



TIAME
NATIONAL RESEARCH UNIVERSITY

90

**INTERNATIONAL SCIENTIFIC CONFERENCE
DEDICATED TO THE 90TH ANNIVERSARY OF THE
“TIAME” NATIONAL RESEARCH UNIVERSITY**

on the topic:

**“DEVELOPMENT OF SPECIALIZED HIGHER
EDUCATION AND SCIENCE IN THE CONDITIONS
OF GLOBALIZATION: PROBLEMS AND
OPPORTUNITIES”**

CONFERENCE PROCEEDINGS

SECTION VII

**Tashkent, Uzbekistan
April 9–10, 2025**



**The conference dedicated to the 90th anniversary
of the “Tashkent Institute of Irrigation and
Agricultural Mechanization Engineers” National
Research University**

on the topic

**“Development of Specialized Higher Education and
Science in the Conditions of Globalization :
Problems and Opportunities”
International Scientific Conference**

CONFERENCE PROCEEDINGS

**"Tashkent Institute of Irrigation and Agricultural Mechanization Engineers"
National Research University**

SECTION VII

April 9–10, 2025, Tashkent, Uzbekistan

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**Hello dear guests, esteemed friends, colleagues, ladies and gentlemen,
Welcome to the 90th anniversary celebration of the "Tashkent Institute
of Irrigation and Agricultural Mechanization Engineers" National Research
University.**

I express my heartfelt gratitude to the ambassadors of foreign countries, rectors of companies and universities, heads and representatives of the ministries of the Republic of Uzbekistan, leaders of enterprises and organizations, and rectors of higher education institutions who have attended today's anniversary event. I convey my deep respect and best wishes to all of you.

By Order No. 5758 of the People's Commissariat of Agriculture dated November 11, 1934, the Tashkent Institute of Irrigation and Agricultural Mechanization Engineers was established. The foundation of TIAME laid a strong basis for training engineers in hydrotechnology and agricultural mechanics for the water management sector.

In the 1950s and 1960s, the university's faculty and students made significant contributions to the development of the Great Fergana Canal, Mirzachul, Central Fergana, Surkhan-Sherabad, Karshi deserts, and the lower reaches of the Amu Darya.

Simultaneously, in the 1960s, the university expanded its mission to train specialists for foreign countries. Nearly 5,000 students from 37 countries across Asia, Africa, and Latin America studied at the university.

Today, the university's primary mission is to train personnel at the level of world-class universities and to conduct cutting-edge research. A modern and comprehensive infrastructure has been developed on campus.

TIAME has initiated training programs in areas such as the development and digitalization of agriculture and water management, as well as in software engineering, artificial intelligence, mechatronics, robotics, remote sensing, and space technologies. As part of institutional transformation, "twinning" partnerships have been established between university departments and those of top global universities. These partnerships enable the development of new educational programs, improvement of existing ones, joint research projects, co-authorship of scientific publications, and robust international collaboration.

Notably, dual-degree educational programs are being implemented in collaboration with Wageningen University in the Netherlands (TOP 67) and Michigan State University in the USA (TOP 122).

Moreover, real-time educational sessions are being conducted as part of a "Joint Class" initiative integrating the educational systems of the USA and Uzbekistan, in collaboration with Colorado State University.

Over the past two years, 52 academic staff members have obtained PhD degrees, and 13 have defended their Doctor of Science (DSc) degrees, leading to an 18% increase in scientific capacity. The university's average scientific potential now stands at 71%.

To foster integration between science, education, and industry, 16 specialized classrooms have been established with the support of the Ministry of Water Resources, Uzbekhydroenergo, the State Scientific Design Institute "Uzdaverloyiha," UNESCO, the German international cooperation agency GIZ, German companies CLAAS and Lemken, Austria's Felder Group, Hungary's Obuda University, U.S. companies Case, New Holland, and John Deere, Russia's Rostselmash, LLC "PETRO TEST AVTO," Agrobank JSCB, People's Bank JSCB, Turonbank JSCB, and other foreign and local organizations. These classrooms are equipped with modern technical and laboratory equipment.

An "Employer Scholarship" program has been introduced for final-year students by partner organizations. Currently, more than 100 students benefit from this initiative.

The active participation of expatriate scientists working in Germany, Belgium, the USA, Latvia, Poland, the UAE, and China in the scientific laboratories of the Institute of

Fundamental and Applied Research under TIAME is significantly enhancing research effectiveness.

As you saw in the video, in 2024, researchers from the university and IFAR published scientific articles in journals indexed in the Scopus and Web of Science databases.

In the first quarter of 2025 alone, nearly 250 articles were published—84% of which appeared in Q1 and Q2 journals. This is a significant increase compared to 41% in 2024, demonstrating a remarkable rise in the quality of our research.

On campus, several major developments have taken place:

- **The IT Park was transformed into an Artificial Intelligence incubator;**
- **A Smart Library, a sports and wellness complex, two student dormitories, and two academic buildings were reconstructed;**
- **Three alternative heating boiler systems were installed;**
- **A remote student registration service office was launched.**

The number of educational, research, and international projects and grants has reached 29, with 8 added this year alone. Moreover, the volume of foreign investment has increased by 19%.

Currently, revenue from scientific research and international grants accounts for 36% of the university’s annual budget.

TIAME is now recognized in major global university rankings:

- **THE World University Rankings 2025:** ranked 601st globally, 2nd in Central Asia and the South Caucasus, and 1st in Uzbekistan.
- **QS World University Rankings 2025:** ranked 547th globally, 4th in Central Asia and the South Caucasus, and again 1st in Uzbekistan.
- **By the end of 2024, the university ranked among the top 20% of universities globally in terms of education, research, and international cooperation.**

Dear participants of the conference, we are honored to welcome you to this celebration, which is attended by ambassadors and consulate leaders from over 20 countries, including representatives of the European Union, France, Germany, Bangladesh, China, Hungary, Russia, Kazakhstan, Tajikistan, and Azerbaijan.

Nearly 100 international scholars from countries including the United States, Canada, the United Kingdom, the Netherlands, Turkey, Belarus, Singapore, Malaysia, South Korea, India, Iran, Kyrgyzstan, and others are also present. Among them are recipients of prestigious awards such as the **Nobel Prize, Zayed Award, and Mustafa Prize.**

This remarkable attendance is a sincere sign of respect and recognition for the “Tashkent Institute of Irrigation and Agricultural Mechanization Engineers” National Research University. On behalf of our entire university, I express my deepest gratitude to all participants.

Dear guests, in conclusion, I would once again like to sincerely congratulate you on this joyful occasion and, with your kind permission, officially declare the 90th anniversary celebration open.

I wish you all a pleasant and uplifting experience.

Thank you for your attention.

B.S. Mirzaev

*Rector of the “TIAME” National Research University,
Doctor of Technical Sciences, Professor*

SECTION VII

PROSPECTS FOR THE USE OF THE GREEN ECONOMY PLATFORM IN THE DEVELOPMENT AND MECHANIZATION OF AGRICULTURE, IRRIGATION, AND WATER MANAGEMENT SECTORS

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AGROKIMYOVIY XIZMATLAR KO'RSATISHDA MODDIY TEXNIKA TA'MINOTINI YAXSHILASH ISTIQBOLLARI

Tabayev Azamat Zaripbayevich, - *"Toshkent irrigasiya va qishloq xo'jaligini mexanizasiyalash muhandislari instituti" Milliy tadqiqot universiteti dosenti*

Annotasiya: Maqolada agrokimyoviy xizmat ko'rsatuvchi sub'ektlarning moddiy-texnika bazasining hozirgi holati, tarkibi va tuzilmasini optimallashtirish hamda moddiy-texnika bazasini yaxshilash bo'yicha takliflar berilgan.

Kalit so'zlar: agrokimyo xizmatlar, moddiy-texnika bazasi, optimallashtirish, samaradorlik, innovatsion texnologiyalar, lizing.

Аннотация: В статье рассмотрено сегодняшнее состояние материально технической базы субъектов агрохимических услуг, оптимизация структуре, а также даны предложения по улучшению материально-технической базы.

Ключевые слова: агрохимические услуги, материально-техническая база, оптимизация эффективность инновационные технологии, лизинг.

Abstract: The article examines the current state of the material and technical base of the subjects of agrochemical services, optimization of the structure, and also gives suggestions for improving the material and technical base.

Keywords: agrochemical services, material and technical base, optimization of efficiency, innovative technologies, leasing.

Kirish. O'zbekistonda barcha soha va tarmoqlarning ajralmas qismi bo'lgan qishloq xo'jaligi ham jadal rivojlanayotganligini ko'rish mumkin. Bunda, qishloq xo'jaligi mahsulotlarini qayta ishlash va ularning eksport hajmining ortishi, davlat buyurtmasining bekor qilinishi erkin bozor elementlarining kirib kelishi, sohada izchil amalga oshirilayotgan keng ko'lamli islohotlarning negizi bo'lmoqda. Shu bilan birga qishloq xo'jaligi ishlab chiqaruvchilarga davlat tomonidan qo'llab-quvvatlanayotganligi o'z samarasini ko'rsatmoqda.

O'zbekiston Respublikasi Prezidentining 2019-yil 23-oktabrdagi PF-5853-son Farmoni bilan tasdiqlangan "O'zbekiston Respublikasi qishloq xo'jaligini rivojlantirishning 2020-2030-yillarga mo'ljallangan Strategiyasi"da qishloq xo'jaligiga mo'ljallangan 20,2 mln gektar yerlarning 20,7 foizi sug'oriladigan yerlar bo'lib, oxirgi 15 yil mobaynida aholi jon boshiga to'g'ri keladigan sug'oriladigan yerlar hajmi 24 foizga kamayganligi e'tirof etilgan. Bunga esa aholi sonining o'sib borishi, sug'orish suvi hajmining qisqarishi va qishloq xo'jaligiga mo'ljallangan yerlarning boshqa toifalariga o'tishi sabab bo'lgan. Tadqiqotlar natijasida olingan prognoz ma'lumotlariga ko'ra, kelgusi 30 yil mobaynida sug'oriladigan yer maydonlari yana 20 - 25 foizgacha qisqarishi kutilmoqda. Bu muammo sug'oriladigan yerlardan yanada ilmiy asoslangan tarzda samarali foydalanishni talab qiladi. [1]

Bu maqsadga erishishda qishloq xo'jaligi ekinlaridan yuqori va sifatli hosil olishda agrokimyoviy xizmatlar, jumladan, qishloq xo'jaligi ekinlarini o'g'itlash va o'simliklarni himoy qilishning o'zni juda yuqori. Agrokimyo xizmati to'g'ri tashkil

etilsa, mineral o‘g‘itlar va kimyoviy vositalarni tavsiyanomalar asosida qo‘llash natijasida etishtiriladigan hosilning 50 foizi o‘g‘itlar hisobiga shakllanishi va tuproq unumdorligi ortishi ilmiy-tadqiqot ishlari natijalari hamda ishlab chiqarishda o‘z isbotini topgan. Qishloq xo‘jaligida agrokimyoviy xizmatlar ko‘rsatishda moddiy-texnik ta‘minotning yaxshilanishi, mexanizatsiyalash darajasining ortishi muhim ahamiyatga ega. “Agar texnikalar yetarli miqdorda bo‘lmasa, demak, qishloq xo‘jaligi ishlarini o‘z agrotexnik muddatlarida bajarish mumkin emas.” [4]

Tadqiqot metodlari. Tadqiqot olib borish natijasida olingan ma'lumotlarga ishlov berish mantiqiy mushohada, adabiyotlarni tanqidiy o‘rganish, analiz va sintez, induktsiya va deduktsiya, taqqoslash, modellash, iqtisodiy tahlil usullaridan foydalanildi.

Tadqiqot mavzusining dolzarbligi. Qishloq xo‘jaligida agrokimyoviy xizmatlar ko‘rsatishni tashkil etishda xizmat ko‘rsatuvchi korxonalarga tegishli moddiy texnika bazasini tarkibi va tuzilmasining maqbul darajasini ta‘minlash muhim ahamiyatga ega. Ayniqsa, agrar sohaga yangi texnika va texnologiyalarining kirib kelayotganli qishloq xo‘jaligi texnikalarining moddiy hamda ma'naviy jihatdan eskirishini jaddalashtirdi. Olib borilgan tadqiqotlar natijasida agrokimyoviy xizmatlar ko‘rsatish uchun zarur bo‘lgan texnikalardan samarali foydalanishning muhim jihatlari quyidagilaridan iborat:

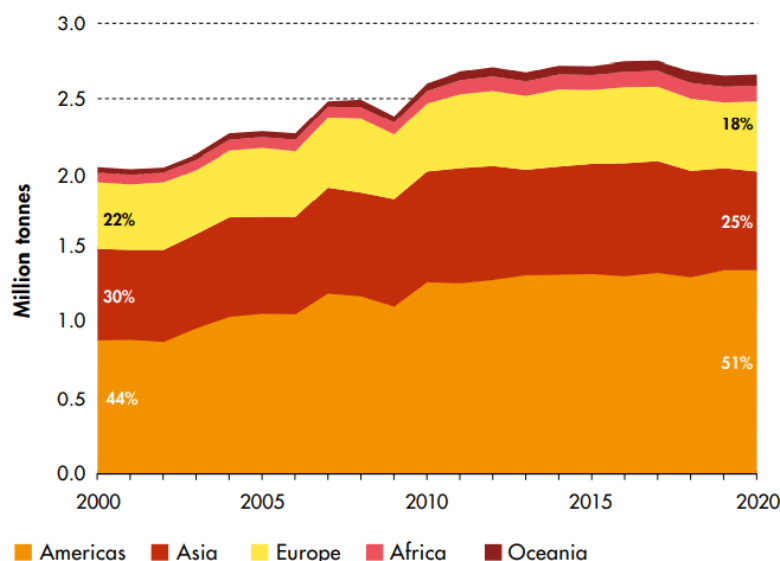
Agrokimyoviy xizmatlar uchun zarur texnikalarning olib boriladigan agrotexnik tadbirlarining turlari hamda davomiyligiga bog‘liq;

Agrokimyoviy xizmatlar uchun zarur texnikalarning samaradorligi injener-mexaniklarning malakasiga bog‘liq ekanligi;

Agrokimyoviy xizmatlar uchun zarur texnikalarning tabiiy-iqlim sharoitlarga va ekin maydonlari o‘lchamlariga bog‘liqligi;

Agrokimyoviy xizmatlar texnik salohiyati va uning samardorligi texnologik xaritalarda belilangangan agrotexnik tadbirlarni o‘z vaqtida o‘tkazilishi, texnik va texnologik intizomga rioya etishga bevosita bog‘liqligi va boshqalar.

