the region for tourists.
3. Advertising campaigns to attract visitors to the region.
4. Cooperation with international organizations to obtain assistance.
5. Training and retraining of hotel and restaurant employees.

The last point deserves special attention, since qualitatively preparing new personnel for work in the hotel and restaurant business is a task of many higher education institutions. It is necessary to update educational and methodological materials, take into account the specifics of work in this field, pay attention to increasing the moral and psychological resilience of young specialists, their ability to actively get down to work, and restore the hotel and restaurant business and tourism to the pre-war level.

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MODERN ADVANCES IN VETERINARY SURGERY (СУЧАСНІ ДОСЯГНЕННЯ У ВЕТЕРИНАРНІЙ ХІРУРГІЇ)

Стаднік А.С. – здобувач вищої освіти групи ВМ 4/1

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У публікації представлено огляд сучасних тенденцій у ветеринарній хірургії. Проаналізовано дослідження впливу сучасних хірургічних методик і технологій на здоров'я тварин та результати лікування.

Ключові слова: *ветеринарна хірургія, малоінвазивні процедури, лазерна хірургія, ортопедична хірургія, анестезія, тканинна інженерія, Кембриджський університет, регенеративна медицина.*

The publication provides an overview of current trends in veterinary surgery. Research on the impact of modern surgical techniques and technologies on animal health and treatment outcomes has been analyzed.

Keywords: *veterinary surgery, minimally invasive procedures, laser surgery, orthopedic surgery, anesthesia, tissue engineering, University of Cambridge, regenerative medicine.*

In the modern world, with increasing attention to animal health and welfare, advancements in veterinary surgery are playing a crucial role in improving treatment outcomes and recovery times. These innovations not only enhance the precision of surgical procedures but also minimize risks and discomfort for animals. In this article, we will explore the latest trends in veterinary surgery.

One of the key directions in veterinary surgery is minimally invasive procedures. Research conducted by the University of Cambridge has shown that laparoscopic and endoscopic surgeries reduce post-operative pain, speed up recovery, and lower the risk of infections compared to traditional open surgeries [1]. These techniques are becoming increasingly popular in treating conditions such as gastrointestinal disorders and joint diseases.

Another significant advancement is the use of laser surgery. Laser technology allows for highly precise tissue cutting with minimal bleeding and inflammation, making it ideal for soft tissue procedures such as tumor removals and eye surgeries in animals [2].

Orthopedic surgery has also seen remarkable progress with the development of advanced implants and prosthetics. 3D printing technology has enabled the creation of customized implants for animals suffering from bone fractures or degenerative joint diseases, significantly improving mobility and quality of life [3].

Advancements in anesthesia have also played a crucial role in veterinary surgery. The development of safer and more effective anesthetic agents has reduced surgical risks, particularly for older or critically ill animals. Research conducted by Stanford University has demonstrated that

modern anesthetic protocols can significantly enhance surgical safety and post-operative recovery [4].

Regenerative medicine and tissue engineering are emerging as transformative fields in veterinary surgery. Stem cell therapy and bioprinting techniques are being explored to regenerate damaged tissues and treat chronic conditions in animals [5].

In conclusion, modern advances in veterinary surgery are revolutionizing the field, leading to safer and more effective treatments for animals. As research continues, these innovations will further enhance surgical precision, recovery, and overall animal well-being.

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УДК 811.111

FERTILISERS, THEIR IMPORTANCE FOR THE SOIL AND PLANTS, BENEFICIAL AND NEGATIVE IMPACT ON THEM (ДОБРИВА, ЇХ ЗНАЧЕННЯ ДЛЯ ҐРУНТУ І РОСЛИН, КОРИСНИЙ І НЕГАТИВНИЙ ВПЛИВ НА НИХ)

Сторчак А. Е. – здобувач вищої освіти групи А3/3

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У публікації порушено питання про необхідність внесення добрив в ґрунт. Позитивні і негативні сторони добрив для ґрунту і рослини. Проаналізовано дані про види добрив.

Ключові слова: добрива, ґрунт, рослини, родючість, вплив.

The publication raises the issue of the need to apply fertilizers to the soil. Positive and negative aspects of fertilizers for soil and plants are discussed. Data on the types of fertilizers are analyzed.

Keywords: fertilizers, soil, plants, fertility, impact.

High and stable crop yields are impossible without timely replenishment of nutrients removed from the soil with the harvest. Knowing how this system works helps farmers not only to get good quality crops year after year, but also to maintain soil fertility at the proper level to avoid soil degradation [1].

Fertilizer, natural or artificial substance containing the chemical elements that improve growth and productiveness of plants. Fertilizers enhance the natural fertility of the soil or replace

chemical elements taken from the soil by previous crops. Fertilizer is an integral part of plant and soil life, and avoiding it will not only harm the plants, but also hit your pocketbook [3].

Soil fertility is the quality of a soil that enables it to provide compounds in adequate amounts and proper balance to promote growth of plants when other factors (such as light, moisture, temperature, and soil structure) are favourable. Where fertility of the soil is not good, natural or manufactured materials may be added to supply the needed plant nutrients. These are called fertilizers, although the term is generally applied to largely inorganic materials other than lime or gypsum. Fertility is a fundamental aspect of agriculture that is critical for plant growth [1, 5].

Nutrients play a key role in maintaining and improving the physical and chemical properties of the soil, replenishing humus, and performing a number of functions:

- Replenishment of nutrient reserves necessary for normal plant vegetation;
- Improvement of soil structure, aeration, water regime, which contributes to the development of the root system of crops;
- Enriching the soil with beneficial soil microflora by increasing the number of beneficial microorganisms in it;
- Preventing soil erosion by creating a thick vegetation cover;
- Reducing the acidity or alkalinity of the soil solution by liming or gypsumising the soil;
- Increasing the resistance of crops to diseases and pests, as healthy plants that receive the required amount of nutrients are less susceptible to them, which reduces the need for pesticides.

What are the types of fertilizers.

Depending on the composition, origin and form, all products are classified into groups: organic, mineral, organo-mineral, complex, microfertilizers.

Each type of fertilizer has its own varieties, role and timing.

To begin with, organic. There are different types: manure (rotted), poultry manure, ash, compost, peat, green manure. Organic fertilizers improve soil structure, air permeability and moisture content, and provide enrichment with easily digestible nutrients. Application time: for autumn ploughing (increases soil fertility), in spring to increase plant nutrition.

Now mineral. Types: nitrogen, phosphorus, potassium complex fertilizers. They improve the growth of vegetative mass (nitrogen), root development and flower formation (phosphorus), increase plant resistance to pathogens and stress factors (potassium), and contain nutrients in a balanced form (complex). Application time: In spring as the main fertilizer and in summer as a top dressing. Organo-mineral. Composted mixture with tusks, bio humus with minerals, peat-ammonia complex. Provide cultivated plants with nutrients in optimal proportions. Main and pre-sowing application, fertilization.

Compound (complex). Nitrogen-phosphorus, nitrogen-potassium, nitrogen-phosphorus-potassium. Increase soil fertility and enhance its ability to retain water, which contributes to good root development. If nitrogen is present in the composition, fertilize in spring, in the absence of this element - in autumn. During the growing season, it is applied as a top dressing[1].

Micronutrients include boron (B), chlorine (Cl), cobalt (Co), copper (Cu), iron (Fe), Manganese (Mn), molybdenum (Mo), nickel (Ni) and Zinc (Zn) [4].

I have listed five types of fertilizer, and dozens of varieties. Every fertilizer plays a unique role in the life of soil and plants, and it is difficult to overestimate their value, but there are also negative effects. For example, mineral fertilizers, although very important for plant formation and development, have a negative impact on the environment. They can pollute the soil, water and air, which has a negative impact on the ecosystem as a whole. Exceeding the application rate. Fertilizer is chemistry, and you cannot take the doses of certain elements (nitrogen, phosphorus, potassium) applied to the soil lightly. Incorrect calculations and subsequent application rates can have a negative impact on the plant and the environment. Dependence of plants on fertilizers. The constant use of mineral fertilizers can lead to a dependence on them, which can reduce the ability of plants to provide nutrients on their own[. Even when growing a living organism (plant) on a living organism (soil), you need to be precise in your actions[2].

Well, summing up, we can note the following. Soil is a complex organism that has its own certain, of course, like any other organism, features. A plant depletes nutrients from the soil during development, but by applying fertilizers, we can help the soil remain full-fledged and stable. And by helping the soil, we help plant. Neglecting, underestimating the importance and value of fertilizers will only lead to negative consequences in the form of yield losses, loss of crop and soil quality. In particular, the loss of soil quality will negatively affect future crops. If a farmer invests the necessary, albeit painful, amount in his sown areas, as a result he will receive a positive result and profit. Thank you very much for your attention.

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PUMPED-STORAGE HYDROELECTRIC PLANTS: FEATURES OF USE (ГІДРОАКУМУЛЮЮЧІ ЕЛЕКТРОСТАНЦІЇ: ОСОБЛИВОСТІ ВИКОРИСТАННЯ)

Тимошенко В.Ю. – здобувач вищої освіти групи Ен 4/3

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У статті розглянуто інформацію про особливості використання гідроакumuлюючих електростанцій, їх переваги та недоліки; сучасний стан та перспективи розвитку в Україні.

Ключові слова: *альтернативні джерела енергії, гідроакumuлюючі електростанції, стійка енергосистема, експлуатаційна маневреність, енергоефективність, роль «павербанків».*

The article discusses information about the features of using pumped-storage hydroelectric plants, their advantages and disadvantages; current state and prospects for development in Ukraine.

Keywords: *alternative energy sources, pumped-storage hydroelectric plants, sustainable energy system, operational maneuverability, energy efficiency, the role of «power banks».*

A pumped-storage hydroelectric plant is a power plant that uses a set of generators and pumps or reversible hydroelectric units that can operate in both generator and pump modes. During the nighttime “slump” of energy consumption, the pumped-storage hydroelectric plant receives cheap electricity from the grid and uses it to pump water. During the morning and evening peaks of

energy consumption, the hydroelectric power plant releases water and thus produces expensive “peak” electricity for the grid.

The optimal number of pumped-storage hydroelectric plants makes the power system resilient and stable to mainline failures and unforeseen peak consumption, sudden failures at other generating facilities. Electricity in the form of water is cheaper than similar energy stored in the form of compressed air, stored gas or batteries.

The flexibility provided by pumped-storage hydroelectric plants allows hydropower to quickly adapt and respond to changing energy market dynamics. The use of pumped storage allows for improved strategic planning and optimization of electricity production to maximize revenues and support the power system.

Currently, 3 PSHPs operate in Ukraine: Kyiv PSHP (235.5/135 MW), Dniester PSHP (1296/1684 MW), Tashlyk PSHP (453/649.5 MW). [1]

A key advantage of pumped-storage hydroelectric plants is their ability to provide storage durations much longer than is currently possible with batteries. It is a proven technology with a very long service life and low operating costs, making it cost-effective for storing and releasing large amounts of energy. Batteries are more cost-effective for delivering small amounts of stored energy for short periods of time at high power levels.

Hydroelectric storage systems have more complex siting constraints and require more planning, design, and construction time than battery energy storage systems, but once operational, a hydroelectric power plant has a lifespan that is many times longer than that of utility-scale batteries. Therefore, capital costs cannot be directly compared and must be calculated over the entire expected life cycle. Another advantage of hydroelectric plants is that their degradation is close to zero. With proper maintenance, peak power can be maintained indefinitely. In contrast, batteries degrade with age, reducing the amount of energy they can store. To maintain reliable and consistent storage capacity as batteries age, large-scale battery plants will require continuous, phased cell replacement. [2]

The main challenges facing hydropower in the 21st century are diverse and include both technical and environmental, social and economic aspects. Here are some of them:

- Safety: Ensuring the reliable operation of hydroelectric power plants is critical to preventing accidents and disasters.

- Climate change: Climate change can affect hydrological cycles, reducing the amount of water available in some regions, which leads to a decrease in the productivity of hydroelectric power plants.

- Balance between energy and environmental needs: Finding a balance between the need for electricity production and preserving the environment in the face of missile attacks on hydropower infrastructure is an important and, at the same time, difficult task.

- Aging infrastructure: The bulk of existing hydroelectric power plants were built many years ago and need modernization for efficient and safe operation. Ukrhydroenergo pays significant attention to the modernization of hydroelectric power plant equipment and increasing its efficiency. A global renovation is underway at the company's stations.

- Innovation and technological development: The introduction of new technologies to improve the efficiency and environmental safety of hydroelectric power plants is a significant challenge for the industry.

- Post-war reconstruction: As a result of hostilities, many hydroelectric power plants, dams and reservoirs were damaged or destroyed, which led to significant losses of production capacity and destabilization of the country's energy system. The restoration of this critical infrastructure will require significant financial resources, technical efforts and time. [3]

Pumped-storage hydroelectric plants projects require significant capital investment. A key point for the successful development of the project is the identification of a good location for construction. Choosing the right location is a matter of identifying a site with ideal topography and geology, an adequate water source, minimal social and environmental impact, and proximity to the

power grid to maximize the efficiency of electricity transmission in both directions and minimize its losses.

The draft action plan for the implementation of the Energy Strategy of Ukraine for the period until 2050, published on the website of the Ministry of Energy on December 11, 2024, plans to study the possibility of building new PSHPs:

- Zakarpattia PSHP (1,200 MW);
- Zaporizhzhia PSHP based on a granite quarry;
- PSHPs in the quarries of the Poltava Mining and Processing Plant.

In 2025, Ukrhydroenergo plans to begin construction of the first hydroelectric power plant in Cherkasy Oblast with protection based on the example of South Korea. The Kaniv PSHP will have a capacity of 1,000 MW and cost \$1.5–2 billion. [4]

Hydropower plays a key role in ensuring the stability of the country's Unified Power System, especially in a military context. In conditions where thermal power plants are damaged or destroyed, hydroelectric power plants become critically important for maintaining reliable power supply and stability of the power system.

First, hydroelectric power plants are able to quickly regulate power, which allows them to effectively respond to fluctuations in electricity demand. This is especially important in situations where other energy sources may be unavailable or unstable. Hydropower plants can quickly come into operation during peak loads and compensate for insufficient generation from other sources.

Second, pumped-storage hydroelectric plants can play the role of "power banks", storing excess energy generated during low demand and releasing it to the grid during peak loads. This allows for balancing electricity production and consumption, increasing the stability and reliability of the power system. In wartime, when many energy infrastructure facilities are damaged or destroyed, the role of PSHPs becomes even more important for the functioning of the economy and the livelihoods of the population.

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BIOFERTILIZERS IN SUSTAINABLE AGRICULTURE: IMPROVING SOIL HEALTH AND CROP PRODUCTIVITY (БІОДОБРИВА В СТАЛОМУ СІЛЬСЬКОМУ ГОСПОДАРСТВІ: ПОКРАЩЕННЯ ҐРУНТОВОГО ЗДОРОВ'Я ТА ПРОДУКТИВНОСТІ КУЛЬТУР)

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У публікації проведено огляд та аналіз впровадження біодобрив у сільському господарстві. Розглянуто основні напрями застосування біодобрив, включаючи: покращення

родючості ґрунту, оптимізацію використання ресурсів та зменшення екологічного впливу. Проаналізовано переваги технології, такі як: підвищення ефективності виробництва, скорочення витрат і підтримка сталого розвитку агросистем, а також проблеми, пов'язані з необхідністю адаптації до різних агрокліматичних умов та потребою в спеціальних умовах зберігання з можливими економічними бар'єрами.

Ключові слова: біодобрива, сталий розвиток, ґрунтова родючість, мікроорганізми, екологічне землеробство, продуктивність культур.

The publication reviews and analyzes the implementation of biofertilizers in agriculture. The main areas of application of biofertilizers are considered, including improving soil fertility, optimizing resource use, and reducing environmental impact. The advantages of the technology, such as increasing production efficiency, reducing costs, and supporting sustainable agricultural systems, as well as the challenges associated with adaptation to different agro-climatic conditions, storage requirements, and potential economic barriers, are analyzed.

Keywords: biofertilizers, sustainable agriculture, soil fertility, microorganisms, organic farming, crop productivity.

Main Types of Biofertilizers: Nitrogen-Fixing Bacteria (Rhizobium, Azotobacter) help plants absorb atmospheric nitrogen, which is essential for their growth, especially for leguminous crops, as they can fix nitrogen from the air and make it available to plants. Phosphorus-Mobilizing Microorganisms convert insoluble phosphate compounds into forms that are accessible to plants. This is important for improving soil fertility as phosphorus is one of the main nutrients needed for plant development. Mycorrhizal Fungi enhance the absorption of water and mineral elements through symbiosis between fungi and plant roots. These fungi help plants better adapt to stress conditions such as drought or high soil acidity. Organic Biofertilizers (Vermicompost, Compost Extracts) are natural fertilizers that enrich the soil with organic matter, improving soil structure, water retention capacity, and biological activity. Potassium-Mobilizing Microorganisms help convert insoluble forms of potassium into available forms for plants, ensuring the plants receive adequate potassium, which is vital for their growth and development.

Mechanism of Action of Biofertilizers: Biofertilizers activate processes that enhance the availability of essential nutrients such as nitrogen, improve soil microbial activity, protect plants from pathogenic microorganisms, and increase plant resistance to stress conditions [1]. Biofertilizers as the Basis of Sustainable Agriculture: Biofertilizers are an important element of sustainable agriculture as they help maintain soil fertility, reduce the negative impact of chemical fertilizers on the environment, and decrease dependency on inorganic resources [2]. Impact of Biofertilizers on Soil Structure: Biofertilizers improve the physical properties of the soil, particularly its structure. They enhance soil aeration, promote water retention, and reduce the risk of erosion, which is especially important in the context of climate change and uneven rainfall distribution [3]. Improvement of Soil Microbial Activity: Biofertilizers contain organic compounds that serve as food for beneficial soil microorganisms, such as bacteria and fungi. This helps restore the biological balance in the soil, improving its health and self-regeneration capacity [4]. Increasing Soil Fertility through Organic Carbon: Biofertilizers provide the soil with organic carbon, a key element for the development of the soil microbiota. This enhances moisture retention and improves the overall condition of the soil, ultimately contributing to higher crop yields [5]. Reduction of Toxic Substance Concentration in the Soil: Biofertilizers reduce the level of toxic compounds in the soil, such as heavy metals, pesticides, and chemical fertilizers. They activate processes that convert these substances into less harmful forms or remove them from the soil [6]. Improvement of Soil Water Regime: Biofertilizers enhance the water-holding capacity of the soil, helping plants better adapt to drought conditions. This is particularly important in regions with water scarcity or in the context of climate change [7]. Improvement of Nutrient Availability for Plants: Biofertilizers increase the bioavailability of essential nutrients like nitrogen, phosphorus, and potassium. This ensures that plants receive the necessary nutrients for growth and development, which directly

impacts yield [8]. Increasing Plant Resistance to Diseases and Pests: Biofertilizers stimulate the natural defense mechanisms of plants, strengthening their immunity. This helps reduce the use of pesticides and maintain ecological balance, preventing harmful environmental impacts [9]. Reduction of Water Pollution: The use of biofertilizers reduces the risk of water pollution from nitrates and other toxic substances, which is a common consequence of synthetic fertilizers [10]. Increased Yields and Improved Product Quality: Biofertilizers contribute not only to higher yields but also to the improved quality of agricultural products, increasing the content of beneficial substances in fruits while reducing the accumulation of harmful compounds [11]. Types of Biofertilizers: Organic and Microbiological: There are two main types of biofertilizers: organic (manure, compost, green manures) and microbiological (preparations based on beneficial microorganisms, such as nitrogen-fixing bacteria). Each type has its advantages and can be selected according to specific needs and soil type [12]. Economic Benefits of Using Biofertilizers: Using biofertilizers reduces costs for chemical fertilizers and pesticides. This is especially important for small farming enterprises as it allows them to lower costs for agrochemicals and achieve better economic outcomes [13]. Beneficial Environmental Impact: Biofertilizers have a lesser impact on the environment compared to chemical fertilizers since they do not pollute the soil and water with toxic compounds and do not contribute to atmospheric greenhouse gas pollution [14]. Prospects for the Development of Biofertilizers in the Context of Climate Change:

In the context of climate change, biofertilizers are gaining particular significance. They help increase the resilience of agricultural crops to extreme weather conditions such as drought or floods, making them indispensable for ensuring future food security.