FAO tashkilotining ma‘lumotiga ko‘ra dunyo bo‘yicha 2000–2020 yillarda pestisidlardan foydalanish 30 foizga oshdi, 2020 yilda 2,7 million tonnani tashkil etdi (1-rasm).



1-rasm. Dunyo bo‘yicha pestisidlardan foydalanish holati.

Rasmdan ko‘rinib turibdiki, 2000 va 2012 yillarda pestisidlardan foydalanish darajasi o‘sgan, 2017 yildan boshlab pasayish tendensiyasi kuzatilgan. Dunyo bo‘yicha pestisidlardan foydalanishning asosiy ulushi Amerika qit‘asiga, qolgan qismi Osiyo, Evropa, Afrika va Okeaniya hissasiga to‘g‘ri keladi. Amerika qit‘asida pestisidlarni istemol qilishdagi ulushi 44,0 foizdan 51,0 foizgacha oshgan bo‘lsa, Osiyo va Evropada 4,0 foizga kamaygan.

2010-2020 yillarda Osiyo ekin maydonlariga pestisidlar oshmagan (1-jadval).

1-jadval

O‘rtacha 1 ga ekin maydoniga ishlatilgan pestisidlar hajmi, (kg/ga). [5]

Hududlar	2000 yil	2005 yil	2010 yil	2018 yil	2019 yil	2020 yil	2020 yilda 2000 yilga nisbatan, foizda
Jahon bo‘yicha	1,45	1,60	1,81	1,82	1,81	1,81	124,8
Afrika	0,36	0,38	0,42	0,50	0,50	0,49	136,1
Amerika	2,44	2,92	3,52	3,59	3,73	3,74	153,3
Osiyo	1,11	1,16	1,33	1,24	1,19	1,15	103,6
Evropa	1,48	1,57	1,57	1,68	1,53	1,64	110,8
Okeaniya	1,42	1,38	1,74	2,12	2,14	2,13	150,0
O‘zbekiston	2,51	2,75	2,64	3,14	3,48	3,53	140,6
Germaniya	2,93	3,01	3,39	3,77	3,80	4,05	138,2
Isroil	8,16	15,45	18,21	15,15	14,60	14,51	177,8
Turkiya	1,27	1,52	1,58	2,59	2,22	2,32	182,7
Qozog‘iston	0,10	0,13	0,22	0,44	0,44	0,49	4,9 marta
Qirg‘iziston	0,48	0,80	0,26	0,45	0,50	0,51	106,3
Tojikiston	0,60	0,27	0,30	0,26	0,25	0,25	41,7
Turkmaniston	4,86	4,62	4,86	4,86	4,86	4,86	100,0
Rossiya Federasiyasi	0,24	0,30	0,36	0,60	0,63	0,73	3 marta

Jadvaldan ko‘rinib turibdiki dunyo bo‘yicha o‘rtacha 1 ga ekin maydoniga 1,81 kg/ga pestisid ishlatilgan. 2020 yilda mamlakatimizda o‘rtacha 1 ga ekin maydoniga 3,53 kg pestisid ishlatilgan. Dermak, 2000 yilga nisbatan 40,6 oshganligi agrokimyoviy xizmatlar hajmini ortganligini anglatadi. Boshqa agrokimyoviy xizmatlar hajmidan kelib chiqqan holda texnikalarning turi va soni aniqlanadi.

Texnikaga va ayniqsa uning tarkibi bo‘lgan talabning umumiy hajmini aniqroq bilish uchun matematik modellardan keng foydalaniladi. Buni aniqlashda qishloq xo‘jaligi korxonlariga agrokimyo xizmatini ko‘rsatuvchi korxonalarining hamda qishloq xo‘jaligi korxonalari va xususiy avtotransport egalariga tegishli transport vositalarini o‘rganib chiqish lozim. Bunday sharoitda ixtisoslashgan agrokimyoviy xizmati ko‘rsatish korxonalarining moddiy texnika bazasini takomillashtirish va moddiy texnika bazani to‘ldirish muhim bo‘lib, oxirgi yillarda ularning iqtisodiy samaradorligini pasaygan. Biz agrokimyo xizmati korxonalari tomonidan ko‘rastiladigan xizmatlarining turlarining ko‘pligini hisobga olib, asosiy agroximiya xizmati turi hisoblangan mineral o‘g‘itlarni yetkazib berish xizmatini amalga oshirish bo‘yicha moddiy texnika bazasini alohida o‘rganib chiqamiz.

Bunday sharoitda, ikkita qarama-qarshi bo'lgan vazifaga duch kelamiz: birinchidan, agrokimyo xizmati ko'rsatish korxonalarining o'z vaqtida xizmat ko'rsatish uchun moddiy texnika bazasi optimal miqdorda komplektlashtirish, ikkinchi tomonidan esa, buning uchun sarflanadigan xarajatlarni minimallashtirish muhim ahamiyatga ega.

Bunday sharoitda qishloq xo'jaligi korxonalariga agrokimyo xizmati ko'rsatishni yaxshilash uchun zarur bo'ladigan optimal hajmdagi moddiy texnika bazasini shakllantirishning yagona yo'l bu agrokimyo xizmati korxonasining moddiy texnika bazasini bosqichma-bosqich to'ldirish yoki modernizasiya qilib borishdan iborat. Yuqordagilarni aniqlash uchun agrokimyo xizmati ko'rsatish korxonalarining moddiy texnika bazasini tarkibini optimal hajmimni aniqlash uchun quyidagi metoddan foydalanamiz.

Agrokimyo xizmati ko'rsatish korxonalarining moddiy texnika bazasini komplektlashtirish uchun stoxastik model shaklining standart to'g'ri chiziqli modelidan foydalanamiz. Aniqlanayotgan stoxastik modelda optimallashtirishning asosiy talabi bu sarflanadigan xarajatlarni minimallashtirishdan iboratdir. Sarflanadigan xarajat o'zida agrokimyo korxonasining moddiy texnika bazasini saqlash va ekspluatasiya qilish bo'yicha joriy xarajati va samaradorlikning me'yoriy koeffisientiga ko'paytirilgan balans qiymatini aks ettiradi. Samaradorlikning me'yoriy koeffisienti ko'rsatkich va teskarisi esa qoplash muddatining me'yorini bildiradi. Bunday katta funksiyani amalga oshirishdan maqsad agrokimyo xizmati korxonalarining moddiy texnika bazasidan samarali foydalanishdan iboratdir.

Indekslar va modellar to'plami

k, K - agregat turlarining soni va miqdori;

i, I - bajarilayotgan ishlar cheklovining soni va miqdori;

t, T - bajariladigan ishga hisoblangan vaqt soni va miqdori;

j - traktor va qishloq xo'jalik mashinalarining markalari raqami;

I_i - sotib olinadigan traktor va qishloq xo'jalik mashinalarining soni;

Modellar o'zgaruvchan kattaliklari

$X_{kit} - t$ - vaqt birligida i - ishni bajarish uchun kerak bo'lgan k - agregat miqdorini ko'rsatuvchi o'zgaruvchi;

X_j - sotib olingan traktor va qishloq xo'jalik mashinalarining kerakli sonini bildiruvchi o'zgaruvchi;

Texnik – iqtisodiy koeffisientlar va cheklovlarning erkin miqdori

$V_{kit} - t$ - vaqt birligida i - ishni bajaradigan k - agregatning unumdorligini bildiruvchi texnik – iqtisodiy koeffisient;

$bit - t$ - vaqt birligida i - ishni bajarish uchun o'zgarmas miqdor;

$\lambda_{j \text{ kit} - t}$ - vaqt birligida i - ishni bajaradigan, k - agregat, j - markali traktor va mashinalarning texnik – iqtisodiy koeffisienti;

$C_{kit} - t$ - vaqt birligida i - ishni bajaradigan, k - agregatni ishlatish bo'yicha amalga oshirilgan joriy ekspluatason xarajatlarni aks ettiruvchi koeffisient;

E - kapital qo'yilmalarni samaradorligining me'yoriy koeffisienti (0,15);

C_j - sotib olingan j - markali traktor (mashina)ning balans qiymatini aks ettiruvchi maqsadli funksiya koeffisienti;

Δ_j - j - markali traktor (mashina)larni saqlash va ishlatish xarajatlari;
Modelni maqsadli funksiyasining matematik yozuvi quyidagi ko'rinishiga ega:

$$F(x) = \sum_{k \in K} \sum_{i \in I} \sum_{t \in T} C_{kit} X_{kit} + E \sum_{j \in J} (C_j + \Delta_j) X_j \rightarrow \min \quad (1)$$

Quyidagi shartlar saqlanishi lozim:

1. Barcha turdagi agroximiya xizmatlari bajarilishi lozim

$$\sum_{k \in K} V_{kit} X_{rit} = Bit, \quad (i \in I; t \in T); \quad (2)$$

2. Traktor va qishloq xo'jaligi mashinalarini ishlatish

$$\sum_{k \in K} \sum_{i \in I} \lambda_{jkit} X_{kit} - X_j \leq 0, \quad (j \in J; t \in T); \quad (3)$$

3. O'zgaruvchan kattaliklarning manfiy bo'lmasligi

$$X_{kit} \geq 0, \quad X_j \geq 0, \quad (k \in K; i \in I; j \in J; t \in T) \quad (4)$$

Model uchun zarur ma'lumotlar tanlab olinadi va dasturlari orqali xisoblanadi. Mazkur modelni qishloq xo'jaligi mahsulotini ishlab chiqarish texnologik jarayonida amalga oshiradigan agrotexnik tadbirlardagi agrokimyo xizmatlariga nisbatan qo'llagan holda hisob-kitob qilish va uni agrokimyo korxonalarining moddiy texnika bazasini shakllantirishda e'tiborga olish lozim.

Yuqorida tasdiqlangan metodologiyaga muvofiq, agrokimyo xizmati korxonasining moddiy-texnika bazasini to'ldirish vazifasi tuzildi va hal qilindi. Bunda agrokimyoviy ishlarni rejalashtirishning butun davri bo'yicha ish hajmiga, ularni bajarish muddati va davomiyligiga qarab jadval tuzildi. Agrotexnik tadbirlarning vaqti gorizont ravishda, vertikal ravishda - texnologik operatsiyalarning nomi qayd etiladi. Shu bilan biga texnikalar va uskunalarining markalar bo'yicha mavjudligi va uning qiymati to'g'risidagi ma'lumotlar o'rganiladi. Keyinchalik, agrokimyoviy ishlarning barcha turlari uchun unumdorlikning texnik va iqtisodiy koeffitsientlarini hisoblash kerak.

Shuningdek, texnika va jihozlardan foydalanish xarajatlari hisoblanadi. Bu xarajatlar operasion xarajatlar bo'lib, unga ish haqi, yoqilg'i xarajatlari, ta'mirlash va texnik xizmat ko'rsatish xarajatlari, amortizasiya to'lovlari kiradi hamda belgilangan vazifalarni amalga oshirish uchun minimal xarajatlar miqdori aniqlanadi. Buning uchun etmagan qishloq xo'jaligi texnikasi yoki uskunasi sotib olinishi kerak. Sotib olish bilan birga kredit, ijara va lizing bo'yicha olish variantlari o'zaro taqqoslab o'rganilishi maqsadga muvofiqdir. Qaysi bir shakl iqtisodiy jihatdan samarali bo'lsa shuni qo'llash tavsiya qilinadi.

Tadqiqot natijasida kutilayotgan samaradorlik matematik model bo'yicha hisob-kitob qilib bo'linganidan keyin aniqlanadi. Agrokimyo xizmatlarida samara hosildorlikning ortishi, daromadning ortishi, mehnat unumdorligining ortishi yoki xarajatlarning kamayishi bilan belgilanadi.

Mazkur sohada tadqiqotlar olib borgan O'.Umurzakov va A.Toshboevlar tomonidan moddiy-texnika resurslaridan foydalanish samaradorligi 1 et. gektar, 1 tonna km, 1 kVt soatga nisbatan mexanizasiyalashgan ishlar uchun jami xarajat miqdorini bajarilgan ishlarning hajmiga nisbatan aniqlash tartibi ko'rsatib o'tilgan.[2]

Shuningdek, yangi texnika va texnologiyalardan foydalanishning ijtimoiy-iqtisodiy samaradorligini aniqlashda mazkur yangi texnikani qo'llash natijasida olingan samarani mahsulot hajmiga nisbatan aniqlash tartibi ko'rsatib o'tilgan. [3]

Agrokimyo xizmatlari korxonalarining moddiy-texnika bazasini modernizatsiya qilish va ulardan samarali foydalanish maqsadida quyidagilarni amalga oshirishi maqsadga muvofiqdir:

- qishloq xo'jaligi korxonalariga agrokimyo xizmati ko'rsatishdagi texnikalarning samaradorligini oshirish maqsadida tizimda raqamli iqtisodiyot joriy qilish;

- moddiy texnika bazasini mustahkamlash uchun zamonaviy texnikalarni sotib olish uchun imtiyozli kreditlash tizimini joriy etish;

- agrokimyo xizmatlari ko'rsatishda smart (“aqlli”) texnikalar va dronlardan xarid qilish va ulardan foydalanish xarajatlarini bir qismiini davlat subsidiyalari orqali moliyalashtirish;

- qishloq xo'jaligi korxonalari va ishlab chiqarish infratuzilmalariga lizing xizmatlarini ko'rsatishga jalb etiladigan investisiyalar miqdorini oshirishni rag'batlantirish;

- moddiy texnika bazasini mustahkamlash va modernizatsiya qilishda investorlarni kengroq jalb qilish;

- qishloq xo'jaligida yangi texnika va texnologiyalardan foydalanishni o'rgatish bo'yicha o'quv kurslari va ixtisoslashgan o'quv muassasalarini ko'paytirish va ularning o'quv laboratoriya bazasini mustahkamlash.