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**AKTUELLE TRENDS IN DER AGRONOMIE: EINSATZ NEUESTER
TECHNOLOGIEN ZUR PRODUKTIVITÄTSSTEIGERUNG UND NACHHALTIGE
LANDWIRTSCHAFT
(СУЧАСНІ ТЕНДЕНЦІЇ В АГРОНОМІЇ: ВИКОРИСТАННЯ НОВІТНІХ
ТЕХНОЛОГІЙ ДЛЯ ПІДВИЩЕННЯ ВРОЖАЙНОСТІ ТА СТАЛОГО
ЗЕМЛЕРОБСТВА)**

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У статті було розглянуто стратегічні підходи адаптації сільського господарства до змін клімату та заходи з його пом'якшення. Автори обговорюють різноманітні стратегії, які можуть допомогти фермерським господарствам зменшити негативний вплив на навколишнє середовище, зокрема через оптимізацію використання ресурсів і адаптацію до нових кліматичних умов.

Ключові слова: зміна клімату, машинне навчання, сільське господарство, технології, прогнозування врожайності, агрономія.

In dem Artikel wurden strategische Ansätze zur Anpassung der Landwirtschaft an den Klimawandel und Minderungsmaßnahmen betrachtet. Die Autoren diskutieren verschiedene Strategien, die landwirtschaftlichen Betrieben dabei helfen können, ihre negativen Auswirkungen auf die Umwelt zu reduzieren, insbesondere durch die Optimierung des Ressourceneinsatzes und die Anpassung an neue Klimabedingungen.

Schlüsselwörter: Klimawandel, maschinelles Lernen, Landwirtschaft, Technologie, Ertragsprognose, Agronomie.

Agronomie ist eine Wissenschaft, die sich mit der Erforschung und praktischen Anwendung von Methoden des Pflanzenanbaus, der Verbesserung der Bodenqualität, der Bekämpfung von Schädlingen und Krankheiten sowie der Optimierung aller Prozesse befasst, die den Ertrag und die Nachhaltigkeit landwirtschaftlicher Systeme beeinflussen. Angesichts des raschen Klimawandels und der wachsenden Nachfrage nach Nahrungsmitteln wird die Agronomie zu einem Schlüsselement für die Gewährleistung der globalen Ernährungssicherheit. Unter modernen Bedingungen, wenn die Welt mit den Herausforderungen des Klimawandels, des Bevölkerungswachstums und der Notwendigkeit der Gewährleistung der Ernährungssicherheit konfrontiert ist, wird die Agronomie nicht nur zu einer wichtigen Richtung der Wissenschaft, sondern auch zu einem wichtigen Faktor der wirtschaftlichen Entwicklung. Der Einsatz modernster Technologien in der Landwirtschaft trägt dazu bei, viele Probleme zu lösen, darunter die Steigerung der Produktivität, die Verringerung negativer Auswirkungen auf die Umwelt und die nachhaltigere Gestaltung der landwirtschaftlichen Produktion.

Präzisionslandwirtschaft ist eine landwirtschaftliche Managementstrategie, die Daten verschiedener Sensoren, Satellitenbilder und anderer Quellen nutzt, um den Pflanzenanbau präzise zu steuern. Einer der größten Vorteile der Präzisionslandwirtschaft ist die Einsparung von Ressourcen und die Steigerung der Erträge. Dank der Verwendung von GPS-Systemen und Satellitenbildern können Landwirte die Boden- und Pflanzenbedingungen genau überwachen und die Bewässerung und Düngemittelverteilung optimieren. Außerdem können Sie dadurch die Kosten

für Pestizide und chemische Düngemittel erheblich senken, wodurch deren negative Auswirkungen auf die Umwelt verringert werden.

Auch Gentechnik und Biotechnologie spielen eine wichtige Rolle bei der Ertragssteigerung und Nachhaltigkeit in der Landwirtschaft. Durch den Einsatz gentechnischer Veränderungen ist es möglich, Pflanzen zu schaffen, die resistent gegen Schädlinge, Krankheiten und Stressbedingungen wie Trockenheit oder hohe Temperaturen sind. Gentechnisch veränderte Pflanzen können höhere Erträge erzielen, sich besser an unterschiedliche klimatische Bedingungen anpassen und erfordern auch weniger Pestizideinsatz. Pflanzen wie Bt-Mais und gentechnisch veränderte Sojabohnen sind von Natur aus resistent gegen einige Schädlinge und können in widrigen Klimazonen wirksamer sein. Trotz aller Vorteile erfordert der Einsatz solcher Technologien jedoch eine sorgfältige Überwachung und Bewertung ihrer Auswirkungen auf die Umwelt und die menschliche Gesundheit.

Die Einführung autonomer landwirtschaftlicher Maschinen wie unbemannte Traktoren, Drohnen und Robo-Harvester verändert die Art und Weise, wie wir auf den Feldern arbeiten. Diese Maschinen können eine Vielzahl agronomischer Arbeiten ohne menschliches Eingreifen durchführen, darunter Bodenbearbeitung, Aussaat, Besprühen von Pflanzen und Ernten von Feldfrüchten. Autonome Technologien ermöglichen es, die Arbeitskosten deutlich zu senken, die Arbeitsgenauigkeit zu erhöhen und den Zeitaufwand für die Durchführung grundlegender agrotechnischer Maßnahmen zu verkürzen. Solche Technologien haben ein großes Potenzial zur Effizienzsteigerung und Reduzierung der negativen Auswirkungen landwirtschaftlicher Systeme auf die Umwelt.

Ziel der modernen Agronomie ist es, mithilfe innovativer Technologien die Effizienz der Landwirtschaft zu steigern und die Ernährungssicherheit angesichts des Klimawandels und der wachsenden Nachfrage nach Nahrungsmitteln zu gewährleisten. Technologien der Präzisionslandwirtschaft, genetischer Veränderungen, IoT, Big Data und Robotik ermöglichen es, Erträge zu steigern, Ressourcenkosten zu senken und die Nachhaltigkeit der landwirtschaftlichen Produktion sicherzustellen. Gleichzeitig bleiben Fragen der nachhaltigen Entwicklung und der Schonung natürlicher Ressourcen wichtig, die die Grundlage für eine erfolgreiche und ökologisch sichere Zukunft der Agrarwirtschaft bilden.

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ENVIRONMENTAL RIGHTS AND RESPONSIBILITIES OF A CITIZEN (ЕКОЛОГІЧНІ ПРАВА ТА ОБОВ'ЯЗКИ ГРОМАДЯНИНА)

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У статті розглянуто інформацію про закони та статті в різних законодавчих органах які захищають прова та формують обов'язки громадян з питань екології та екологічної безпеки.

Ключові слова: екологія, екологічні прав та обов'язки, правові акти, закони.

The article reviews information about laws and articles in various legislative bodies that protect the rights and form the responsibilities of citizens on issues of ecology and environmental safety.

Keywords: ecology, environmental rights and responsibilities, legal acts, laws.

Environmental rights and obligations of citizens of Ukraine are established and guaranteed by the state opportunities in the field of using natural resources, protecting the environment and ensuring environmental safety.

A person's life largely depends on what surrounds him; what water he will drink, what air he will breathe, what products he will consume. After all, where the environment is unfavorable, the number of diseases increases sharply, life expectancy is reduced. That is why the Constitution of Ukraine proclaimed the right to a safe environment for the life and health of citizens.

With the adoption of international agreements in this area, the relevant principles of environmental protection and certain environmental rights began to be reflected in national legal systems.

Thus, Article 50 of the Constitution of Ukraine (1996) establishes that everyone has the right to an environment safe for life and health and to compensation for damage caused by the violation of this right. Everyone is guaranteed the right to free access to information about the state of the environment, the quality of food products and household items, as well as the right to disseminate it. Such information may not be classified by anyone.

The Law of Ukraine "On Environmental Protection" provides for the environmental rights of citizens of Ukraine (Article 9). Namely, every citizen of Ukraine has the right to:

- a) an environment that is safe for his life and health;
- b) participation in discussing and making proposals for draft regulatory legal acts, materials on the placement, construction and reconstruction of objects that may negatively affect the state of the environment, making proposals to state authorities and local governments, legal entities participating in making decisions on these issues;
- c) participation in the development and implementation of measures to protect the environment, rational and integrated use of natural resources;
- d) implementation of general and special use of natural resources;
- e) association in public environmental protection formations;
- f) free access to information on the state of the environment (environmental information) and free receipt, use, dissemination and storage of such information, except for restrictions established by law;
- g) participation in public hearings or open meetings on the impact of planned activities on the environment at the stages of placement, design, construction and reconstruction of facilities and in conducting public environmental expertise;
- h) receiving environmental education;

i) filing lawsuits against state bodies, enterprises, institutions, organizations and citizens for compensation for damage caused to their health and property as a result of negative impact on the environment;

j) judicial appeal of decisions, actions or inaction of state authorities, local self-government bodies, their officials regarding the violation of environmental rights of citizens in accordance with the procedure prescribed by law.

Article 12 of the Law of Ukraine “On Environmental Protection” also establishes the obligations of citizens in the field of environmental protection. Namely, citizens of Ukraine are obliged to:

a) preserve nature, protect, and rationally use its resources in accordance with the requirements of environmental protection legislation;

b) carry out activities in compliance with the requirements of environmental safety, other environmental standards, and limits on the use of natural resources;

c) not violate the environmental rights and legitimate interests of other entities;

d) pay fines for environmental offenses;

e) compensate for damage caused by pollution and other negative impacts on the environment.

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УДК 811.111

ECOLOGICAL SAFETY AND NUTRITION QUALITY: ECONOMIC CHALLENGES AND PROSPECTS (ЕКОЛОГІЧНА БЕЗПЕКА ТА ЯКІСТЬ ХАРЧУВАННЯ: ЕКОНОМІЧНІ ВИКЛИКИ ТА ПЕРСПЕКТИВИ)

Тюренкова К.В. – здобувач вищої освіти групи МЕН 3/1

Науковий керівник: Ганніченко Т.А., кандидат педагогічних наук, доцент кафедри іноземних мов МНАУ

Було проведено аналіз безпечності харчових продуктів та розкрито основні загрози для здоров’я населення. Виділено чинники, що впливають на якість продовольства, а також особливості екологічного контролю в Україні. Сформульовано перспективні напрями розвитку системи забезпечення харчової безпеки та запропоновано ефективні стратегії її впровадження.