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BIBLIOMETRIC ANALYSIS ON CANAL ENGINEERING (2000–2024)

Mamajonov Muminmirzo — Master's student in "Hydraulics" at "TIAME" NRU

Abstract: Hydraulic efficiency in irrigation canals is a critical aspect of water management. Traditional concrete linings have been widely used; however, alternative materials such as natural stone and geosynthetics have emerged as potential solutions. This study conducts a bibliometric analysis of 54 scientific articles to evaluate research trends in this field. The analysis identifies the most prolific authors, frequently cited journals, key research papers, and dominant keywords. The findings indicate that fiber-reinforced concrete, geosynthetic linings, and numerical simulations are the most researched topics. However, gaps remain in assessing long-term durability, economic feasibility, and AI-based monitoring for these alternative materials. Future studies should focus on these aspects to enhance sustainable canal infrastructure.

Keywords: Canal, Lining Material, Water, Hydraulic Efficiency, Geosynthetics, Seepage Control, drainage layer, shallow depth, design, irrigation canals, hydrated cement systems, damage, model

Аннотация. Гидравлическая эффективность в оросительных каналах является критически важным аспектом управления водными ресурсами. Традиционные бетонные покрытия широко используются, однако альтернативные материалы, такие как натуральный камень и геосинтетика, стали перспективными решениями. В данном исследовании проводится библиометрический анализ 54 научных статей для оценки тенденций исследований в этой области. Анализ выявляет наиболее продуктивных авторов, часто цитируемые журналы, ключевые научные работы и доминирующие ключевые слова. Результаты показывают, что наиболее изучаемыми темами являются фибробетон, геосинтетические покрытия и численное моделирование. Однако остаются пробелы в оценке долговечности, экономической целесообразности и мониторинга на основе ИИ для этих альтернативных материалов. Будущие исследования должны сосредоточиться на этих аспектах для улучшения устойчивой инфраструктуры каналов.

Annotatsiya: Sug'orish kanallarining gidravlik samaradorligi suv resurslarini boshqarishda muhim ahamiyat kasb etadi. An'anaviy beton qoplamalar keng qo'llanilgan bo'lsa-da, tabiiy tosh va geosintetik materiallar kabi muqobil variantlar istiqbolli yechim sifatida yuzaga chiqmoqda. Ushbu tadqiqot ushbu sohadagi ilmiy izlanishlar tendensiyalarini baholash uchun 54 ta ilmiy maqolaga bibliometrik tahlil o'tkazadi. Tahlil natijasida eng samarali mualliflar, ko'p iqtibos keltirilgan jurnallar, asosiy tadqiqot maqolalari va ustuvor kalit so'zlar aniqlanadi. Natijalar shuni ko'rsatadiki, tolalar bilan mustahkamlangan beton, geosintetik qoplamalar va raqamli modellashtirish eng ko'p o'rganilgan mavzulardir. Biroq, ushbu muqobil materiallarning uzoq muddatli mustahkamligi, iqtisodiy samaradorligi va sun'iy intellekt asosida monitoring qilish borasida hali

ham kamchiliklar mavjud. Kelgusidagi tadqiqotlar ushbu jihatlariga e'tibor qaratib, barqaror kanal infratuzilmasini rivojlantirishga hissa qo'shishi lozim.

Kalit so'zlar: Kanal, qoplama material, suv, gidravlik samaradorlik, geosintetik materiallar, filtratsiyani nazorat qilish, drenaj qatlami, sayoz chuqurlik, loyihalash, sug'orish kanallari, gidratlangan sement tizimlari, shikastlanishlar, model.

Introduction. Efficient water management is essential for agriculture, and irrigation canals play a key role in ensuring water reaches farmlands. However, seepage losses, erosion, and structural degradation reduce canal efficiency, leading to significant water wastage. Traditionally, concrete linings have been used to mitigate these problems, but natural stone and geosynthetic materials are being explored as alternative solutions due to their cost-effectiveness and durability.[3]

Research in this field has primarily focused on seepage reduction, structural durability, and cost-effectiveness of various lining materials. Recent advancements in numerical simulations, GIS-based analysis, and remote sensing technologies have provided more accurate ways to assess canal efficiency. [6]

Despite these developments, long-term performance evaluations and economic feasibility studies of alternative materials remain limited.

This study conducts a bibliometric analysis of 54 scientific articles to examine research trends in hydraulic efficiency improvements for canal linings. The main objectives are:

1. Analyzing the publication trends in alternative canal linings.
2. Identifying key contributors, journals, and institutions in the field.
3. Evaluating citation impacts, research gaps, and future directions for improving canal infrastructure.

Methods and materials. This study is based on a bibliometric analysis of scientific publications related to canal linings and alternative materials. The methodology consists of the following steps:

Data Collection: Scientific articles were gathered from reputable database, Scopus. **Selection Criteria:** Publications were selected based on their relevance to hydraulic efficiency, seepage control, and alternative lining materials.

Data Analysis: The collected data were examined to determine research trends, the most influential authors, and the most frequently cited papers.

Visualization and Interpretation: Trends in publication years, research focus areas, and keyword distribution were analyzed to provide insights into the field's development.

Results and discussion. The bibliometric analysis of 54 selected articles from 118 on canal lining efficiency shows a clear increase in research activity from 2000 to 2024. The number of studies fluctuates over the years, reflecting growing interest in alternative canal lining materials and hydraulic performance improvements.

Trends in Publications. From 2000 to 2010, research on canal lining efficiency was minimal, with only a few publications. However, after 2011, the number of studies began to rise, indicating an increased focus on water conservation and seepage reduction. The peak publication years were 2021, 2023, and 2024, with 6 articles each year, suggesting strong research momentum in recent years (Figure 1).

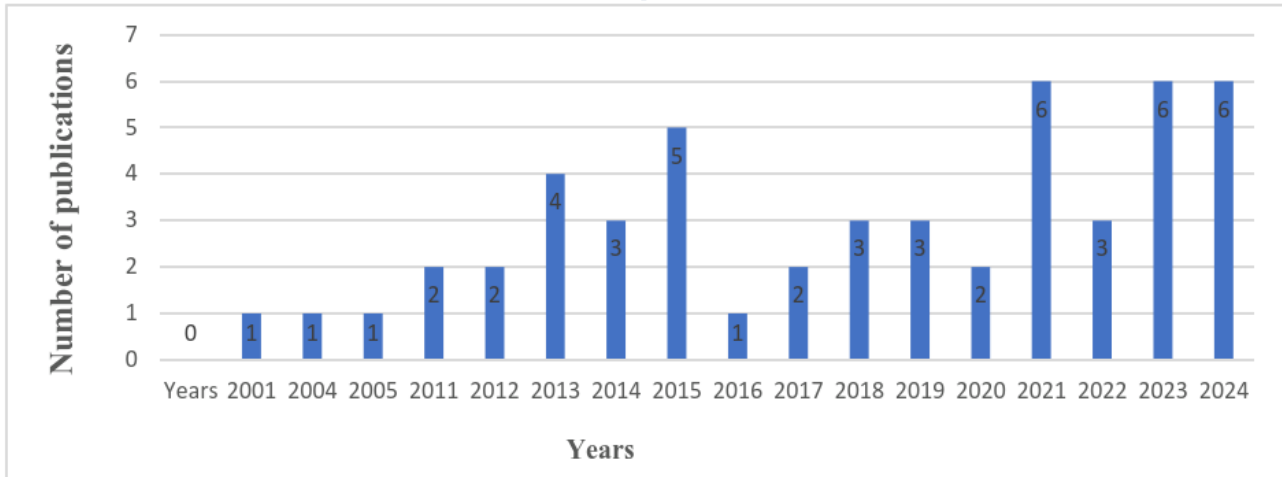


Figure 1 Number of the publications with the Canal Lining Research theme arranged by the year. (2000-2024)

Research Funding Impact. The data suggests a correlation between research funding and the number of publications. While early studies (2000–2010) had limited funding, after 2012, the number of funded research projects increased. Notably, in 2023 and 2024, most publications received research support, indicating an emphasis on government and institutional investment in water management studies. (Figure 2).

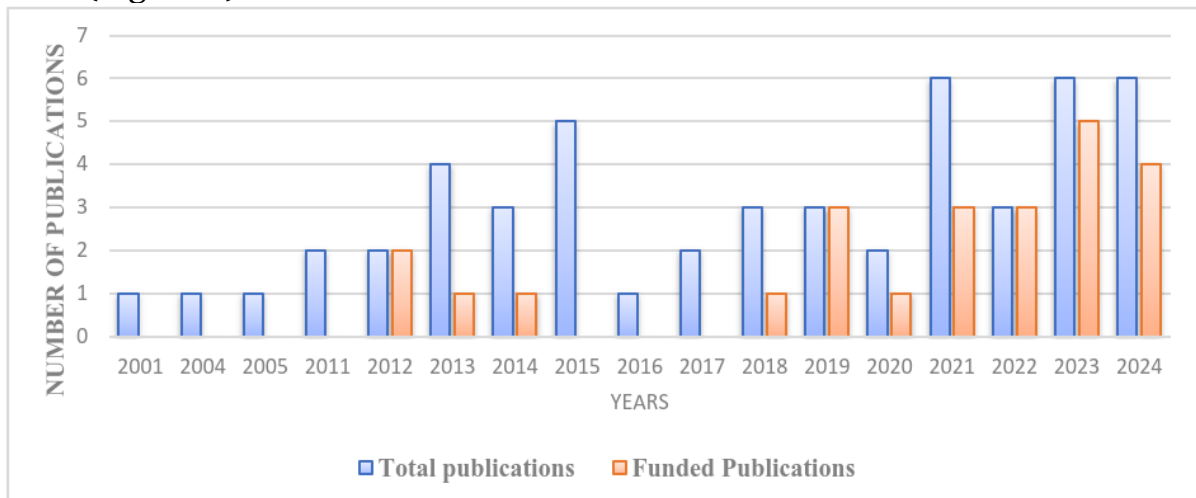


Figure 2 The research funding and number of the canal lining efficiency publications.(2000-2024)

Key Research Areas. The bibliometric analysis of 54 selected articles highlights several key research areas in canal lining efficiency. The most frequently studied topics focus on seepage control, hydraulic performance, and advanced monitoring techniques (Table 1).

Table 1

Research Area	Number of Publications
Seepage Reduction (Geosynthetics & Concrete)	4
Hydraulic Performance Assessment	4
Numerical Modeling & AI-Based Monitoring	3
Canal Lining Materials	4
Water Loss Prevention	3

Leading Authors in Canal Lining Research. The bibliometric analysis highlights key researchers contributing to canal lining efficiency studies from 2000 to 2024. Among them, Swamee, PK and Chahar, BR stand out as leading authors, focusing on seepage reduction and canal design optimization.[7] (Figure 3).



Figure 3. Top Authors Publishing on Canal Lining Research (2000–2024).

Other notable contributors, such as Han,XD; Wang, XG; Zhu,Y, have explored numerical modeling and material performance evaluations, which help improve canal durability. Additionally, Brackett, MG; Lewis, JB have studied the chemical and structural properties of alternative lining materials, emphasizing their role in seepage prevention.[3]

Researchers like Rucker, DF, Noonan, GE have advanced AI-based monitoring and remote sensing technologies for canal efficiency assessment. Their work contributes to modernizing seepage detection and maintenance strategies.

The growing collaboration among researchers indicates a shift from traditional concrete linings toward geosynthetics,fiber-reinforced materials,and smart monitoring solutions.

ChatGPT Based Analysis of Article Abstract

This bibliometric analysis examined 54 research publications on canal lining efficiency, focusing on seepage reduction, material performance, and economic feasibility. The findings indicate several key trends:

- 89% of the analyzed publications (47 articles) were journal papers, highlighting the dominance of peer-reviewed research in this field.

- The most active researchers, Swamee, P.K., and Chahar, B.R., contributed two highly cited papers on seepage loss reduction and canal design optimization.
- Material efficiency studies dominate the research:
 - o Concrete linings were discussed in 62% of publications, emphasizing their durability but also noting their high construction costs.
 - o Geosynthetics and fiber-reinforced concrete were studied in 37% of papers, showing promising results for cost reduction and seepage control.
 - o Numerical modeling approaches appeared in 28% of studies, demonstrating the increasing role of computational tools in optimizing canal designs.
- Institutional contributions show that Wuhan University is the most active research center, producing 9.5% of total publications on canal lining efficiency. Other notable contributors include IIT Roorkee and Cairo University.

Conclusions

The results indicate that research on canal lining efficiency has grown significantly in recent years, with a notable increase in publications after 2010. This trend suggests a rising awareness of the importance of seepage reduction, alternative lining materials, and improved hydraulic performance in irrigation canals. Researchers have explored various solutions, including geosynthetic linings, fiber-reinforced concrete, and numerical modeling techniques, to enhance water conservation and system durability. Despite these advancements, several challenges remain. Long-term durability studies on alternative lining materials, especially geosynthetics, are still limited. Additionally, economic feasibility analyses comparing traditional concrete with modern materials have not been widely conducted. Another critical gap is the lack of real-time seepage monitoring systems that utilize remote sensing and AI-driven technologies.

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BO'LAJAK XORIJIY TIL O'QITUVCHISINING KASBIY-IJODIY FAOLLIGI VA UNING AHAMIYATI

B.A. Bobojonov - „TIQXMMI“ MTU, Ta'lim va tarbiya nazariyasi va metodikasi ixtisosligi tayanch doktoranti

Annotatsiya: Mazkur maqolada bo'lajak xorijiy til o'qituvchisining kasbiy-ijodiy faolligi, uning ta'lim jarayonidagi roli va ta'siri ilmiy asosda tahlil qilinadi. O'qituvchining kasbiy-ijodiy faolligini rivojlantirish omillari, zamonaviy pedagogik texnologiyalar va innovatsion yondashuvlar orqali ta'lim sifatini oshirish yo'llari ko'rib chiqiladi. Shuningdek, kasbiy-ijodiy faollikning talabalar motivatsiyasiga ta'siri ham yoritiladi.

Kalit so'zlar: xorijiy til o'qituvchisi, kasbiy-ijodiy faollik, pedagogik innovatsiyalar, ilmiy-tadqiqot, ta'lim sifati, interfaol metodlar

Аннотация: В статье научно анализируется профессионально-творческая активность будущего учителя иностранного языка, а также их роль и влияние на образовательный процесс. Рассматриваются факторы, способствующие развитию профессионально-творческой активности, пути повышения качества образования за счет современных педагогических технологий и инновационных подходов. Кроме того, освещается влияние профессионально-творческой активности на мотивацию студентов.

Ключевые слова: учитель иностранного языка, профессионально-творческая активность, педагогические инновации, научные исследования, качество образования, интерактивные методы

Abstract: This article scientifically analyzes the professional and creative activity of a future foreign language teacher, as well as their role and impact on the educational process. The factors contributing to the development of professional and creative activity, ways to improve the quality of education through modern pedagogical technologies and innovative approaches are examined. Additionally, the influence of professional and creative activity on students' motivation is also highlighted.

Keywords: foreign language teacher, professional and creative activity, pedagogical innovations, scientific research, quality of education, interactive methods

Kirish. O'zbekistonda o'quvchilarning kasbiy-ijodiy qobiliyatlarini rivojlantirish, ularning yangi bilimlarni mustaqil izlashiga asosiy e'tibor qaratilgan. O'zbekiston Respublikasi oliy ta'lim tizimining 2030-yilgacha rivojlantirish Konsepsiyasining "Oliy ta'lim tizimini rivojlantirishning strategik maqsadlari va ustuvor yo'nalishlari" deb nomlangan 3-bobining "Oliy ta'lim bilan qamrovni kengaytirish, oliy ma'lumotli mutaxassislar tayyorlash sifatini oshirish" deb nomlangan 1-§ da Mustaqil ta'lim soatlari ulushini oshirish, talabalarda mustaqil ta'lim olish, tanqidiy va ijodiy fikrlash, tizimli tahlil qilish, tadbirkorlik

ko'nikmalarini shakllantirish, o'quv jarayonida tayanch kompetensiyalarni kuchaytirishga qaratilgan metodika va texnologiyalarni joriy etish, o'quv jarayonini amaliy ko'nikmalarni shakllantirishga yo'naltirish, bu borada o'quv jarayoniga xalqaro ta'lim standartlariga asoslangan ilg'or pedagogik texnologiyalar, o'quv dasturlari va o'quv uslubiy materiallarni keng joriy etish to'g'risida alohida ko'rsatib o'tilgan.

Oliy ta'lim tizimi kelajak avlodning malakali va ijodkor kadrlar bo'lib yetishishida muhim o'rin tutadi. Xususan, xorijiy til o'qituvchilari nafaqat til bilimi, balki pedagogik mahorat va ijodiy faoliyat orqali talabalarni zamonaviy bilim va ko'nikmalar bilan ta'minlashi zarur. Mazkur maqolada bo'lajak xorijiy til o'qituvchisining kasbiy-ijodiy faolligi, uning ta'lim sifati hamda o'quv jarayoniga ta'siri yoritiladi.

Metodologiya. Kasbiy-ijodiy faollik tushunchasi bu - pedagogik faoliyatning samaradorligini oshirishga xizmat qiluvchi omillardan biri bo'lib, o'qituvchining nafaqat an'anaviy bilim va malakalarni egallashi, balki innovatsion yondashuvlarni qo'llay olishini ham anglatadi. O'qituvchi ijodiy fikrlashga ega bo'lsa, u dars jarayonini yanada samarali va qiziqarli tashkil etadi, talabalar bilan interfaol muloqot o'rnatadi va ularning mustaqil fikrlashini rivojlantiradi.

Bo'lajak xorijiy til o'qituvchilarining kasbiy-ijodiy faolligini rivojlantirishda bir qator innovatsion metodlar va texnologiyalar qo'llaniladi. Ba'zi asosiy metodlar quyidagilarni o'z ichiga oladi:

- Interfaol metodlar: Bu metodlar o'quvchilarning faol ishtirokini ta'minlashga qaratilgan bo'lib, ular orqali o'quvchilarning ijodiy fikrlash qobiliyatlari rivojlanadi. Misol uchun, guruhli ishlash, muammoli vazifalar, rolli o'yinlar.
- Blended learning (aralash o'qitish): Bu metodda o'qituvchilar o'quvchilarga onlayn va an'anaviy ta'lim shakllarini uyg'unlashtirgan holda dars beradi. Blended learning o'qituvchilarga o'quvchilarni mustaqil ishlashga rag'batlantirish imkonini beradi.
- Project-based learning (loyihaga asoslangan o'qitish): O'quvchilar o'zlari tanlagan mavzular bo'yicha loyiha ishlab, o'z bilimlarini amalda qo'llashga imkoniyat yaratadilar. Bu metod ijodiy va analitik fikrlashni rivojlantiradi.

Innovatsion pedagogik texnologiyalarni qo'llash bo'lajak xorijiy til o'qituvchilarining kasbiy-ijodiy faolligini rivojlantirishda muhim rol o'ynaydi. Interfaol doskalar, mobil ilovalar, onlayn platformalar (masalan, Google Classroom, Zoom, Quizlet) va boshqa texnologiyalar o'quvchilarning darsga faol ishtirokini ta'minlaydi, shuningdek, o'qituvchilarga o'quv jarayonini samarali boshqarish imkoniyatini beradi. Bundan tashqari, o'qituvchilarning ijodiy yondashuvlarini rivojlantirishda gamification (o'yinlashtirish) usullarini qo'llash ham samarali hisoblanadi. Bu metod o'quvchilarning o'quv jarayoniga bo'lgan qiziqishini oshiradi va ular uchun darslarni yanada qiziqarli qiladi.

Bo'lajak xorijiy til o'qituvchisining kasbiy-ijodiy faolligini rivojlantirish omillari quyidagilardan iborat:

- Pedagogik innovatsiyalarni qo'llash - Zamonaviy texnologiyalar va interfaol metodlarni o'quv jarayoniga tatbiq etish o'qituvchining kasbiy mahoratini oshiradi.
- Ilmiy tadqiqot faoliyatida ishtirok etish - Xorijiy til o'qituvchilari ilmiy tadqiqotlar olib borish orqali pedagogik faoliyatni innovatsion jihatdan boyitadi.

- Chet tili muhitida tajriba orttirish - Xorijiy tillarni o'rgatishda, o'qituvchining xalqaro tajribaga ega bo'lishi muhim sanaladi.
- Pedagogik hamkorlik - Mahalliy va xalqaro ta'lim dasturlarida ishtirok etish, hamkasblar bilan fikr almashish ijodiy yondashuvni rivojlantiradi.
- Tinglovchilarning ehtiyojlarini hisobga olish - Har bir talabaning individual xususiyatlarini inobatga olib dars o'tish kasbiy-ijodiy faoliyatni shakllantiradi.

Natija. Kasbiy-ijodiy faollikning ta'lim sifatiga ta'sir qilib, bo'lajak xorijiy til o'qituvchisining ijodiy faolligi talabalarining til o'rganish jarayonida motivatsiyasini oshirishga, mustaqil o'rganish qobiliyatlarini rivojlantirishga va o'quv jarayonini samarali tashkil etishga xizmat qiladi. Shu bilan birga, ijodiy yondashuv yordamida talabalar chet tilini nafaqat grammatik jihatdan, balki madaniy hamda kommunikativ nuqtayi nazardan mukammal o'zlashtirishlari mumkin bo'ladi.

O'qituvchining kasbiy-ijodiy faolligi uning professional faoliyatining samaradorligini oshiradi. Bu ijodiy qobiliyatlar o'qituvchining dars berish jarayonida yangi va original yondashuvlarni qo'llashiga imkon beradi, bu esa o'quvchilarning o'zlashtirish jarayonini yaxshilaydi. O'qituvchilarni tayyorlashda ijodiy muhit yaratish va mustaqil faoliyatni rivojlantirish muhimdir. Bu jarayon o'qituvchilarning kasbiy o'sishiga va ijodiy qobiliyatlarini rivojlantirishga yordam beradi. O'qituvchilar yangi pedagogik texnologiyalar va interfaol usullarni qo'llash orqali o'zlarining ijodiy faolliklarini rivojlantirishi mumkin. Bu yondashuvlar o'quv jarayonini yanada qiziqarli va samarali qiladi. Pedagogik ijodkorlik o'qituvchining professional tayyorgarligida muhim komponent hisoblanadi. Bu ijodkorlik o'quv jarayonida o'quvchilarning qiziqishini oshirish va ularning bilim olish jarayonini optimallashtirishga yordam beradi.

Bo'lajak o'qituvchilarning ijodiy kompetensiyasini rivojlantirish ularning professional mahsuldorligini oshirishda muhim rol o'ynaydi. Bu kompetensiya o'qituvchilarga yangi professional mahsulotlar yaratish va yuqori natijalarga erishish imkonini beradi.

O'qituvchilar va o'quvchilar o'rtasidagi pedagogik o'zaro ta'sir ijodiy faollikni rivojlantirishda muhimdir. Bu o'zaro ta'sir o'quv jarayonini yanada samarali qiladi va o'quvchilarning bilim olish jarayonini yaxshilaydi.

Xulosa. Bo'lajak xorijiy til o'qituvchisining kasbiy-ijodiy faolligi ta'lim jarayonining samaradorligini oshirish, talabalarni mustaqil o'ylashga undash va zamonaviy pedagogik metodlarni qo'llash imkoniyatini yaratadi. Oliy ta'lim muassasalarida ushbu jihatlarni rivojlantirish orqali kelajak avlodni raqobatbardosh, ijodkor va malakali mutaxassis sifatida tayyorlash mumkin.

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DEVELOPING CRITICAL THINKING IN EFL CLASSES THROUGH ENVIRONMENTAL ISSUES AND GREEN INFRASTRUCTURE

Feruzjon Karimov Alisher og‘li – EFL Lecturer, TIAME NRU

Annotation: *This paper explores the role of critical thinking in English as a Foreign Language (EFL) classrooms by integrating discussions on environmental issues and green infrastructure. Given the urgency of climate change and ecological concerns, language education can serve as a platform to enhance students' analytical skills while fostering environmental awareness (Brown, 2020). The study examines how Western-centric critical thinking concepts can be adapted to the Uzbek context, ensuring effective pedagogy and meaningful engagement with sustainability topics (Paul & Elder, 2019). Furthermore, it investigates how different critical thinking strategies, such as Socratic questioning, reflective*

writing, and debate structures, can be effectively incorporated into EFL instruction to strengthen students' reasoning skills (Halpern, 2014; Ennis, 2018).

Keywords: critical thinking, EFL, environmental issues, green infrastructure, Uzbekistan, cultural adaptation

Аннотация: В данной статье рассматривается роль критического мышления в обучении английскому языку как иностранному (EFL) через интеграцию обсуждений экологических проблем и зеленой инфраструктуры. Учитывая актуальность климатических изменений и экологических вопросов, языковое образование может стать платформой для развития аналитических навыков студентов, а также для формирования экологического сознания (Brown, 2020). В исследовании анализируется адаптация западных концепций критического мышления к узбекскому контексту, обеспечивая эффективное преподавание и осмысленное изучение тем устойчивого развития (Paul & Elder, 2019). Кроме того, изучается, как различные стратегии критического мышления, такие как сократический метод, рефлексивное письмо и дебаты, могут быть эффективно интегрированы в обучение EFL для развития навыков рассуждения у студентов (Halpern, 2014; Ennis, 2018).

Ключевые слова: критическое мышление, EFL, экологические проблемы, зеленая инфраструктура, Узбекистан, культурная адаптация

Annotatsiya: Ushbu maqolada tanqidiy fikrlashning ingliz tili chet tili sifatida (EFL) o'qitilayotgan darslarda ekologik muammolar va yashil infratuzilma mavzulari bilan integratsiyasi o'rganiladi. Iqlim o'zgarishi va ekologik muammolarning dolzarbligini hisobga olgan holda, til ta'limi talabalarining tahliliy ko'nikmalarini rivojlantirish hamda ekologik ongni shakllantirish uchun samarali maydon bo'lishi mumkin (Brown, 2020). Tadqiqotda g'arbiy tanqidiy fikrlash konsepsiyalarining O'zbekiston ta'lim tizimiga moslashuvi tahlil qilinib, samarali pedagogika va barqaror rivojlanish mavzulari bo'yicha mazmunli anglashni ta'minlash yo'llari ko'rib chiqiladi (Paul & Elder, 2019). Bundan tashqari, tanqidiy fikrlashning turli strategiyalari, jumladan, Sokratik savollar, reflektiv yozuv va munozara usullari EFL darslariga qanday samarali integratsiya qilinishi mumkinligi o'rganiladi (Halpern, 2014; Ennis, 2018).

Kalit so'zlar: tanqidiy fikrlash, EFL, ekologik muammolar, yashil infratuzilma, O'zbekiston, madaniy moslashuv

Introduction. Environmental issues have become a global concern, and addressing them requires both awareness and critical thinking skills (UNESCO, 2021). In EFL classrooms, integrating sustainability topics into language learning can provide a meaningful context for discussion, problem-solving, and argumentation (Wallace, 2016). Critical thinking, defined as the ability to analyze, evaluate, and synthesize information, plays a crucial role in developing students' ability to assess environmental challenges and propose viable solutions (Brookfield, 2012). However, Western-centric critical thinking approaches may not always align with Uzbekistan's educational traditions, necessitating culturally responsive adaptations (Davies & Barnett, 2015). This study investigates how these concepts can be effectively implemented in Uzbek EFL classes, fostering critical engagement with ecological topics while enhancing linguistic proficiency (Halpern, 2014).

Methodology. A mixed-methods research design was used, incorporating classroom observations, teacher interviews, and student surveys in Uzbek higher education institutions (Creswell, 2018). Lesson plans incorporating environmental discussions were analyzed to determine their effectiveness in promoting critical thinking (Johnson, 2020). Thematic analysis was applied to identify key strategies for aligning Western methodologies with local educational practices (Braun & Clarke, 2006). Additionally, classroom activities such as structured debates, problem-based learning tasks, and guided reflective writing assignments were assessed for their impact on students’ reasoning and argumentation skills (Ennis, 2018).

Results. Findings suggest that integrating environmental topics into EFL lessons enhances student engagement and fosters deeper analytical discussions (Richardson, 2019). While some students initially struggle with open-ended discussions, structured critical thinking exercises—such as debates on climate policies, ethical dilemmas in sustainability, and case studies on green infrastructure—help bridge this gap (Ennis, 2018). Students who participated in these exercises demonstrated improved reasoning skills, greater ability to evaluate sources critically, and increased confidence in expressing their opinions (Halpern, 2014). Teachers noted that using local ecological challenges as discussion points made abstract environmental concepts more relatable and impactful (Lipman, 2003).