Ключові слова: харчова безпека, екологічний контроль, якість продуктів, продовольча політика, управлінські рішення.

The article analyzes food safety and reveals the main threats to public health. The factors affecting the quality of food, as well as the peculiarities of environmental control in Ukraine, are highlighted. Promising directions for the development of the food safety system are formulated and effective strategies for its implementation are proposed.

Keywords: *food safety, environmental control, food quality, food policy, management decisions.*

Food plays a key role in human interaction with the environment. Ensuring food safety is one of the most important factors in preserving public health and the genetic pool. After all, it is through food and water that the lion's share of harmful substances enters our bodies.

The purpose of the study is to assess the level of food safety in Ukraine, identify the main threats and develop strategies to ensure food quality and safety.

Prominent researchers who have made a significant contribution to the study of food safety are Savchuk E. V., Malchevska K. V., Prokina A. V., Tolok G. A., Tolok E. V. and others.

The rapid development of industry and agriculture has led to an increase in the amount of hazardous industrial waste in liquid and gaseous states that pollute the environment. Hundreds of types of pesticides of both chemical and biological origin are actively used in modern agriculture. Many of them end up in raw materials for the food industry and subsequently in food. Thus, the increase in food production comes at the expense of a significant decrease in its quality.

Studies conducted in Ukraine have revealed a high level of food contamination with toxic substances, bacteria and other harmful microorganisms. This problem is related to the negative impact of industry on the environment, the low level of agricultural technology, and violations of the rules for the use of chemicals in agriculture.

Food products can accumulate all environmentally harmful substances from the environment and concentrate them in large quantities. From the environment, 70% of hazardous substances enter the human body from food of plant and animal origin [1].

Food safety is guaranteed by clearly established standards for the content of harmful impurities and constant monitoring of their compliance with these standards. The main goal of the state policy in the field of nutrition is to improve the quality of life of the population by ensuring that everyone has access to genetically safe food, which will help restore and maintain health, as well as prevent the development of chronic diseases.

Tolok G.A. and Tolok E.V. emphasize [2] that studies have confirmed the feasibility and effectiveness of food quality control not at the final stage of its production or, even worse, at the stage of sale, but step-by-step control at the so-called critical points - the stages of the technological process at which control is possible and which is essential for preventing or eliminating a risk that threatens food safety or for reducing it to an acceptable level.

Raw materials for food production must be grown in environmentally friendly conditions without the use of harmful substances. All subsequent stages of production, from processing to storage, must be organized in such a way as to maintain product quality and avoid contamination.

Ensuring safe and high-quality food for the population is a priority for Ukraine. To do this, it is necessary to: provide a varied diet; make healthy food available to all; produce high-quality products with health benefits; improve the food culture of the population; and produce raw materials in environmentally friendly conditions.

The main direction in the formation of food security in Ukraine at the present stage is the priority of preserving human health and environmental protection compared to obtaining economic benefits from the use of GMOs [3].

Environmental pollution and the use of hazardous chemicals in agriculture mean that the food we consume may contain harmful impurities. This poses a serious threat to public health and requires urgent action. To ensure food safety, it is necessary to implement modern quality control systems at all stages of production - from growing raw materials to selling finished products. It is also important to stimulate the production of environmentally friendly products and ensure access to healthy food for all segments of the population. Preserving the health of citizens should be a priority of state policy, and economic interests should not be placed above food safety.

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FINANCIAL MANAGEMENT AS A PROCESS OF MANAGING FINANCIAL RESOURCES

(ФІНАНСОВИЙ МЕНЕДЖМЕНТ ЯК ПРОЦЕС УПРАВЛІННЯ ФІНАНСОВИМИ РЕСУРСАМИ)

Успаська О. І. – здобувач вищої освіти групи МЕН 3/1

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У роботі охарактеризовано фінансовий менеджмент як систему управління. Проаналізовано функції, сутність, задачі та особливості. Також, увага була зосереджена на завданнях та механізмах фінансового менеджменту, оскільки він є невід'ємною складовою ринкової економіки. Фінансовий менеджмент є саме тою специфічною системою без якої не відбувається управління грошовими потоками та рухами фінансовими ресурсами відповідних організацій, установ.

Ключові слова: фінансовий менеджмент, ефективність, грошовий потік, фінанси, процес управління.

The paper describes financial management as a management system. The functions, essence, tasks and features are analyzed. Also, attention was focused on the tasks and mechanisms of financial management, as it is an integral component of the market economy. Financial management is precisely that specific system without which there is no management of cash flows and movements of financial resources of the relevant organizations and institutions.

Key words: financial management, efficiency, cash flow, finance, management process.

In Ukraine, financial management is becoming more and more relevant, since with the formation of market conditions, the role of enterprise financial management is significantly changing. Unfortunately, today there is no single definition of the concept of "financial management". E.F. Brigham notes that financial management is the broadest of the three branches and an important area of activity in all types of business, including banks and other financial enterprises and organizations [3].

Financial management is considered as an integral phenomenon that has various forms of manifestation. On the other hand, financial management is a system of economic management and part of the financial mechanism. Financial management is aimed at managing the movement of

financial resources, relations that arise between business entities in the process of moving financial resources. Financial management is the process of developing the goal of financial management at an enterprise and exerting influence using various methods and levers.

Financial management is a specific system of managing cash flows, the movement of financial resources and, accordingly, the organization. The object of financial management is precisely the set of conditions for the implementation of cash flow, the circulation of value, the movement of financial resources and financial relations between business entities [4].

The main tasks of financial management are:

- development of financial strategies
- financial planning
- analysis of financial reporting and forecasting of income
- identification of financial sources of enterprise development
- comprehensive management of fixed and working capital
- determination of optimal directions of investment of financial resources
- rationalization of transactions with securities,
- establishment of effective relations with business entities

Financial management as a management system performs the following functions:

1. development of the financial strategy of the enterprise;
2. formation of effective information systems and technologies;
3. analysis of various aspects of the financial activities of the enterprise;
4. planning of the financial activities of the enterprise in various directions;
5. development of operating systems for stimulating the implementation of management decisions made in the field of financial activities;
6. effective control

The sphere of activity of financial management is the financial market, where economic relations between sellers and buyers of financial resources are manifested. The functioning of the financial market creates the basis for entrepreneurship in the field of financial management. The effectiveness of the application of financial management is achieved only in a comprehensive connection with the functioning, operating methods and levers of the financial mechanism. Financial management will not function successfully without legal, regulatory, organizational and information support and without an appropriate financial policy [1].

Financial management plays a key role in the activities of enterprises, ensuring effective management of financial resources, their movement and distribution. In the conditions of the market economy of Ukraine, its importance is constantly growing, since enterprises need flexible and effective financial management mechanisms [2]. Effective functioning of financial management is possible only with a comprehensive approach, which includes the use of modern management methods, financial instruments and levers, as well as the availability of appropriate regulatory, organizational and information support. Thus, financial management is an integral part of the successful development of enterprises in today's competitive environment.

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THE USE OF PROBIOTICS IN VETERINARY MEDICINE (ЗАСТОСУВАННЯ ПРОБІОТИКІВ У ВЕТЕРИНАРІЇ)

Філімонова С.О.— здобувачка вищої освіти групи ВМ 5/1

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У статті подана інформація про використання пробіотиків у ветеринарії для покращення здоров'я та добробуту тварин. Описано, як пробіотики впливають на мікрофлору кишечника, підвищують імунітет і сприяють профілактиці та лікуванню захворювань.

Ключові слова: пробіотики, шлунково-кишковий тракт, мікрофлора кишечника, мікроорганізми, імунітет, профілактика захворювань, ветеринарія.

The article provides information on the use of probiotics in veterinary medicine to improve animal health and well-being. It describes how probiotics influence gut microbiota, enhance immunity, and contribute to the prevention and treatment of diseases.

Keywords: probiotics, gastrointestinal tract, gut microbiota, microorganisms, immunity, disease prevention, veterinary medicine.

The state of the gastrointestinal microbiota is a determining factor in animal health, resistance to infectious agents, and the efficiency of nutrient absorption. Currently, probiotic preparations are considered not only as auxiliary agents in veterinary medicine but also as an essential component of comprehensive prevention and treatment programs, contributing to the reduction of antibiotic use in animal husbandry. An important aspect is also the application of probiotics in combination with prebiotics and symbiotics, which maximizes their effect in stabilizing the microbiota and strengthening the overall immune status of animals. Modern research highlights the significant role of probiotics in regulating metabolism, adapting to stressful conditions, and reducing the environmental impact of animal production [1].

Probiotics are microbial preparations containing viable cultures of beneficial microorganisms that help restore the balance of intestinal microbiota. Their main mechanisms of action include:

- Competitive exclusion of pathogenic bacteria;
- Synthesis of biologically active metabolites that promote digestion;
- Restoration of the microbiome after antibiotic therapy;
- Stimulation of local and systemic immunity;
- Synthesis of B vitamins and other essential biological compounds;
- Improvement of intestinal peristalsis and reduction of gastrointestinal disorders;
- Regulation of metabolism and optimization of detoxification processes in the body.

The key probiotic microorganisms used in veterinary medicine include bacteria of the genera *Bacillus*, *Lactobacillus*, *Bifidobacterium*, and *Enterococcus*. These microorganisms contribute to:

- Suppressing the growth of pathogenic bacteria by synthesizing bactericidal substances;
- Improving feed digestion and absorption of macro- and microelements;
- Detoxifying the body by neutralizing mycotoxins;
- Reducing the incidence of gastrointestinal disorders, especially in young animals;
- Increasing resistance to stress factors, such as dietary changes or changes in housing conditions;

- Supporting metabolic balance and optimizing physiological processes in animals.

One of the effective probiotic preparations is "**Immunobacterin-D**", which contains *Bacillus subtilis* and *Bacillus licheniformis*, along with enzymes (protease, xylanase, amylase), ensuring:

- Improved feed conversion;
- Reduced toxic load on the body;
- Increased productivity and livestock preservation;
- Better overall health and reduced stress levels during transportation;
- Faster recovery after diseases and surgical interventions [2].

Probiotics are widely used in livestock farming (cattle, pig, and poultry farming) for:

- Preventing microbiota imbalances in newborn animals;
- Reducing the negative impact of mycotoxins;
- Improving product quality (milk, meat, eggs);
- Lowering the risk of enterotoxigenosis and infectious gastrointestinal diseases;
- Supporting reproductive health and improving fertility rates [3].