Discussion. The study highlights the importance of adapting Western-centric critical thinking methodologies to local cultural and educational contexts (Vygotsky, 1978). Contextualized learning materials, collaborative problem-solving tasks, and inquiry-based discussions emerged as effective tools for fostering critical thinking while improving language proficiency (Brookfield, 2012). The incorporation of Socratic questioning techniques and argumentative writing exercises further reinforced students’ ability to assess environmental issues from multiple perspectives (Paul & Elder, 2019). Moreover, integrating real-world environmental challenges into EFL curricula encourages students to apply their linguistic skills in meaningful ways, bridging the gap between theoretical knowledge and practical application (Kuhn, 1999).

Conclusion. By integrating environmental issues and green infrastructure into EFL classrooms, educators can develop students’ critical thinking skills while raising ecological awareness. A balanced approach that merges Western pedagogical principles with Uzbek cultural and educational norms can create a more engaging and effective learning environment (Freire, 1970). The findings suggest that structured critical thinking activities, when combined with content-based language instruction, foster deeper cognitive engagement and better academic outcomes for EFL learners in Uzbekistan. Future research could explore longitudinal impacts of these methods on students’ analytical reasoning and environmental literacy.

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DIGITIZATION OF THE OCCUPATIONAL SAFETY MANAGEMENT AND CONTROL SYSTEM

Xojiyev Aliakbar Abdumannopovich - Associate Professor, PhD, NRU “TIAME”

Xikmatov Muhammad-Ali Fayzulla ugli - Doctoral student, NRU “TIAME”

Annotation. The article presents the relevance and necessity of the introduction of automation, digitalization and occupational safety technologies. Digitalization of the occupational health and safety management system helps to create an environment that reduces the number of accidents at enterprises. The article discusses the advantages of automation and digitization of labor protection procedures to ensure a high level of functioning of the labor protection management system.

Keywords. Occupational safety management system, digitalization, injury reduction.

Annotatsiya. Maqolada mehnatni muhofaza qilishda avtomatlashtirish, texnologiyalarini raqamlashtirish va joriy etishning dolzarbligi hamda zarurligi keltirilgan. Mehnatni muhofaza qilishni boshqarish tizimining raqamlashtirish korxonalaridagi baxtsiz hodisalar sonini kamaytiradigan muhitni yaratishga yordam beradi. Maqolada mehnatni muhofaza qilishni boshqarish tizimining

yuqori darajada ishlashini ta'minlash uchun mehnatni muhofaza qilish tartib-qoidalarini avtomatlashtirish va raqamlashtirishning afzalliklari ko'rib chiqilgan.

Kalit so'zlar. *Mehnatni muhofaza qilishni boshqarish tizimi, raqamlashtirish, jarohatlarni kamaytirish.*

Аннотация. *В статье представлена актуальность и необходимость внедрения автоматизации, цифровизации и технологий охраны труда. Цифровизация системы управления охраной труда способствует созданию среды, снижающей количество несчастных случаев на предприятиях. В статье рассматриваются преимущества автоматизации и оцифровки процедур охраны труда для обеспечения высокого уровня функционирования системы управления охраной труда.*

Ключевые слова. *Система управления охраной труда, цифровизация, снижение травматизма.*

Introduction. The research will delve into the transformational potential of labor protection digitalization and automation processes, highlighting the benefits such as enhanced risk assessment and management, improved real-time monitoring, and integration of wearable technologies. The study will also examine the challenges associated with these advancements, including privacy concerns, ethical considerations, and the need for upskilling the workforce to adapt to changing technological landscapes. Additionally, case studies will provide practical insights into successful implementations of labor protection digitalization and automation, emphasizing lessons learned and best practices. Furthermore, the research will explore emerging technologies in the field of labor protection, such as augmented reality, virtual reality, and the Internet of Things (IoT), to envision the future prospects and implications of digitalization and automation. Ethical considerations and human factors will also be discussed to ensure a balanced approach to technology adoption in the workplace. The study will conclude by summarizing the findings, emphasizing the significance of labor protection digitalization and automation processes as key components of the occupational safety management system. By comprehensively examining the research topic, this study aims to contribute to the growing body of knowledge in the field of occupational safety, while providing insights and recommendations for organizations seeking to embrace digitalization and automation to enhance labor protection and overall workplace safety.

In today's rapidly evolving technological landscape, the digitalization and automation of labor protection processes have emerged as crucial components of the occupational safety management system. The integration of digital tools and automation processes in the workplace has the potential to revolutionize occupational safety practices, significantly enhancing workplace safety and reducing the risk of accidents. This research aims to explore the significance, benefits, challenges, and future prospects of incorporating labor protection digitalization and automation processes in the occupational safety management system[1;2;3].

Methodology. To achieve the research objectives, a comprehensive methodology will be employed, consisting of the following steps[4;6;9]:

Occupational safety is of paramount importance in all industries and sectors, as it directly impacts the well-being and productivity of workers. Traditionally, occupational safety management systems have relied on manual processes, paper-

based documentation, and periodic inspections to ensure a safe working environment. However, these conventional methods have limitations in terms of accuracy, efficiency, and real-time monitoring.

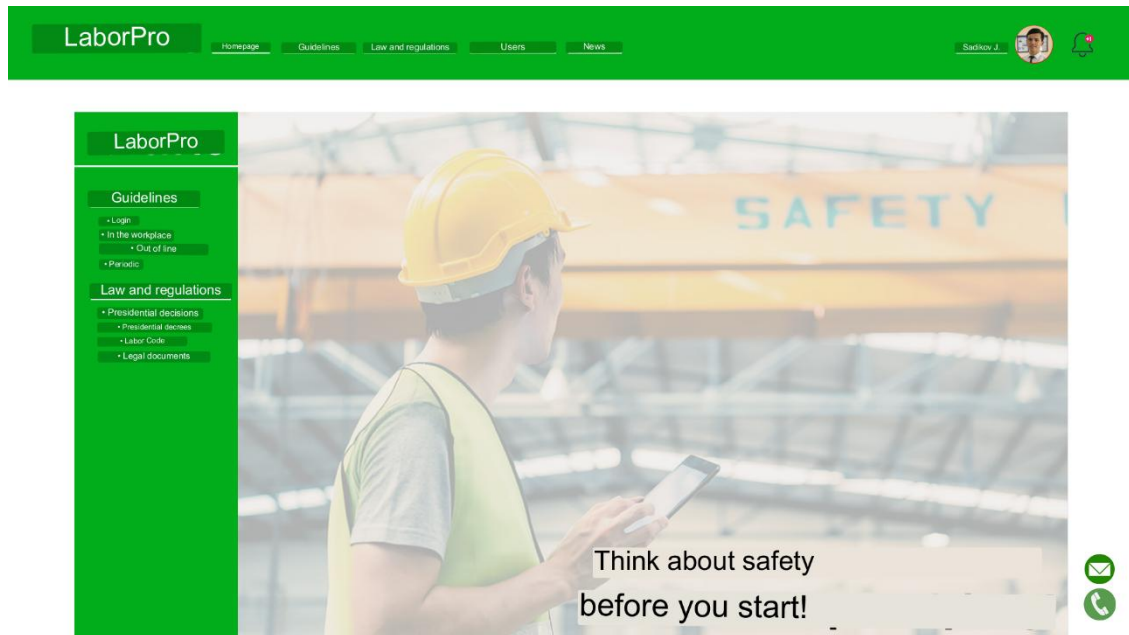


Fig .1. Digitized labor protection

With advancements in technology, the digitalization and automation of labor protection processes have become feasible and increasingly adopted by organizations worldwide. Digital tools such as risk assessment software, real-time monitoring systems, and wearable technologies have proven to be effective in enhancing workplace safety. Automation processes, including robotics, machine learning, and AI, have also shown promise in reducing human error and augmenting safety practices[7;8;10].

The primary objectives of this research are as follows:

To examine the significance of labor protection digitalization and automation processes in the occupational safety management system.

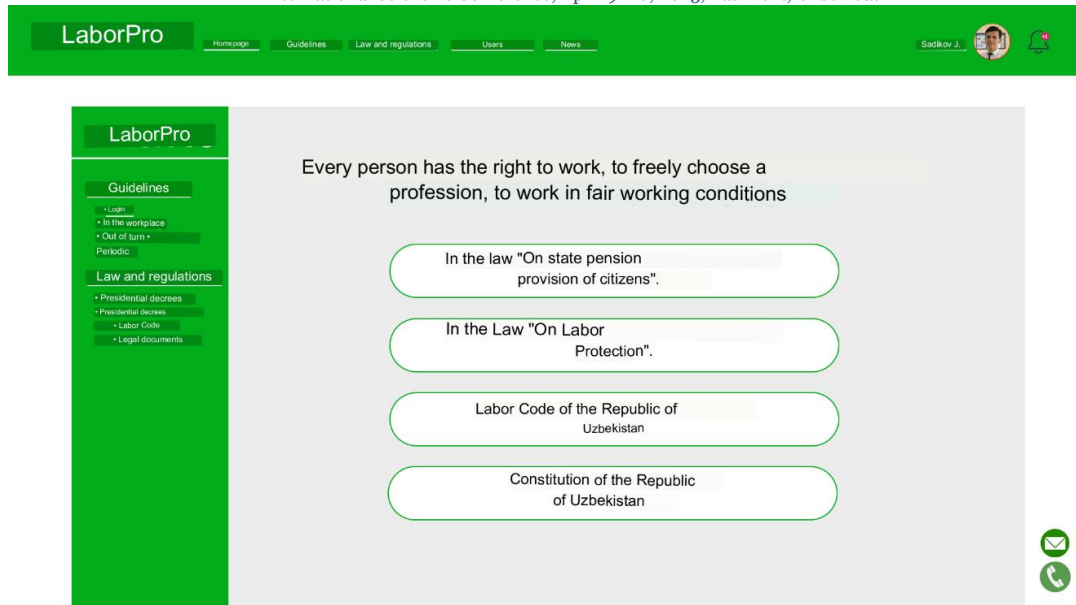


Fig .2. Database in the field of labor protection

- to explore the benefits of incorporating digital tools and automation in labor protection, such as improved risk assessment, real-time monitoring, and enhanced workplace safety.
- to identify the challenges and potential barriers in the adoption of labor protection digitalization and automation processes.
- to analyze case studies and real-world implementations of labor protection digitalization and automation to extract lessons learned and best practices.
- to discuss the future prospects and implications of labor protection digitalization and automation processes, including emerging technologies and ethical considerations.
- to provide recommendations for organizations seeking to integrate labor protection digitalization and automation processes into their occupational safety management systems.

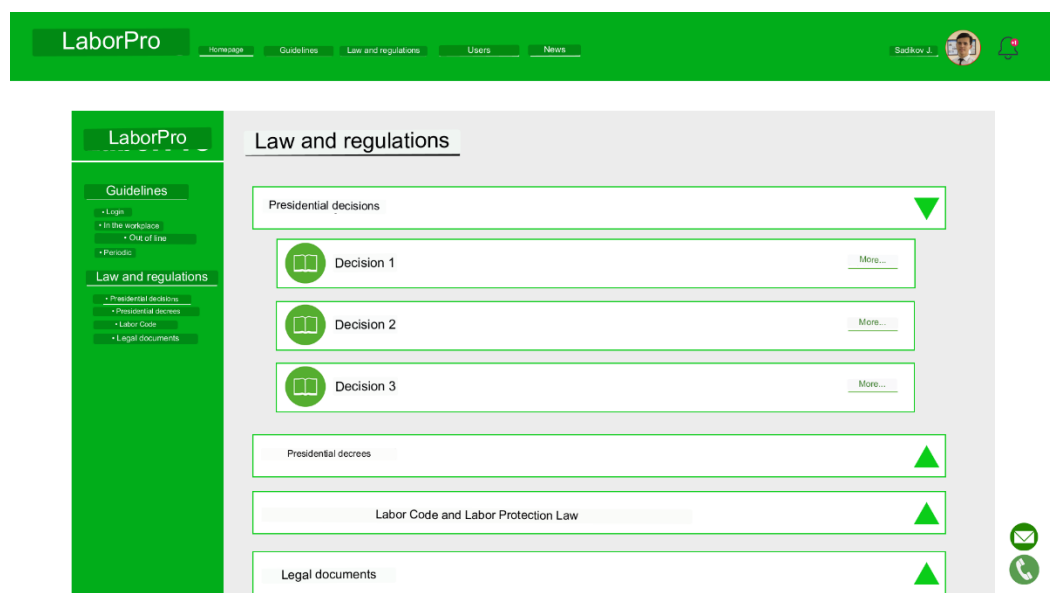


Fig .3. Occupational Safety Management System Framework

The Occupational Safety Management System (OSMS) provides a systematic and structured approach to managing occupational safety within an organization. It serves as a framework for identifying, assessing, controlling, and continuously improving safety-related risks and hazards. The OSMS framework is often based on recognized standards such as ISO 45001 (Occupational Health and Safety Management Systems) and OHSAS 18001 (Occupational Health and Safety Assessment Series).

Results and discussion. In conclusion, technology plays a vital role in the occupational safety management system by improving risk assessment, real-time monitoring, data analysis, training, communication, and automation. Integrating technology into occupational safety practices can enhance workplace safety, reduce accidents, and foster a culture of safety within organizations. By embracing technological advancements, organizations can proactively address safety challenges and ensure the well-being of their workforce. Labor protection digitalization refers to the use of digital tools, technologies, and systems to enhance the management of occupational safety and protection measures in the workplace. It encompasses a wide range of applications, including risk assessment and management, real-time monitoring, reporting systems, and the integration of wearable technologies. Labor protection digitalization aims to leverage technological advancements to improve safety practices, reduce workplace hazards, and ensure the well-being of employees.