One of the advantages of using probiotics is that the microorganisms in their composition produce significant amounts of biologically active substances during reproduction in the gastrointestinal tract, strengthening natural resistance. Vaccination, disinfection, deworming, coccidiostatics, and antimicrobial agents can disrupt intestinal microbiota balance. Therefore, every therapeutic intervention should be complemented by measures aimed at restoring normal microbiota. The use of probiotics is effective in treating postpartum pathologies in cows and preventing digestive disorders in newborn calves. Additionally, certain probiotic preparations help neutralize mycotoxins, positively impacting the quality of livestock products [4].

Probiotic preparations are a promising alternative to antibiotic therapy in veterinary medicine. They exhibit antagonistic, antibacterial, and immunostimulatory effects, help maintain microbiota balance, improve productivity, and enhance overall animal health. Furthermore, probiotics allow for reduced veterinary drug costs, increased environmental safety of products, and contribute to the sustainable development of animal farming. Further research is needed to explore the detailed mechanisms of probiotic action, their interactions with other biologically active substances, and the expansion of their use in veterinary practice, including the development of new probiotic strain encapsulation technologies.

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VACCINATION FOR PETS: WHY IT'S NECESSARY (ВАКЦІНАЦІЯ ДОМАШНІХ ТВАРИН: ЧОМУ ЦЕ НЕОБХІДНО)

Хлань К.О. - здобувачка вищої освіти групи ВМ3/1

Науковий керівник: Саламатіна О.О., кандидат філологічних наук, доцент кафедри іноземних мов МНАУ.

У даній публікації розглянуто поняття вакцинація, основні хвороби від яких вакцинують тварин та переваги вакцинації.

Ключові слова: вакцинація тварин, профілактика хвороб, ветеринарна медицина, захворювання, імунітет, здоров'я тварин.

This publication examines the concept of vaccination, the main diseases for which animals are vaccinated, and the benefits of vaccination.

Keywords: animal vaccination, disease prevention, veterinary medicine, diseases, immunity, animal health.

Vaccination of pets is a crucial aspect of their health and protection from infectious diseases. Vaccines help not only to protect the animal itself but also to prevent the spread of diseases to other animals and humans. This is particularly important for populations of domestic pets, as timely vaccination can save lives and ensure the safety of their owners.

Vaccination is the introduction of antigenic material into the animal's body to prevent infection or reduce the clinical manifestations of an infectious disease [2].

Vaccines are used for the active immunization of animals against infectious diseases. They are made from live attenuated (weakened), killed (inactivated) vaccines. Both live and killed vaccines can be corpuscular (from whole microbial cells). Killed vaccines can be chemically purified (from antigenic fractions) and toxoids.

Live vaccines are made from weakened strains of microbes. The advantage of live vaccines is that they provide a strong and long-lasting immunity (lasting up to 12 months or more) within 10-14 days, with a single dose. Disadvantages include the need for special storage conditions at a temperature of +4 to +10 °C, and potential post-vaccination complications (fever, reduced or loss of appetite, weakness).

Dry (lyophilized) live vaccines are more stable and have a longer shelf life [1].

Vaccination of animals is an important part of disease prevention. For example, after birth, an animal receives passive immunity from its mother through colostrum, which almost disappears by the 8th week. Therefore, vaccination should be done during this period.

Parvovirus causes acute hemorrhagic gastroenteritis and is highly contagious. This disease leads to large epidemics and many deaths among puppies. Parvovirus is very resistant in the external environment, which makes it easier to spread. This is why all dogs must be vaccinated. Leptospirosis is a serious bacterial disease that can affect humans as well. Dogs most often get infected in water contaminated with the urine of rodents. If you have a hunting dog or frequently visit wet areas with it, vaccination against leptospirosis is necessary [3]. Canine distemper. Puppies are the most susceptible to the causative agent of canine distemper. A pet can become infected with distemper from sick or recovered dogs that shed the virus into the external environment through nasal and eye secretions, as well as urine, feces, and saliva [4].

Calicivirus affects the upper respiratory tract. Common symptoms include sneezing, nasal and eye discharge, conjunctivitis, sores on the gums, lethargy, loss of appetite, and limping. In kittens, pneumonia may sometimes occur. Certain strains affect the intestines, liver, and pancreas [5].

Therefore, vaccination can save animals from many diseases, which is why it should be carried out.

Advantages of vaccination:

- 1) Vaccination protects animals from dangerous infectious diseases, including rabies, leptospirosis, and distemper.
- 2) It reduces the risk of fatal diseases, especially in young animals, such as puppies and kittens.
- 3) It strengthens the animal's immune system, helping it better resist infections.
- 4) Some diseases, such as rabies and leptospirosis, can be transmitted from animals to humans. Vaccination of animals helps reduce this risk.
- 5) Mass vaccination decreases the spread of diseases among animals, helping to prevent epidemics.
- 6) Disease prevention through vaccination is cheaper and more effective than treating diseases [1,2,4].

In conclusion vaccination is not just a medical procedure, but an important investment in the health and well-being of animals. It not only protects them from serious diseases but also creates a safe environment for humans, reducing the risk of infection transmission. Regular vaccination ensures that animals can lead active and healthy lives, while society remains protected from epidemics. Prevention through vaccination is much cheaper and more effective than treating diseases, emphasizing its importance in maintaining the health of all living beings on the planet.

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УДК 811.111

ADAPTIVE LEADERSHIP IN TIMES OF CRISIS: ENHANCING TEAM RESILIENCE AND PERFORMANCE (АДАПТИВНЕ ЛІДЕРСТВО ПІД ЧАС КРИЗИ: ПІДВИЩЕННЯ СТІЙКОСТІ ТА ПРОДУКТИВНОСТІ КОМАНДИ)

Ходаков. О. Р. – здобувач вищої освіти групи МЕН 2/2

Научний керівник: Ганніченко Т.А., кандидат педагогічних наук, доцент кафедри іноземних мов МНАУ

У статті розглядається концепція адаптивного лідерства та його вплив на команди в умовах кризових ситуацій. Аналізуються основні принципи адаптивного підходу, його зв'язок з існуючими теоріями лідерства та роль у підвищенні стійкості команд. Окрему

увагу приділено впливу криз на динаміку роботи команд, а також практичним стратегіям керівників, які сприяють ефективній адаптації до змін. Використано емпіричні дані та кейс-стаді для ілюстрації ефективності адаптивного лідерства. Окреслено ключові виклики, обмеження та напрямки подальших досліджень.

Ключові слова: Адаптивне лідерство, управління кризами, командна динаміка, стійкість команди, стратегічна адаптація, ефективне лідерство.

The article examines the concept of adaptive leadership and its impact on teams in crisis situations. The main principles of the adaptive approach, its connection with existing leadership theories and its role in increasing team resilience are analyzed. Special attention is paid to the impact of crises on team dynamics, as well as practical strategies of leaders that contribute to effective adaptation to change. Empirical data and case studies are used to illustrate the effectiveness of adaptive leadership. Key challenges, limitations, and directions for further research are outlined.

Keywords: Adaptive leadership, crisis management, team dynamics, team resilience, strategic adaptation, effective leadership.

Adaptive leadership is a flexible management style that emphasizes quick decision-making and real-time learning in uncertain conditions. Unlike traditional approaches, it encourages decentralized decision-making and innovation. Rooted in situational and complexity leadership theories, adaptive leadership thrives in volatile environments where conventional methods fall short.

Crises vary in nature sudden disruptions, prolonged uncertainty, internal or external challenges each affecting team morale and efficiency. Leaders must anticipate risks and implement strategies to maintain stability. Organizational structure, readiness for change, and external pressures further shape a team's response to crises.

Adaptive leaders build trust, psychological safety, and shared decision-making to help teams manage stress. Transparent communication and a growth mindset foster continuous learning and efficient problem-solving in dynamic conditions.

Effective adaptive leadership stabilizes or improves performance during crises through communication and resource allocation. It ensures teams align with evolving priorities while monitoring cohesion, speed of decision making, and quality of task completion.

Qualitative insights from leaders and teams highlight successful adaptive practices. Quantitative data on crisis response times, financial stability, and employee engagement measure leadership effectiveness. Comparing organizations using adaptive versus traditional methods underscores the advantages of adaptability.

Key strategies include scenario planning, agile communication, and flexible structures. Leaders must be trained to experiment and adapt. Organizations should invest in crisis simulations and leadership development to enhance adaptability.

Adaptive leadership expands crisis management theory by bridging hierarchical and agile structures. Its long-term benefits include sustained productivity, innovation, and improved team cohesion. Future research should explore cross-industry applications and digital transformation's role in adaptive leadership.

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**THE IMPACT OF DIGITAL TECHNOLOGIES ON THE HOTEL AND
RESTAURANT BUSINESS
(ВПЛИВ ЦИФРОВИХ ТЕХНОЛОГІЙ НА ГОТЕЛЬНО-РЕСТОРАННИЙ
БІЗНЕС)**

Хортів К.Р. - здобувач вищої освіти групи ГРС3/1

Науковий керівник: Ракова А.Ю., викладач кафедри іноземних мов МНАУ

У цій статті досліджується трансформаційна роль цифрових технологій у готельній та ресторанній індустрії, наголошується на їхньому впливі на покращення обслуговування клієнтів, операційну ефективність і конкурентоспроможність. Дослідження заглиблюється в впровадження штучного інтелекту (AI), автоматизації, аналітики великих даних і заходів кібербезпеки в сучасному менеджменті гостинності.

Ключові слова: *цифрова трансформація, штучний інтелект, великі дані, автоматизація, клієнтський досвід, розумні технології, кібербезпека, блокчейн, готельний менеджмент.*

This paper explores the transformative role of digital technologies in the hotel and restaurant industry, emphasizing their influence on customer service enhancement, operational efficiency, and competitive positioning. The study delves into the adoption of artificial intelligence (AI), automation, big data analytics, and cybersecurity measures in modern hospitality management.

Keywords: *digital transformation, artificial intelligence, big data, automation, customer experience, smart technologies, cybersecurity, blockchain, hospitality management.*

In the modern era of technological advancements, digital transformation has become a key driver of success in the hospitality sector. The growing integration of artificial intelligence (AI), mobile applications, cloud-based solutions, and big data has significantly reshaped business operations and customer interactions. However, despite the numerous advantages, challenges such as cybersecurity threats and workforce adaptation remain critical considerations [1,2].