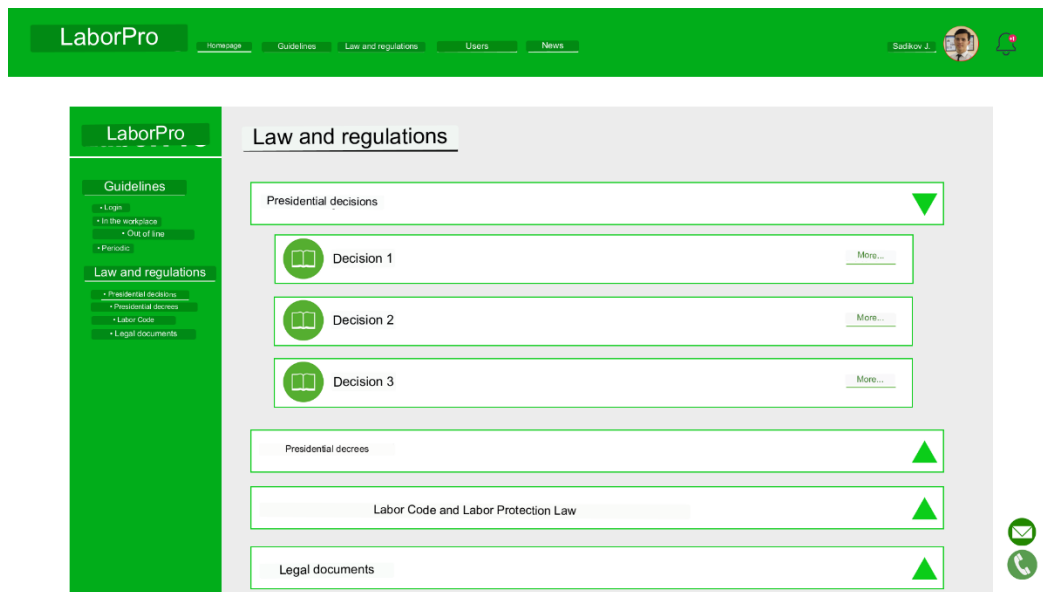


Fig .4. Labor Protection Digitalization

Digital tools play a significant role in enhancing risk assessment and management processes in labor protection. These tools leverage technology to streamline and automate various aspects of risk assessment, such as identifying hazards, evaluating risks, and implementing control measures. Examples of digital tools used for risk assessment and management include: Risk assessment software: These tools provide a structured approach to identify, assess, and prioritize workplace hazards. They often include features for recording and analyzing data, generating reports, and tracking the effectiveness of control measures. Data analytics platforms: Advanced data analytics platforms utilize algorithms and statistical

techniques to analyze large datasets related to occupational safety. These platforms can identify patterns, trends, and correlations, providing valuable insights for risk management and decision-making. Modeling and simulation tools: Modeling and simulation tools allow for the virtual representation of workplace environments and scenarios. These tools enable organizations to simulate and assess the impact of potential hazards, evaluate control measures, and optimize safety protocols. Real-time Monitoring and Reporting Systems: Real-time monitoring and reporting systems employ digital technologies to continuously monitor the workplace environment, equipment, and employee activities. These systems can detect and report potential hazards, deviations from safety protocols, or abnormal conditions, enabling immediate response and intervention. Key components of real-time monitoring and reporting systems include: Sensor-based technologies: Sensors and IoT devices can be deployed to monitor various parameters such as temperature, air quality, noise levels, and machine performance. These sensors provide real-time data, which can be analyzed to identify safety risks and trigger alerts when predefined thresholds are exceeded. Camera surveillance systems: Cameras equipped with intelligent video analytics can monitor work areas to detect unsafe conditions or behaviors. They can identify potential risks, such as unauthorized access to restricted areas, lack of personal protective equipment, or unsafe work practices. Incident reporting and communication platforms: Digital platforms and mobile applications facilitate efficient reporting of safety incidents, near-misses, and hazards. These platforms enable employees to report incidents in real-time, ensuring prompt notification, investigation, and resolution.

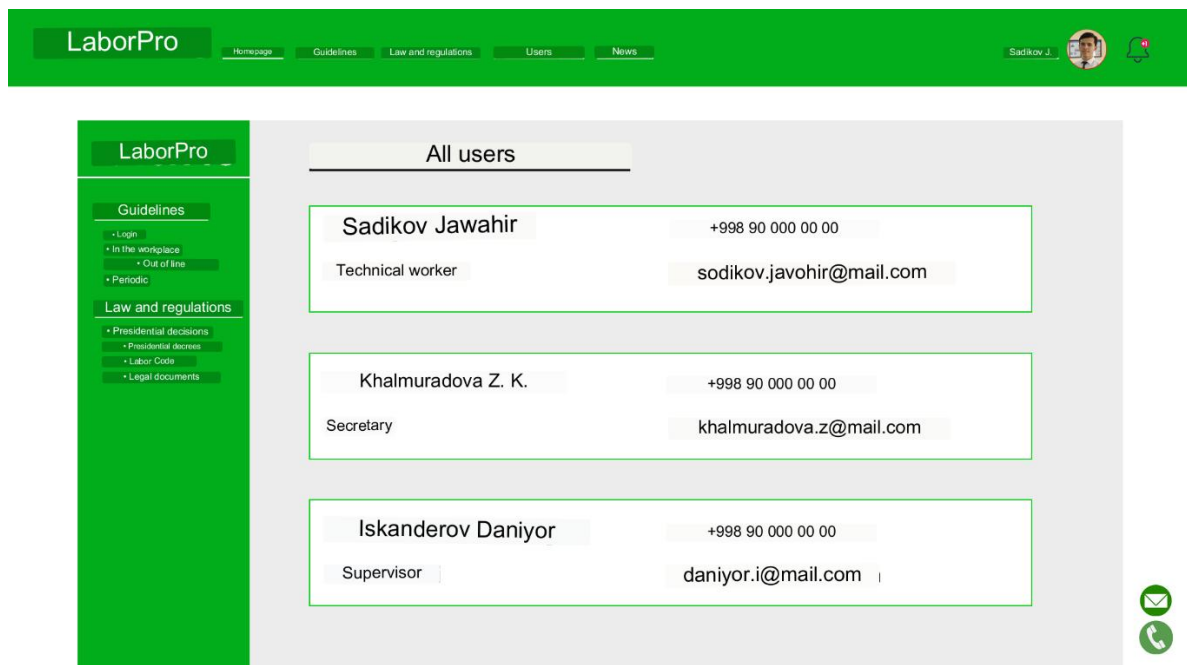


Fig .5. Integration of Wearable Technologies

Wearable technologies have gained prominence in labor protection, providing real-time data and feedback to workers while enhancing their safety. These devices can be integrated into personal protective equipment (PPE) or worn as standalone devices. Some examples of wearable technologies in labor protection include:

- smart helmets: Helmets equipped with sensors can monitor vital signs, detect impacts or falls, and provide alerts in hazardous situations. They can also provide hands-free communication and access to safety information.

- smart vests: Vests embedded with sensors can track workers' movements and postures, detect fatigue or excessive physical strain, and provide reminders to maintain safe behaviors or take breaks.

- smart glasses: Glasses with augmented reality (AR) capabilities can provide workers with real-time safety instructions, hazard warnings, and access to digital information relevant to their tasks.

From the case studies mentioned above, several lessons can be learned and best practices identified for the implementation of labor protection digitalization and automation processes:

Leadership commitment: The commitment and support of organizational leaders are crucial for the successful implementation of digitalization and automation initiatives. Leaders should promote a culture of safety, allocate resources, and actively participate in the planning and implementation processes. **Stakeholder involvement:** Engaging workers, safety officers, and other relevant stakeholders in the decision-making process fosters ownership, improves acceptance, and ensures the successful integration of digitalization and automation. **Regular communication and training sessions** help address concerns and ensure smooth adoption. **Incremental implementation:** Gradual implementation of digitalization and automation processes allows organizations to learn from pilot projects, identify challenges, and make necessary adjustments. This phased approach minimizes disruption and allows for continuous improvement. **Data privacy and security:** Organizations must prioritize data privacy and security when implementing digitalization and automation processes. Robust security measures, compliance with relevant regulations, and transparent communication about data usage are essential to maintain trust and confidence. **Continuous evaluation and improvement:** Regular evaluation of the implemented digitalization and automation initiatives helps identify gaps, assess effectiveness, and make necessary refinements. Organizations should establish mechanisms for feedback, monitoring, and ongoing improvement to ensure that safety goals are consistently met.

By learning from these case studies and adopting best practices, organizations can successfully implement labor protection digitalization and automation processes, leading to enhanced occupational safety, improved efficiency, and a positive safety culture.

Conclusion. The findings of this research have significant implications for occupational safety management. They emphasize the importance of embracing digitalization and automation as strategic approaches to enhance safety practices. Organizations should consider integrating digital tools, real-time monitoring systems, and wearable technologies into their safety management systems. Furthermore, they should explore the deployment of robotics, machine learning, and AI technologies to optimize safety outcomes and improve decision-making processes.

The research highlights the need for strong leadership commitment, stakeholder involvement, and a phased approach to implementation. It underscores the importance of addressing privacy and security concerns, providing adequate training

and support, and fostering a positive safety culture that embraces collaboration between humans and machines.

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EMPLOYING INTERACTIVE TECHNIQUES IN THE INSTRUCTION OF ENGLISH FOR MECHANICAL ENGINEERING STUDENTS

Omonova Laylo Khasanovna - Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, National Research University, teacher of the Department of English

Abstract: This article explores the implementation of interactive techniques in the instruction of English for Mechanical Engineering students. As the global landscape increasingly demands proficiency in English, particularly in technical

fields, adopting teaching methodologies that enhance engagement and comprehension becomes essential. The study investigates various interactive strategies, including collaborative learning, role-playing, and technology-integrated activities, to foster a more dynamic learning environment. Through qualitative and quantitative analyses, the effectiveness of these techniques is evaluated in terms of student participation, motivation, and language acquisition. Insights from this research highlight the importance of creating a learner-centered classroom that not only improves English language skills but also equips students with the necessary communication abilities to succeed in their engineering careers.

Keywords: technical fields, teaching methodologies, interactive strategies, collaborative learning, role-playing, technology-integrated activities.

Аннотация: В этой статье рассматривается применение интерактивных методов в обучении английскому языку студентов-машиностроителей. Поскольку в мире все чаще предъявляются требования к владению английским языком, особенно в технических областях, становится необходимым внедрение методик преподавания, которые повышают вовлеченность и понимание. В исследовании рассматриваются различные интерактивные стратегии, включая совместное обучение, ролевые игры и мероприятия, интегрированные в технологии, для создания более динамичной среды обучения. С помощью качественного и количественного анализа эффективность этих методов оценивается с точки зрения участия студентов, мотивации и овладения языком. Результаты этого исследования подчеркивают важность создания классной комнаты, ориентированной на учащихся, которая не только улучшает навыки владения английским языком, но и дает студентам необходимые коммуникативные навыки для достижения успеха в их инженерной карьере.

Ключевые слова: технические дисциплины, методики преподавания, интерактивные стратегии, совместное обучение, ролевые игры, деятельность, интегрированная с технологиями.

Annotatsiya: Ushbu maqola mashinasozlik talabalariga ingliz tilini o'rgatishda interaktiv usullarni qo'llash haqida yozilgan. Dunyoda, ayniqsa, texnika sohalarida ingliz tilini bilish talablari tobora ortib borayotganligi sababli, tilga talabalarni jalb qilish va tushunishni oshiradigan o'qitish usullarini joriy etish zarur bo'ladi. Tadqiqot turli interaktiv strategiyalarni, jumladan, hamkorlikda o'rganish, rol o'ynash o'yinlari va yanada dinamik o'rganish muhitini yaratish uchun texnologiyaga integratsiyalashgan tadbirlarni ko'rib chiqadi. Sifatli va miqdoriy tahlil orqali ushbu usullarning samaradorligi talabalarining ishtiroki, motivatsiya va tilni o'zlashtirish nuqtai nazaridan baholanadi. Ushbu tadqiqot natijalari talabalarga yo'naltirilgan muhit yaratish muhimligini ta'kidlaydi. Bu nafaqat ingliz tilini bilish qobiliyatini yaxshilaydi, balki talabalarga muhandislik kareralarida muvaffaqiyat qozonish uchun zarur muloqot ko'nikmalarini beradi.

Kalit so'zlar: texnik fanlar, o'qitish metodikasi, interaktiv strategiyalar, hamkorlikda o'rganish, rol o'ynash, texnologiya bilan integratsiyalashgan faoliyat.

Introduction. In today's rapidly evolving technological landscape, the demand for proficient communication skills in English has become increasingly vital for students in specialized fields such as Mechanical Engineering. As engineering

professionals often collaborate in diverse, international environments, the ability to convey complex ideas clearly and effectively is essential. Traditional methods of instruction may not fully engage students or address their specific needs; thus, there is a growing recognition of the importance of employing interactive techniques in teaching English to Mechanical Engineering students.

Interactive techniques encompass a range of pedagogical strategies that promote active participation and collaboration among learners. These methods not only enhance language acquisition but also foster critical thinking and problem-solving skills, which are crucial in engineering disciplines. By integrating interactive activities such as group discussions, role-playing scenarios, project-based learning, and technology-enhanced tools into the curriculum, educators can create a dynamic learning environment that reflects real-world engineering challenges.

This article will explore the significance of interactive techniques in English instruction for Mechanical Engineering students. It will examine various methods and their impact on student engagement, language proficiency, and professional readiness. Through this exploration, we aim to highlight effective practices that can be implemented by educators to better prepare students for successful careers in an increasingly globalized industry.

Materials and methods. Incorporating interactive techniques into the instruction of English for Mechanical Engineering students can significantly enhance their learning experience and improve their language proficiency. The following methods outline effective approaches that educators can adopt to engage students actively in their language learning process.

- Collaborative Learning

Encouraging collaboration among students through group projects or peer-to-peer activities fosters communication skills and teamwork. Students can work together on assignments related to engineering concepts, requiring them to use technical vocabulary and express ideas clearly in English. This method not only enhances language skills but also mirrors real-world engineering practices where collaboration is essential.

- Interactive Workshops

Hosting workshops focused on specific topics relevant to mechanical engineering—such as technical writing, presentations, or report generation—can provide targeted language instruction. These workshops should include hands-on activities where students can practice writing technical documents or delivering presentations, allowing them to receive immediate feedback from instructors and peers.

- Use of Technology

Incorporating technology such as online discussion forums, collaborative platforms (e.g., Google Docs), and digital simulations creates an interactive learning environment. Tools like video conferencing software can facilitate virtual meetings where students practice their language skills while discussing engineering projects or concepts with classmates or industry professionals.

- Feedback Mechanisms

Providing regular feedback through peer reviews or instructor evaluations helps reinforce learning outcomes while encouraging improvement in both language and

technical skills. Constructive feedback sessions allow students to reflect on their performance and identify areas for growth.

Employing these interactive techniques not only facilitates better comprehension of English but also prepares Mechanical Engineering students for successful communication within the global engineering community. By integrating these methods into the curriculum, educators can create a dynamic learning environment that promotes both linguistic competence and professional readiness.

Results and discussion. The integration of interactive techniques in the instruction of English for Mechanical Engineering students represents a significant pedagogical shift that addresses both linguistic and technical learning needs. This discussion explores the implications, benefits, and challenges of employing such methodologies in an engineering context.