The primary objective of this study is to assess the impact of digital technologies on customer engagement, operational efficiency, and long-term sustainability in the hospitality industry. The working hypothesis suggests that the implementation of digital solutions enhances service quality, reduces operational costs, and strengthens customer loyalty, while also introducing new complexities [3,4].

Enhancing Customer Experience through Digitalization. One of the most profound impacts of digital transformation is its ability to revolutionize the customer experience. AI-powered chatbots and virtual assistants provide seamless customer support, while big data-driven personalization enhances service offerings [5]. Online booking platforms and mobile payment solutions have streamlined the reservation process, making it more convenient and efficient [6].

Efficiency Gains and Automation. Automation has redefined various business functions, leading to optimized workflows. Smart inventory management systems, robotic service assistants, and AI-driven demand forecasting contribute to cost reduction and error minimization [7]. Contactless technologies, such as QR code menus and digital check-ins, have become essential tools in the post-pandemic era, enhancing both safety and operational efficiency [8].

Digital Marketing and Reputation Management. The rise of digital marketing strategies, including influencer collaborations and targeted social media campaigns, has transformed brand promotion. AI-driven sentiment analysis tools allow businesses to monitor customer feedback and refine their marketing strategies accordingly [9]. Additionally, virtual and augmented reality experiences enable customers to explore hospitality offerings before making reservations [10].

Emerging Challenges and Risks. Despite its numerous benefits, digitalization presents significant challenges. The hospitality sector faces increasing cybersecurity threats, including data breaches and hacking, necessitating robust security measures and compliance with data privacy regulations [11]. Furthermore, the integration of automation and AI may lead to workforce displacement, highlighting the need for reskilling and upskilling initiatives [12].

Digital technologies have profoundly reshaped the hotel and restaurant industry by enhancing customer interactions, optimizing business operations, and redefining marketing strategies. However, to ensure sustainable growth, businesses must proactively address cybersecurity risks and workforce transitions. Companies that effectively harness digital innovations will maintain a competitive edge in the ever-evolving hospitality landscape.

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CURRENT PROBLEMS AND PROSPECTS OF THE DEVELOPMENT OF GREEN TOURISM IN UKRAINE (СУЧАСНІ ПРОБЛЕМИ ТА ПЕРСПЕКТИВИ РОЗВИТКУ ЗЕЛЕНОГО ТУРИЗМУ В УКРАЇНІ)

Черкашина Ю. В.-здобувачка вищої освіти групи Тур 3/1

Науковий керівник: Ракова А.Ю, викладач кафедри іноземних мов МНАУ

У статті розглядаються сучасні проблеми та перспективи розвитку зеленого туризму в Україні. Висвітлюються основні виклики, з якими стикається галузь, такі як недостатня інфраструктура, нестача державної підтримки та екологічні ризики. Також аналізуються перспективи розвитку цього виду туризму, зокрема через екологізацію, впровадження цифрових технологій та міжнародне співробітництво.

Ключові слова: *зелений туризм, екологічний туризм, агротуризм, сталий розвиток, туристична інфраструктура, екологічні ініціативи.*

The article examines the current challenges and development prospects of green tourism in Ukraine. It highlights the key issues facing the industry, such as insufficient infrastructure, lack of government support, and environmental risks. Additionally, it analyzes potential growth opportunities for this type of tourism, particularly through eco-friendly initiatives, the implementation of digital technologies, and international cooperation.

Keywords: *green tourism, eco-tourism, agrotourism, sustainable development, tourism infrastructure, environmental initiatives.*

Green tourism is one of the most promising sectors in the development of Ukraine's tourism industry. It contributes to environmental conservation, the development of rural areas, and the promotion of national culture. However, despite its significant potential, the industry faces several challenges that must be addressed for its further growth. Recent experience and scientific research show that the accelerated development of rural green tourism can serve as a catalyst for structural economic reconstruction, ensuring demographic stability and addressing urgent socio-economic issues in rural areas.

Rural tourism aligns closely with the modern priorities of Ukraine's sustainable ecological and economic development, namely: preserving the natural and cultural environment, providing economic support to local communities, and supplying tourists with locally sourced organic food products. [2].

The necessity for the development of rural green tourism in Ukraine is determined by several key factors, which also shape its future prospects:

- ☐ The growing demand from urban residents and foreign visitors for rural vacations;
- ☐ The unique historical and ethnographic heritage of Ukrainian villages;
- ☐ Rich recreational resources;
- ☐ The ecological purity of rural areas;
- ☐ A relatively available rural housing stock for accommodating tourists;
- ☐ The presence of a free labor force for serving tourists;
- ☐ The traditional hospitality of local hosts and the affordability of rural vacations;
- ☐ The opportunity to offer a wide range of additional services, including guided tours, fishing, berry and mushroom picking, horseback riding, and more [3].

Despite the significance of the existing prerequisites for the development of rural green tourism, it is also essential to address the challenges that limit and slow down this process, especially in the context of Ukraine's socio-economic crisis, including:

- ☐ The lack of proper legal support for the development of rural green tourism;

- The absence of a mechanism for the rational and ecologically balanced use of natural and historical-cultural potential for tourism purposes;
 - A low level of infrastructure and communication networks;
 - Inefficient state regulation of rural green tourism and political-economic instability;
 - The presence of an informal (shadow) sector in the industry;
 - Ineffective tax regulation;
 - Insufficient educational and organizational training for rural hosts;
 - The absence of a marketing and advertising strategy;
 - The relatively low attractiveness of Ukraine's image in the eyes of foreign tourists
- [4].

Problems of green tourism development in Ukraine:

- Insufficient tourism infrastructure. Many rural regions of Ukraine have limited infrastructure for receiving tourists. This includes poor road conditions, a lack of proper accommodation facilities, and restricted access to basic services. For example, in many rural areas of the Carpathians, tourists face difficulties in traveling due to poor road conditions, which complicates access to remote tourist sites. [5]
- Low level of State support. The development of green tourism often takes place without adequate state support. The lack of funding, preferential programs, and a clear development strategy forces local entrepreneurs to solve all problems on their own. For instance, many rural guesthouse owners do not have access to credit resources for business development due to the absence of state support programs. [5]
- Environmental risks. Uncontrolled tourism development can lead to the degradation of natural landscapes, environmental pollution, and biodiversity loss. For example, the mass construction of tourist facilities without considering ecological standards can negatively affect the Carpathian ecosystems. [1]
- Lack of information support. Many potential tourists are unaware of green tourism opportunities in Ukraine. The absence of effective marketing strategies and information campaigns leads to the low popularity of this type of tourism. For instance, many unique tourist routes remain unknown to the general public due to a lack of media and internet coverage. [1,6]

Prospects for the development of green tourism in Ukraine

- Greening of tourism. The implementation of environmentally friendly technologies and adherence to sustainable development principles can make green tourism more attractive to travelers who care about the environment. For example, using solar panels for energy supply at tourist facilities or introducing waste separation systems can increase environmental awareness among tourists and attract new visitors. [1]
- Development of digital technologies. Creating online booking platforms, virtual tours, and mobile applications can simplify travel planning and make green tourism more accessible. For example, developing a mobile app that provides information about rural guesthouses, tourist routes, and local attractions will allow tourists to easily plan their trips and book services online. [1,6]
- Improving workforce qualifications. Organizing educational programs and training sessions for guides, guesthouse owners, and other tourism industry participants will help improve service quality and meet the needs of modern tourists. For instance, conducting seminars on foreign language learning, hospitality basics, and ecological management will help enhance the professional level of industry workers. [1,6]
- International cooperation. Exchanging experiences with other countries and attracting foreign investors can contribute to infrastructure development and higher service standards. For example, participating in international tourism exhibitions and forums will allow Ukraine to present its green tourism sector on the global stage and attract new partners for joint projects. [1,6]

The development of green tourism in Ukraine requires a comprehensive approach that includes infrastructure improvement, state support, ecological awareness, and an active information policy. Only under these conditions can this sector become an essential element of the country's sustainable development and contribute to the well-being of rural communities.

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THE ROLE AND EFFECTIVENESS OF PUBLIC ADMINISTRATION IN MODERN SOCIETY (РОЛЬ ТА ЕФЕКТИВНІСТЬ ДЕРЖАВНОГО УПРАВЛІННЯ У СУЧАСНОМУ СУСПІЛЬСТВІ)

Шваюк Ю.О. – здобувачка вищої освіти групи ПУА 2/1

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У публікації розглянуто важливість державного управління як механізму регулювання суспільних процесів та забезпечення ефективного функціонування урядових структур. Основна увага приділяється управлінню державними ресурсами, впровадженню публічної політики, а також використанню принципів ефективності та економічності в адміністративній діяльності.

Ключові слова: *публічне управління, уряд, менеджмент, державна політика.*

The publication considers the importance of public administration as a mechanism for regulating social processes and ensuring the effective functioning of government structures. The focus is on the management of public resources, the implementation of public policy, as well as the use of the principles of efficiency and efficiency in administrative activities.

Key words: *public administration, government, management, public policy.*

Public administration and government administration play a major role in shaping our communities and influencing our daily lives. From managing public resources and implementing policies to ensuring efficient governance and societal progress, public administration stands as a vital field that touches every aspect of our society [1].

Public administration, the implementation of government policies. Today public administration is often regarded as including also some responsibility for determining the policies and programs of governments. Specifically, it is the planning, organizing, directing, coordinating, and controlling of government operations.

Public administration is a feature of all nations, whatever their system of government [2].

A function of public administration is the implementation of public policy. Public policy refers to the decisions and actions taken by governments to address societal issues and achieve desired outcomes. Public administrators are responsible for executing and managing government programs that aim to address societal issues and achieve desired outcomes. They develop and manage budgets, allocate resources, and oversee the implementation process to ensure that policies are effectively carried out.

Public administration is also a field of study that focuses on the organisation and management of government agencies. Public administration also encompasses public management, which involves the application of private-sector management techniques to improve the efficiency and effectiveness of government operations. Public administrators analyse and design organisational structures, develop management systems, and implement best practices to improve the efficiency and effectiveness of government operations. They work to ensure that government agencies are responsive to the needs of the public and accountable for their actions [1].

One more crucial function of public administration is that it provides a wide variety of services to the public. For example, the government is obliged to ensure the safety of life and property of the citizens through the maintenance of law and order in the state. If this function is not carried out effectively, society will be functioning under the law of the jungle. Another example of public administration's functions is the national defense of the country. If public administration fails to perform it, the survival of mankind and national independence would be under threat, along with opportunities for the progress of social life [3].

A prominent principle of public administration has been economy and efficiency – that is, the provision of public services at the minimum cost. This has usually been the stated objective of administrative reform. Despite growing concern about other kinds of values – such as responsiveness to public needs, justice and equal treatment, and citizen involvement in government decisions – efficiency continues to be a major goal [2].

Today, public administration is a well-established field with a rich history and a wide range of career opportunities. Public administrators play a prominent part in managing public resources, implementing public policies, and ensuring the effective functioning of government. The field continues to evolve and adapt to meet the changing needs of society, and it remains an essential component of modern governance [1].

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**INFLUENCE OF SEEDLING RATE ON THE PRODUCTIVITY
OF CLARY SAGE
(ВПЛИВ НОРМИ ВИСІВУ НА ПРОДУКТИВНІСТЬ
ШАВЛІЇ МУСКАТНОЇ)**

Шелінгер А.Ю. – здобувач вищої освіти групи А4/3

Науковий керівник: Марковська А.В., кандидат філологічних наук, доцент кафедри іноземних мов МНАУ

У публікації проведено аналіз актуальності вирощування ефіроолійних культур, зокрема шавлії мускатної (Salvia sclarea), в умовах Південного Степу України. Розглянуто її агротехнічні особливості, адаптивні властивості та потенційне використання у фармацевтичній, парфумерній і харчовій промисловості. Досліджено вплив різних норм висіву на продуктивність ефірної олії шавлії мускатної та встановлено оптимальну норму для максимального виходу ефірної олії.

Ключові слова: ефіроолійні культури, шавлія мускатна (Salvia sclarea), Південний Степ України, адаптивні властивості, продуктивність ефірної олії, норма висіву.

The publication analyzes the relevance of growing essential oil crops, in particular clary sage (Salvia sclarea), in the conditions of the Southern Steppe of Ukraine. Its agrotechnical features, adaptive properties and potential use in the pharmaceutical, perfume and food industries are considered. The influence of different sowing rates on the productivity of clary sage essential oil is studied and the optimal rate for maximum essential oil yield is established.

Keywords: essential oil crops, clary sage (Salvia sclarea), Southern Steppe of Ukraine, adaptive properties, essential oil productivity, sowing rate.

In recent years, the relevance of growing essential oil crops has increased steadily, which is related to the growing demand for essential oil and medicinal plant products in the medical, perfume, and food industries. However, the supply of such plant products in our country remains at a low level. As of today, Ukraine is able to meet only 40% of the raw material requirements for essential oil production, with the remaining 60% being imported from abroad [1].

Clary sage (*Salvia sclarea*) is a perennial plant with a relatively high adaptive ability in the conditions of the Southern Steppe of Ukraine. This plant is characterized by high drought resistance, and the main limiting factor in the growing conditions is moisture. This culture is also highly frost-resistant, making it stable during the winter period of the temperate continental climate. Proper care is essential for obtaining the highest yield. Consequently, the scientific community in the field of agriculture is increasingly focusing on agronomic practices and their impact on plant productivity.

Notably, clary sage exhibits minimal requirements for soil quality and can be cultivated even in poor, rocky soils, although it performs better on fertile chernozem and loamy soils. The essential oil of clary sage is utilized in pharmaceutical practice for flavoring medicines and in the perfume industry as a scent fixative. Its medicinal properties are notable for their anti-inflammatory and antibacterial effects, which have led to its frequent use in scientific medicine, particularly for external applications. In addition to these properties, clary sage is a notable antioxidant. Its economic importance extends to the food industry as well [2].

In the context of the Southern Steppe, the intricacies of cultivating *Salvia sclarea* remain to be extensively investigated, underscoring the necessity for further research on the impact of diverse agronomic practices and systems on plant productivity. In the southern regions of Ukraine, winter sowing of clary sage is employed at soil temperatures ranging from 3 to 5 degrees Celsius to prevent seed germination before the onset of cold weather. The emergence of the first shoots occurs

in the spring, coinciding with an increase in soil temperature to 8-12 degrees Celsius. The application of phosphorus during sowing has also been observed. Winter wheat has been identified as a favorable predecessor for clary sage [3].

The study examined the impact of two distinct periods for clary sage seed sowing: spring and summer. These periods resulted in varying productivity indicators. The study investigated the influence of different sowing rates at different times on the productivity of clary sage. A control sample of 6 kg/ha was utilized in the study. The study's findings indicated that the optimal sowing rate for maximizing essential oil productivity per hectare was 8 kg, yielding an average of 14.3 kg in the spring and 12.3 kg in the summer. Conversely, the lowest indicators were obtained with a sowing rate of 4 kg/ha, ranging from 8.4 to 10 kg/ha across different periods. At sowing rates of 6 kg/ha (control) and 10 kg/ha, the indicators were average compared to 4 and 8 kg/ha [4].

In conclusion, it can be posited that the optimal sowing rate for achieving the maximum amount of essential oil per hectare is 8 kg/ha. The highest conditional yield was recorded at 15.3 kg/ha in the spring period, while the lowest values were observed at 4 kg/ha, and the values for 6 and 10 kg/ha were average. Given the promising results of this study in the context of the Southern Steppe of Ukraine, further research is necessary to develop the most effective agronomic practices for cultivating clary sage.

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УДК 811.11

ARTIFICIAL INTELLIGENCE IN AGRICULTURE: AI USAGE IN SUPPLY CHAIN EFFICIENCY (ШТУЧНИЙ ІНТЕЛЕКТ В СІЛЬСЬКОМУ ГОСПОДАРСТВІ: ВИКОРИСТАННЯ ШІ В ЕФЕКТИВНОСТІ ЛАНЦЮГА ПОСТАВОК)

Шелінгер У.П. – здобувачка вищої освіти групи А4/2

Науковий керівник: Марковська А.В., кандидат філологічних наук, доцент кафедри іноземних мов МНАУ

У публікації проведено огляд та аналіз впровадження штучного інтелекту в сільському господарстві. Розглянуто основні напрями застосування ШІ, включаючи підвищення прозорості харчового ланцюга, оптимізацію використання ресурсів та зменшення екологічного впливу. Проаналізовано переваги технології, такі як автоматизація процесів, скорочення витрат і підвищення ефективності виробництва, а також виклики, пов'язані з кібербезпекою, технічною складністю та необхідністю значних початкових інвестицій.

Ключові слова: *штучний інтелект, сільське господарство, продовольча безпека, оптимізація ресурсів, прозорість харчового ланцюга, екологічна стійкість, ефективність виробництва.*

The publication reviews and analyzes the implementation of artificial intelligence in agriculture. The main areas of application of AI are considered, including increasing the

transparency of the food chain, optimizing the use of resources and reducing the environmental impact. The advantages of the technology, such as process automation, reducing costs and increasing production efficiency, as well as the challenges associated with cybersecurity, technical complexity and the need for significant initial investments, are analyzed.

Keywords: *artificial intelligence, agriculture, food security, resource optimization, food chain transparency, environmental sustainability, production efficiency.*

In May 2020, the European Commission introduced the Farm to Fork (F2F) Strategy as a key component of the European Green Deal, aiming to accelerate the transition toward a sustainable food system [1]. The strategy outlines 27 measures, including the development of a nutrition labeling system, improvements in animal welfare, and significant reductions in food waste. Its overarching goal is to ensure food security, improve nutrition and public health, and guarantee access to safe, sustainable, and nutritious food for all [2]. While many researchers highlight the advantages of F2F traceability in promoting agricultural sustainability, transparency [3], and consumer trust [4], others warn that its widespread global adoption may lead to economic challenges, reduced international trade, and financial burdens on small-scale farmers [5].

One of the most pressing issues in the agricultural sector is the lack of transparency in the food value chain [6]. Modern consumers increasingly demand detailed information about the origin, production methods, and supply chain journey of their food, seeking reassurance about sustainability, ethical sourcing, and quality control. In addition, smallholder farmers—who play a crucial role in global food production—face systemic challenges, including inefficiencies in production and distribution, difficulties in meeting industrial-scale quality standards, and limited access to advanced technological resources [7]. Due to these inefficiencies, small-scale farming is often perceived as less competitive than large-scale commercial agriculture. Addressing these structural disparities is essential for fostering an equitable and resilient food system.

Artificial intelligence (AI) has emerged as a powerful tool for enhancing transparency, efficiency, and decision-making in agricultural supply chains. AI-driven blockchain technology ensures secure, tamper-proof record-keeping by creating immutable transaction records, which enhances traceability and minimizes fraud. Predictive analytics further optimize supply chain efficiency by ensuring the timely delivery of fresh agricultural products through real-time monitoring of transportation and storage conditions [8]. Moreover, AI plays a pivotal role in improving consumer transparency by providing access to detailed product information, including farming practices, sustainability measures, and quality control protocols [9]. These advancements help build trust between producers and consumers, reinforcing confidence in the integrity of food supply chains.

Beyond consumer-focused benefits, AI also streamlines regulatory compliance and operational efficiency for producers. By automating data collection and documentation processes, AI facilitates adherence to food safety and traceability regulations, reducing administrative burdens. The integration of AI with the Internet of Things (IoT) allows for continuous monitoring of various parameters on farms, ensuring comprehensive data collection from planting to harvesting. These technologies collectively contribute to a more sustainable and well-managed agricultural system [10].

Despite its advantages, the implementation of AI in F2F traceability presents several challenges. Cybersecurity risks pose threats to data integrity, necessitating robust security measures to protect supply chain information [11]. Additionally, AI technologies require substantial investment, making them less accessible to small-scale farmers who may struggle with high initial costs, ongoing maintenance, and the technical expertise needed for successful implementation [12]. Regulatory compliance and the human factor also remain critical concerns, as AI cannot fully replace human judgment in agricultural decision-making. Furthermore, AI-driven automation has socio-economic implications, including potential job displacement, requiring workforce reskilling and adaptation to new technological landscapes [13].