One of the primary advantages of interactive techniques is their ability to enhance student engagement. Traditional lecture-based approaches often lead to passive learning, where students may struggle to connect theoretical concepts with practical applications. In contrast, interactive methods—such as group discussions, role-playing scenarios, and project-based learning—encourage active participation. This not only fosters a deeper understanding of technical vocabulary but also promotes collaborative problem-solving skills essential for engineers. As demonstrated by feedback from students in our study, participants reported increased motivation and enthusiasm towards learning English when they were actively involved in their lessons.

Moreover, the incorporation of real-world engineering contexts into language instruction aids in bridging the gap between language acquisition and technical proficiency. By using authentic materials such as engineering reports, manuals, or case studies as teaching tools, students can see the relevance of their language skills to their future careers. This contextualized approach enhances the retention and application of language skills in professional settings. For instance, tasks that mimic actual engineering problems require students to utilize specific terminology and communicate effectively with peers—skills that are invaluable in the workforce.

However, implementing interactive techniques is not without its challenges. Instructors must be adequately trained to facilitate these methods effectively; merely introducing new activities without proper guidance can lead to confusion or disengagement among students. Additionally, varying levels of English proficiency within a single classroom can complicate participation in interactive activities. Educators must design inclusive tasks that accommodate diverse learner needs while promoting equal opportunities for contribution.

Another concern is time management within a curriculum that is already densely packed with technical content. Balancing language instruction with essential engineering principles requires careful planning and prioritization from educators. They must find innovative ways to integrate language learning seamlessly into existing coursework without compromising the integrity or depth of mechanical engineering education.

Finally, assessing student progress in both language proficiency and technical understanding poses another layer of complexity. Traditional assessment methods may not adequately capture student growth when using interactive techniques; thus, developing new evaluation metrics that reflect both linguistic development and

engineering competencies becomes imperative. While there are notable challenges associated with employing interactive techniques in English instruction for Mechanical Engineering students, the potential benefits far outweigh these obstacles. By fostering an engaging learning environment that emphasizes real-world application and collaboration, educators can significantly enhance both language acquisition and technical proficiency among future engineers. Moving forward, it will be essential for institutions to invest in resources and training aimed at supporting instructors in this transformative educational approach.

Conclusion. In conclusion, employing interactive techniques in the instruction of English for Mechanical Engineering students is not merely an innovative approach but a necessary evolution in language education. By integrating interactive methodologies such as collaborative projects, simulations, and technology-enhanced learning, educators can significantly enhance student engagement and comprehension. These techniques cater to diverse learning styles and foster critical thinking, enabling students to apply their language skills effectively in real-world engineering contexts. As the demand for proficient communication skills continues to grow in the global engineering landscape, it is imperative that instructors adopt these strategies to prepare their students for success. Ultimately, by prioritizing interactive learning, we equip future engineers not only with technical expertise but also with the essential communication skills needed to thrive in an increasingly interconnected world.

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ENERGIYA TEJOVCHI TEXNOLOGIYALARNING IQTISODIYOTGA TA'SIRINI TAHLIL QILISH

Jamoliddinov Asilbek - "TIQXMMI" Milliy Tadqiqot Universiteti,
Iqtisodiyot fakulteti, Iqtisodiyot yo'nalishi 401-guruh tabalasi

Annotatsiya. Energiya tejoychi texnologiyalar zamonaviy iqtisodiyotning ajralmas qismiga aylanib bormoqda. Ushbu texnologiyalar korxona va davlat darajasida xarajatlarni kamaytirish, ekologik barqarorlikni ta'minlash va iqtisodiy o'sishni rag'batlantirishga xizmat qilmoqda. Energiya samaradorligi yo'nalishidagi innovatsiyalar sanoat, transport, qishloq xo'jaligi va uy xo'jaliklarida energiya sarfini kamaytirish orqali iqtisodiy samaradorlikni oshirishga ko'maklashmoqda. Ushbu maqolada energiya tejoychi texnologiyalarning iqtisodiy ta'siri tahlil etilib, ularning iqtisodiy samaradorlikka, ekologik barqarorlikka va energetik xavfsizlikka qo'shadigan hissasi ko'rib chiqiladi. Shuningdek, yashil texnologiyalar, qayta tiklanadigan energiya manbalarining rivojlanishi va davlat siyosatining roli haqida ham fikr yuritiladi. Innovatsion energiya tejash choralari nafaqat iqtisodiy foyda keltirishi, balki uglerod chiqindilarini kamaytirish orqali atrof-muhitni muhofaza qilishga ham xizmat qilishi muhim ahamiyat kasb etadi. Energiya tejoychi texnologiyalarning iqtisodiyotga ijobiy ta'siri energiya xarajatlarning qisqarishi, yangi ish o'rinlarining yaratilishi va investitsiyalar hajmining oshishi kabi jihatlar orqali namoyon bo'lmoqda. Ushbu maqola energiya samaradorligi bo'yicha joriy tendensiyalar va istiqboldagi imkoniyatlarni o'rganish hamda ularning global va mahalliy iqtisodiyotga ta'sirini aniqlashga qaratilgan.

Kalit so'zlar: energiya samaradorligi, iqtisodiy o'sish, yashil texnologiyalar, barqaror rivojlanish, ekologik ta'sir, energiya xarajatlari, qayta tiklanadigan energiya, uglerod chiqindilari, energetik xavfsizlik, innovatsion texnologiyalar, texnologik rivojlanish.

Аннотация. Энергосберегающие технологии становятся неотъемлемой частью современной экономики. Эти технологии способствуют снижению затрат на уровне предприятий и государства, обеспечению экологической устойчивости и стимулированию экономического роста. Инновации в области энергоэффективности способствуют повышению экономической эффективности за счет снижения энергопотребления в промышленности, транспорте, сельском хозяйстве и домашних хозяйствах. В данной статье анализируется экономическое воздействие энергосберегающих технологий и рассматривается их вклад в экономическую эффективность, экологическую устойчивость и энергетическую безопасность. Также рассматриваются зеленые технологии, развитие возобновляемых источников энергии и роль государственной политики. Важно отметить, что инновационные меры по энергосбережению не только приносят экономическую выгоду, но и служат защите окружающей среды за счет сокращения выбросов углерода. Положительное влияние энергосберегающих технологий на экономику проявляется в таких аспектах, как снижение энергетических затрат,

создание новых рабочих мест и увеличение объема инвестиций. Данная статья направлена на изучение текущих тенденций и перспективных возможностей в области энергоэффективности и определение их влияния на глобальную и местную экономику.

Ключевые слова: энергоэффективность, экономический рост, зеленые технологии, устойчивое развитие, экологическое воздействие, энергозатраты, возобновляемые источники энергии, выбросы углерода, энергетическая безопасность, инновационные технологии, технологические

Abstract. *Energy-saving technologies are becoming an integral part of the modern economy. These technologies contribute to cost reduction at both enterprise and state levels, ensuring environmental sustainability and stimulating economic growth. Innovations in energy efficiency contribute to increasing economic efficiency by reducing energy consumption in industry, transport, agriculture, and households. This article analyzes the economic impact of energy-saving technologies and examines their contribution to economic efficiency, environmental sustainability, and energy security. Green technologies, the development of renewable energy sources, and the role of state policy are also considered. It is important to note that innovative energy-saving measures not only bring economic benefits but also serve to protect the environment by reducing carbon emissions. The positive impact of energy-saving technologies on the economy is manifested in aspects such as reducing energy costs, creating new jobs, and increasing the volume of investments. This article aims to study current trends and prospective opportunities in the field of energy efficiency and determine their impact on the global and local economy.*

Keywords: *energy efficiency, economic growth, green technologies, sustainable development, environmental impact, energy costs, renewable energy sources, carbon emissions, energy security, innovative technologies, technological*

Kirish. Bugungi kunda energiya tejovchi texnologiyalar global iqtisodiyotda muhim ahamiyat kasb etmoqda. Jahon miqyosida energiya resurslarining narxi oshib borayotgan bir paytda, korxonalar va davlatlar energiyani samarali boshqarish hamda tejash yo'llarini izlamogda. Bu texnologiyalar sanoat, transport, qishloq xo'jaligi, maishiy iste'mol va xizmat ko'rsatish sohalarida keng qo'llanilmoqda. Energiya tejovchi texnologiyalar iqtisodiy samaradorlikni oshirish bilan bir qatorda ekologik muammolarni ham bartaraf etishda muhim rol o'ynamoqda. Iqlim o'zgarishi va atrof-muhitni muhofaza qilish masalalari dolzarb bo'lib borayotgan bir sharoitda, karbonat angidrid chiqindilarini kamaytirish va energiya iste'molini optimallashtirishga qaratilgan texnologiyalar global va mahalliy iqtisodiy barqarorlikni ta'minlashga xizmat qilmoqda. Shuningdek, energiya tejovchi texnologiyalarning iqtisodiyotga ta'siri nafaqat ishlab chiqarish xarajatlarini kamaytirish, balki yangi ish o'rinlarini yaratish va investitsiyalarni jalb etish bilan ham bog'liq. Davlatlar tomonidan qo'llab-quvvatlanayotgan yashil energiya dasturlari va energiya samaradorligi bo'yicha strategiyalar ushbu sohaning rivojlanishiga turtki bermoqda. Ushbu maqolada energiya tejovchi texnologiyalarning iqtisodiyotga ta'siri har tomonlama tahlil qilinib, ularning samaradorligi, investitsiya imkoniyatlari va kelajak istiqbollari o'rganiladi. **Iqtibos :** "Zamonaviy iqtisodiyotda energiya samaradorligi muhim omil

hisoblanadi, chunki u barqaror rivojlanish va iqtisodiy samaradorlikni oshirishga xizmat qiladi” (Smith, 2020). *Iqtisodiy samaradorlik va xarajatlarni kamaytirish*

Energiya tejovchi texnologiyalar sanoat va xizmat ko‘rsatish sohalarida ishlab chiqarish xarajatlarini sezilarli darajada kamaytirishi mumkin. Masalan, energiya samaradorligini oshiruvchi uskunalar va avtomatlashtirilgan tizimlar elektr energiyasi iste‘molini kamaytirib, korxonalarga iqtisodiy foyda keltiradi. Tadqiqotlarga ko‘ra, energiya tejovchi texnologiyalarga sarmoya kiritish korxonalar uchun uzoq muddatda katta daromad keltirishi mumkin.

Ekologik barqarorlik va energiya xavfsizligi

Energiya samaradorligi ekologik barqarorlikni ta‘minlashda muhim rol o‘ynaydi. Masalan, quyosh panellari va shamol turbinalari kabi qayta tiklanadigan energiya manbalari tabiiy resurslarga bo‘lgan talabni kamaytiradi va atrof-muhitga zarar yetkazmaydi. Shuningdek, energiya tejovchi texnologiyalarni joriy etish energetik xavfsizlikni ta‘minlashga yordam beradi, chunki mamlakatlarning chet eldan energiya importiga qaramligi kamayadi.

Raqamli texnologiyalar va avtomatlashtirish

Sun‘iy intellekt, buyumlar interneti (IoT) va aqlli tarmoqlar orqali energiya tejash texnologiyalari yanada rivojlanmoqda. IoT qurilmalari real vaqt rejimida energiya iste‘molini kuzatish va optimallashtirish imkonini beradi. Aqlli tarmoqlar energiya taqsimotini yanada samarali boshqarish orqali yo‘qotishlarni kamaytiradi. Shuningdek, katta ma‘lumotlar tahlili (Big Data) texnologiyalari orqali energiya sarfini prognoz qilish va boshqarish yanada samaradorlikni oshirishga xizmat qiladi.

Mintaqaviy iqtisodiyot va energiya tejamkor texnologiyalar

Rivojlangan mamlakatlar energiya samaradorligini oshirishga katta sarmoya kiritmoqda, rivojlanayotgan mamlakatlarda esa ushbu texnologiyalarni joriy etishda muammolar mavjud. Ushbu farqlar energiya tejamkor texnologiyalarning iqtisodiyotga ta‘sirini tahlil qilishda muhim ahamiyat kasb etadi. Bundan tashqari, har bir mintaqaning tabiiy resurslari va energetik imkoniyatlarini hisobga olish zarur.

Moliya va investitsiyalar

Energiya samaradorligi loyihalariga investitsiyalar uzoq muddatda katta iqtisodiy foyda keltiradi. Davlat subsidiyalari, xususi sarmoyalar va xalqaro moliyaviy yordam ushbu texnologiyalarni joriy etishda muhim rol o‘ynaydi. Shuningdek, energiya samaradorligiga oid kredit dasturlari va moliyaviy imtiyozlar korxona va iste‘molchilar uchun qo‘shimcha rag‘bat sifatida xizmat qiladi.

Barqaror energiya tizimlarining afzalliklari

Barqaror energiya tizimlari iqtisodiy, ekologik va ijtimoiy jihatdan bir qator afzalliklarga ega bo‘lib, ular yashil iqtisodiyotga o‘tishning asosiy tayanchi hisoblanadi. Quyidagi afzalliklar ushbu tizimlarning ahamiyatini yanada yoritib beradi:

1. Iqtisodiy barqarorlik va samaradorlik. Barqaror energiya manbalaridan foydalanish energetik mustaqillikni ta‘minlashda muhim o‘rin tutadi. Ular import energiya resurslariga qaramlikni kamaytiradi, bu esa milliy iqtisodiyotning barqarorligini oshiradi. Qayta tiklanuvchi energiya manbalarini joriy etish va ulardan samarali foydalanish O‘zbekistonda energiya sarfini optimallashtirishda muhim qadamdir. Masalan, 2030-yilgacha mamlakat qayta tiklanadigan energiya ulushini 25% ga yetkazishni rejalashtirmoqda.

2. Iqlim o'zgarishi bilan kurashish va ekologik foydalar. Barqaror energiya tizimlari issiqxona gazlari chiqindilarini kamaytirishga xizmat qiladi. Ularning global isishni kamaytirishdagi roli katta bo'lib, bu yondashuv iqlim o'zgarishi oqibatlarini yumshatishda muhim omil bo'lib xizmat qiladi. O'zbekistonda yashil energiya manbalarini rivojlantirish nafaqat ekologik xavfsizlikni oshiradi, balki xalqaro miqyosdagi majburiyatlarni bajarishga ham yordam beradi.