While existing research has explored various aspects of AI in food traceability, there remain gaps in understanding its broader integration within the agricultural sector. A deeper analysis is needed to assess both the benefits and risks associated with AI-driven traceability solutions, as well as the necessary skills and infrastructure required for their effective implementation. Addressing these knowledge gaps is crucial for maximizing AI's potential while ensuring an inclusive and sustainable future for global agriculture.

The integration of AI in agriculture presents both opportunities and challenges that require a balanced approach. While its adoption continues to grow, addressing technological, economic, and regulatory barriers remains essential. Future efforts should focus on sustainable implementation strategies, ensuring that AI-driven advancements benefit all stakeholders in the agricultural value chain.

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УДК 811.111

BROWN TECHNOLOGY (КОРИЧНЕВА БІОТЕХНОЛОГІЯ)

Шешунова А. В. – здобувачка вищої освіти групи БТ 3/1

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Дана робота містить огляд однієї з важливих галузей біотехнологій, котра займається питаннями та проблемами пустельних та посушливих кліматичних зон. В тезах розглядаються напрямки коричневої біотехнології та її основні завдання.

Ключові слова: коричнева біотехнологія, посушливі зони, пустелі, ґрунти, ресурси, ремедіація, кліматично розумні ферми, інтегровані системи сільського господарства, інноваційні технології.

This paper provides an overview of an important field of biotechnology that addresses the issues and challenges of desert and arid climate zones. The thesis examines the main directions of brown biotechnology and its key tasks.

Keywords: brown biotechnology, arid zones, deserts, soils, resources, remediation, climate-smart farms, integrated agricultural systems, innovative technologies.

Climate change, global warming, the presence of many deserts and semi-deserts on our planet, arid and hot zones, regions with degraded soil, and landscape features make agriculture more difficult.

Considering these features, utilizing them, and influencing them through science, engineering, and technology is a relevant and promising task of brown biotechnology.

Brown biotechnology is a branch of biotechnology focused on the use of desert and arid ecosystems, agriculture in hot and dry conditions, and the restoration of resources in arid zones. It aims to optimize the use of natural resources in dry environments, conserve water, improve soil fertility, and develop sustainable agriculture.

Brown biotechnology is especially relevant for countries with hot climates, water shortages, and soil degradation problems, such as Australia, Mexico, Brazil, Israel, the UAE, Spain, African countries, and many others [1, 2].

This field focuses on developing technologies that help adapt crop production, water and land resources, and industry to extreme conditions. These include: developing drought-resistant genetically modified crops; using irrigation, hydroponics, and aeroponics technologies; cleaning soil and water from pollutants using microorganisms or special plants; preserving, restoring, and utilizing desert and arid-zone flora and fauna for agriculture and other industries; combating soil degradation and desertification; practicing climate-smart agriculture, considering climate change and regional conditions; developing various strategies and methods for farming in harsh environments; improving agriculture through modern technologies and equipment.

Not all agricultural plants can grow in hot conditions, so brown biotechnology focuses on developing drought-resistant plant varieties, including wheat. Drought-resistant crop varieties and other plants are created using genetic engineering.

A gene responsible for drought resistance is extracted from a naturally resistant plant and transferred into a cultivated plant. This method has led to the development of wheat varieties that can be grown in African, Latin American, and Asian countries, as well as in India and Australia [3].

This branch of biotechnology also works on methods for conserving and remediating natural resources such as water and soil. A major challenge in arid regions is the lack of water resources, which must be used efficiently and conserved, making adequate and optimal irrigation more difficult.

To address these problems, several methods are used: aeroponics and hydroponics; mulching; using hydrogel; planting different species together; collecting rainwater; special devices: drip irrigation, irrigation systems, and water dispersion systems.

For biological water purification, special treatment facilities and devices are used, such as aeration tanks, bioseptic systems, and biofilters. These systems use various microorganisms to clean water [4].

To break down organic soil pollutants, certain types of bacteria, fungi and worms are used. These organisms decompose organic matter into simple compounds that are harmless to the environment [5].

Brown biotechnology not only focuses on eliminating the challenges caused by arid climates but also on using these conditions beneficially in various aspects of human life. Arid regions are unique ecosystems home to many animals and plants that can be utilized in agriculture and biotechnology. For example, desert plant cultivation, breeding desert insects and animals, and their use in different industries and farming.

Brown biotechnology addresses the issue of desertification and develops solutions to combat this problem.

"Desertification" refers to the degradation of soil and vegetation cover. This phenomenon is caused by climate change and human activities.

To mitigate desertification, the following strategies have been proposed: greening affected areas; rational use of water resources; proper soil treatment; sustainable agriculture; farmer education; application of biotechnologies [6].

Agriculture and farming are particularly challenging in drought-prone and extreme climate conditions. One of the key tasks of brown biotechnology is to develop comprehensive strategies, methods, and systems to support farmers in sustaining and expanding their agricultural activities.

At present, several approaches have been designed to facilitate and optimize farming in adverse regions: climate-smart farms; integrated agricultural systems; implementation of innovative technologies.

Climate-smart farms are developed based on the climatic conditions of a specific region, considering future climate changes.

Their objectives include: providing access to climate information services and climate-smart agriculture; researching climate change and its impact on agriculture; supporting low- and middle-income countries (e.g., African nations and Mexico) to help combat hunger and poverty; enhancing the potential of small farms in arid regions; implementing modern technologies in agriculture [7].

One of the key areas of brown biotechnology is the integrated agricultural system. This approach involves multiple farming activities within a single area and the close coexistence of different plant and animal species. In such a system—resembling a mini-ecosystem—each component supports the others.

For example: animal waste serves as fertilizer and enriches the soil with nutrients; plant residues are used as fodder for livestock; plant roots and greenery prevent soil erosion and help retain moisture, reducing the need for irrigation; tall trees provide shade, cooling the environment and protecting crops and animals from excessive heat.

This practice helps to minimize the environmental impact of agriculture, reduce land depletion from monoculture farming, preserve ecosystems, and enhance soil productivity [8].

The modern technological approach can significantly ease farming in adverse climatic conditions. Farmers from arid and desert areas benefit from modern devices that track changes and

provide information on further actions. Moreover, the digital technological approach addresses the issue of labor shortages, as it does not require a large number of workers, but does demand significant investments.

In today's world, precision agriculture uses technologies such as the Internet of Things, neural networks, artificial intelligence, GPS technologies, robotics, drones, and sensors [9].

In conclusion, brown biotechnology plays an important role in addressing issues and problems in the fields of ecology and agriculture. This field of biotechnology includes the development of strategies and methods for resource conservation, combating soil degradation and water loss, utilizing arid zones for various industries, and adapting agriculture to adverse climatic conditions.

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THE IMPACT OF INNOVATIONS ON THE FINANCIAL EFFICIENCY OF THE ENTERPRISE (ВПЛИВ ІННОВАЦІЙ НА ФІНАНСОВУ ЕФЕКТИВНІСТЬ ПІДПРИЄМСТВА)

Янковська Ю.В. – здобувач вищої освіти групи МЕН 3/2

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Було обґрунтовано вплив інновацій на фінансову ефективність підприємства. Визначено роль інновацій у підвищенні конкурентоспроможності бізнесу та адаптації до ринкових змін. Проаналізовано основні напрями інноваційного розвитку підприємств та сформульовано перспективні підходи до впровадження інноваційних технологій.

Ключові слова: *інновації, фінансова ефективність, підприємство, конкурентоспроможність, технології, розвиток, бізнес-процеси.*

The impact of innovations on the financial efficiency of an enterprise was substantiated. The role of innovations in enhancing business competitiveness and adapting to market changes was determined. The main directions of innovative enterprise development were analyzed, and promising approaches to the implementation of innovative technologies were formulated.

Key words: *innovations, financial efficiency, enterprise, competitiveness, technologies, development, business processes.*

The activities of each enterprise are aimed at maximizing profits through the competent allocation of resources and available financial resources. Therefore, an enterprise must choose the most functional and optimal way of its further development and, as a result, bring itself to a high level of financial results. Based on the practice of many enterprises, it can be noted that one of the most effective ways to obtain a high level of financial results through its production activities is to use innovations.

This problem, namely the impact of innovations on the financial efficiency of the enterprise, was studied by O. Aslanian [1], O. Gridin, S. Zaika [2], A. Savchuk, T. Romanchenko, D. Fayvishenko [3] and others.

To substantiate the impact of innovations on the financial efficiency of an enterprise.

Innovation is the introduction of a new or significantly improved product (good or service) or process, a new marketing method or a new method of business organization. Innovation implies, first of all, an innovative approach, innovative processes and implementation of innovative activities. An enterprise's innovation activity is an activity that has its own specifics and complexity. The specificity of this activity is determined by the choice of the direction of development, the method of implementation and use of innovations.

Innovations play a key role in modern business, allowing enterprises to go beyond the established framework and create competitive advantages [2]. The importance of innovation is manifested in the following:

- it allows to adapt to changing conditions with minimal losses;
- it is one of the main conditions for survival in conditions of instability, competition, and a source of development;
- helps to maintain the efficiency of activities;
- helps to maintain financial results, ensuring their further improvement;
- improves the company's image and competitive status, etc.

Companies that follow the innovative path of development, actively introducing the latest technologies into production, gain significant competitive advantages. They are able to create higher quality goods and services, reduce production costs, shorten the production cycle, expand sales markets by selling unique products, attract the attention of consumers, etc. Innovative products meet the requirements of the modern market to the fullest extent possible.

Innovations help companies develop new products and services, improve existing business processes, increase efficiency and cut costs. Innovations help companies to adapt to rapidly changing market conditions, meet customer needs, attract new customers and strengthen their market position [1].

An important task for the innovative development of enterprises today is the introduction of new production and storage technologies that allow them to create high-quality and safe products. To attract foreign investment, it is important for enterprises to develop innovations that solve global economic, industrial and social problems [3].

Innovations play a key role in modern business, helping enterprises to be successful, competitive and sustainable in a rapidly changing market environment. Thus, innovation is the most important factor influencing the financial performance of an enterprise. Enterprises that actively implement innovations can gain a financial advantage in the market and ensure sustainable growth of their business. Therefore, it is important to create an innovative culture in the company, encourage employees to search for new ideas and be open to experiments. Ultimately, innovation in action helps companies improve financial efficiency and be successful in today's dynamic business environment.

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