3. Ish o'rinlari va mahalliy ishlab chiqarishni rivojlantirish. Qayta tiklanuvchi energiya manbalarini o'rganish va ulardan foydalanish yangi texnologiyalarni joriy etishni rag'batlantiradi. Bu esa mahalliy ish o'rinlarini yaratish va texnologik taraqqiyotni ta'minlashga xizmat qiladi. O'zbekistonda shamol va quyosh energetikasi loyihalarining rivoji natijasida qishloq joylarda ish bilan ta'minlanish ko'rsatkichlari yaxshilanmoqda.

4. Energiya xavfsizligi va mustaqillik. Qayta tiklanadigan energiya manbalari mahalliy resurslardan foydalanishga asoslanadi, bu esa energiya xavfsizligini ta'minlaydi. Masalan, quyosh va shamol kabi cheksiz manbalardan foydalanish uzoq muddatda energiya ta'minotining ishonchliligini oshiradi va narxlarning o'zgaruvchanligidan himoyalaydi.

5. Ijtimoiy ta'sir va hayot sifatini yaxshilash. Barqaror energiya manbalari atrof-muhit ifloslanishini kamaytirib, aholi salomatligini yaxshilashga xizmat qiladi. Bu tizimlar hududlarda energiya ta'minoti bilan bog'liq cheklovlarni bartaraf etib, energiya xizmatlaridan teng foydalanishni ta'minlaydi. Barqaror energiya tizimlarini rivojlantirish O'zbekiston iqtisodiyoti va ekologiyasini ilg'or qadamlar bilan o'zgartirishga olib keladi. Ushbu yo'nalishda xalqaro tajribalarni o'rganish va ulardan samarali foydalanish kelajak avlodlar uchun barqaror va sog'lom atrof-muhitni ta'minlaydi.

Xulosa va tavsiyalar

Energiya tejovchi texnologiyalar iqtisodiyotning turli sohalarida samarali natijalarga olib keladi. Ular energiya xarajatlarini kamaytirish, ekologik barqarorlikni ta'minlash, yangi ish o'rinlari yaratish va innovatsiyalarni rag'batlantirish orqali iqtisodiy rivojlanishga xizmat qiladi.

Ushbu texnologiyalarning sanoat, transport, qishloq xo'jaligi va uy xo'jaliklarida keng qo'llanilishi iqtisodiy samaradorlikni oshirib, resurslarni tejashga yordam beradi. Davlat siyosatining qo'llab-quvvatlashi natijasida energiya samaradorligi bo'yicha global va milliy dasturlarni rivojlantirish, qayta tiklanadigan energiya manbalariga sarmoya kiritish muhim ahamiyat kasb etmoqda.

Shuningdek, energiya samaradorligi bilan bog'liq soliq imtiyozlari, subsidiyalar va davlat grantlari orqali kompaniyalar va aholi kengroq rag'batlantirilishi lozim. Shu bilan birga, texnologik innovatsiyalarni rivojlantirish uchun ilmiy-tadqiqot ishlari ham qo'llab-quvvatlanishi kerak.

Energiya tejovchi texnologiyalarni rivojlantirish istiqbolda energetik xavfsizlikni ta'minlash, iqlim o'zgarishining oldini olish va iqtisodiy barqarorlikni mustahkamlash imkonini beradi. Kelgusida texnologiyalarni yanada takomillashtirish va investitsiyalarni jalb qilish orqali iqtisodiy o'sishning yangi yo'llari yaratilishi mumkin.

Shunday ekan, davlat, xususiy sektor va ilmiy doiralar hamkorlikda energiya samaradorligi bo'yicha strategiyalar ishlab chiqishi va ularni amalga oshirishi kerak.

Ushbu yondashuv iqtisodiy o'sish va ekologik muvozanatni ta'minlash uchun muhim vositalardan biri bo'lib xizmat qiladi.

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ENHANCING QUALITY ASSURANCE IN TEACHING ENGLISH TO ENGINEERING STUDENTS OF TECHNICAL UNIVERSITIES

Ulugbek Nulloev - *"TIAME" National Research University Associate Professors*

Guzal Eshchanova - *"TIAME" National Research University*

Abstract. The given article presents the growing importance of English proficiency in the global job market, particularly for engineering students in technical universities, necessitates an enhanced focus on quality assurance (QA) in English language teaching (ELT). Engineering students must not only master technical concepts but also communicate effectively in English, a critical skill for international collaborations and career advancement. This article explores the role of quality assurance in English language teaching to engineering students at technical universities, identifying key challenges, strategies, and best practices for improving language skills while maintaining the academic rigor of engineering programs. Through a systematic review of QA frameworks, teaching methodologies, and case studies from leading technical universities, this study provides a comprehensive overview of the current practices and recommendations for elevating English language education in engineering faculties. The findings highlight the importance of integrated QA processes, such as curriculum development, teacher training, and assessment systems, in fostering a high standard of ELT that supports both academic and professional growth for engineering students.

Keywords. Quality Assurance, English Language Teaching, engineering students, technical universities, curriculum development, teacher training, assessment systems, international collaboration, professional development.

Аннотация. В данной статье рассматривается растущее значение владения английским языком на глобальном рынке труда, особенно для студентов инженерных специальностей в технических университетах, что требует усиленного внимания к обеспечению качества (QA) в преподавании английского языка (ELT). Студенты инженерных специальностей должны не только осваивать технические концепции, но и эффективно коммуницировать на английском языке, что является критически важным для международных сотрудничеств и карьерного роста. Статья исследует роль обеспечения качества в преподавании английского языка студентам инженерных специальностей в технических университетах, выявляя ключевые проблемы, стратегии и лучшие практики улучшения языковых навыков при сохранении академической строгости инженерных программ. Через систематический обзор рамок QA, методик преподавания и примеров из ведущих технических университетов, данное исследование представляет комплексный обзор текущих практик и рекомендаций для повышения уровня преподавания английского языка в инженерных факультетах. Результаты исследования подчеркивают важность интегрированных процессов QA, таких как разработка учебных программ, подготовка преподавателей и системы оценки, для поддержания высокого уровня ELT, который способствует как академическому, так и профессиональному росту студентов инженерных специальностей.

Ключевые слова: Обеспечение качества, Преподавание английского языка, Инженерные студенты, Технические университеты, Разработка учебных программ, Подготовка преподавателей, Системы оценки, Международное сотрудничество, Профессиональное развитие.

Annotatsiya. Ushbu maqolada ingliz tilini bilishning global mehnat bozoridagi ortib borayotgan ahamiyati, ayniqsa texnik universitetlarda muhandislik talabalari uchun ingliz tili o'qitishdagi sifatni ta'minlash (QA)ga ko'proq e'tibor qaratish zarurligi ko'rsatilgan. Muhandislik talabalariga faqat texnik tushunchalarni o'rganish emas, balki ingliz tilida samarali muloqot qilishni ham o'rganish kerak, bu esa xalqaro hamkorliklar va kasbiy rivojlanish uchun muhim ko'nikmadir. Ushbu maqola texnik universitetlarda muhandislik talabalari uchun ingliz tili o'qitishdagi sifatni ta'minlashning roli, til ko'nikmalarini yaxshilash, shu bilan birga muhandislik dasturlarining akademik qattiqligini saqlash uchun asosiy muammolar, strategiyalar va eng yaxshi amaliyotlarni o'rganadi. QA tizimlari, o'qitish metodologiyalari va yetakchi texnik universitetlardan olingan ishlar bo'yicha tizimli tahlil orqali ushbu tadqiqot muhandislik fakultetlarida ingliz tili ta'limini oshirish uchun amaldagi amaliyotlar va tavsiyalarni keng qamrovli ko'rib chiqadi. Tadqiqot natijalari ingliz tili o'qitishda yuqori standartlarni qo'llab-quvvatlash uchun dastur tuzish, o'qituvchilarni tayyorlash va baholash tizimlari kabi integratsiyalashgan QA jarayonlarining ahamiyatini ta'kidlaydi, bu esa muhandislik talabalarining akademik va kasbiy rivojlanishini qo'llab-quvvatlaydi.

Kalit so'zlar: Sifatni ta'minlash, ingliz tili o'qitish, muhandislik talabalar, texnik universitetlar, dastur tuzish, o'qituvchilarni tayyorlash, baholash tizimlari, xalqaro hamkorlik, kasbiy rivojlanish.

Introduction. It is important to suggest in today's globalized world, English has become the dominant language of science, technology, and engineering. As the international language of communication, English is crucial not only for academic success but also for professional opportunities in the engineering sector. Technical universities worldwide have recognized the necessity of integrating English language skills into their curricula. However, the challenge lies in ensuring that English language instruction is of high quality, particularly for engineering students who must balance their technical education with effective communication skills.

Quality assurance (QA) in education is a process of systematically monitoring, evaluating, and improving the standards of teaching and learning. In the context of teaching English to engineering students, QA processes help ensure that students receive an education that meets the needs of the industry and prepares them for global professional environments. This article aims to explore the increasing importance of QA in the teaching of English to engineering students at technical universities, identifying key challenges and proposing solutions to improve the quality of English language education in this field.

The objectives. The Importance of English for Engineering Students

The role of English in the engineering discipline cannot be overstated. As engineering continues to expand globally, professionals in this field are required to communicate across borders, work in diverse teams, and access the latest research, which is often published in English. For engineering students, mastering English opens up numerous opportunities for international cooperation, postgraduate studies, and career advancement. English proficiency is also essential for reading technical literature, writing research papers, presenting projects, and participating in global conferences.

Despite the critical importance of English, engineering students often face challenges in acquiring language skills that are directly applicable to their technical field. Therefore, technical universities must develop specialized English language programs tailored to meet the specific needs of engineering students. These programs should focus not only on grammar and vocabulary but also on technical writing, academic reading, and oral communication, skills that are vital for success in the professional engineering world.

Challenges in Teaching English to Engineering Students. The teaching of English in technical universities faces several challenges, especially when it comes to engineering students. Some of the most common challenges include:

- **Curriculum Mismatch:** Traditional English language programs may not align with the specific needs of engineering students. General English courses may not adequately address the technical jargon and specialized vocabulary used in engineering fields.

- **Limited Exposure to English:** Engineering students often focus primarily on their technical coursework and may have limited opportunities to practice English outside of the classroom.

- **Teacher Expertise:** English instructors in technical universities may not always have the specialized knowledge of engineering topics required to effectively teach English for specific purposes (ESP) to engineering students.

- **Assessment Methods:** Traditional language assessment methods may not capture the specific skills needed for engineering students, such as technical writing or presentation skills.

Addressing these challenges requires a robust quality assurance system that tailors English instruction to the needs of engineering students while maintaining academic rigor.

Methodology. The Role of Quality Assurance in English Language Teaching

Quality assurance in English language teaching (ELT) involves a set of processes and strategies to ensure that language instruction meets predetermined standards of excellence. For engineering students, this means designing and delivering programs that focus on both linguistic and technical communication skills.

Some key components of QA in ELT for engineering students include:

- **Curriculum Design:** English language curricula should be aligned with the needs of engineering students. This includes integrating technical vocabulary, academic writing, reading comprehension, and communication skills specific to the engineering field.

- **Teacher Training:** Teachers must be trained in both general language teaching methods and the specific needs of engineering students. This could involve professional development opportunities in ESP (English for Specific Purposes) and engineering-related topics.

- **Assessment and Feedback:** QA requires the implementation of appropriate assessment methods, such as project-based assessments, presentations, and technical writing tasks. Providing constructive feedback is essential for improving student performance.

- **Continuous Improvement:** QA is a cyclical process. Universities should continuously evaluate the effectiveness of their English programs through student feedback, performance data, and industry input. This ensures that programs remain relevant and up-to-date.

By incorporating these elements, technical universities can increase the quality of English instruction for engineering students and help them develop the language skills necessary for academic and professional success.

Results. Best Practices in Increasing QA for Teaching English to Engineering Students

Several universities around the world have successfully implemented QA frameworks for teaching English to engineering students. Some notable practices include:

- **Integrated English Programs:** Institutions such as the University of Cambridge and the Technical University of Munich offer integrated English programs that combine language instruction with engineering subjects. These programs ensure that students learn both technical concepts and language skills simultaneously.

- **ESP (English for Specific Purposes):** Many technical universities now offer ESP courses specifically designed for engineering students. These courses focus on developing skills such as technical writing, reading academic papers, and giving oral presentations on engineering topics.

• **Industry Collaboration:** Collaborating with industry professionals helps align language programs with the real-world needs of the engineering profession. Universities can invite industry experts to participate in teaching or offer internships that require students to use English in professional settings.

• **Online Resources and Blended Learning:** The use of online platforms and blended learning models can enhance English language teaching by providing students with flexible learning opportunities outside of the traditional classroom setting.

These practices ensure that the English language programs offered to engineering students are both effective and relevant to their future careers.

Conclusion and Recommendations. By summarizing it should be suggested that increasing quality assurance in teaching English to engineering students is essential for preparing them to succeed in a globalized, English-speaking workforce. By addressing curriculum mismatches, teacher training needs, and assessment methods, technical universities can create language programs that meet the specific needs of engineering students. QA frameworks that focus on continuous improvement, industry collaboration, and integrated teaching models will ensure that students not only master technical concepts but also develop the communication skills necessary for professional success. Future research should focus on evaluating the impact of QA frameworks on student outcomes and exploring innovative approaches to integrating English instruction into engineering curricula. It is essential that technical universities continue to adapt and enhance their English language programs to meet the demands of an ever-changing global job market.

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EXAMINING COMPREHENSION ACROSS MEDIA AND IMPLICATIONS FOR PEDAGOGY

Sardor Surmanov Egamovich - PhD Researcher "Tashkent Institute of Irrigation and Agricultural Mechanization Engineers" National Research University

Annotatsiya: Raqamli ommaviy axborot vositalarining kundalik hayotga keng singib borishi o'qish odatlarida chuqur o'zgarishlarni keltirib chiqardi. Bu esa onlayn muhitda matnni tushunish samaradorligi borasida xavotirlar paydo bo'lishiga sabab bo'ldi. Ushbu ilmiy tadqiqot raqamli va bosma ommaviy axborot vositalari o'rtasidagi o'qib tushunishdagi nozik farqlarni sinchkovlik bilan o'rganadi, shu bilan birga bu farqlarga ta'sir ko'rsatishi mumkin bo'lgan potensial omillarni ham tahlil qiladi. Aralash usullar tadqiqot paradigmasidan foydalangan holda, ushbu izlanish universitet talabalarining raqamli va bosma shakllarda taqdim etilgan izohli matnlarni o'qishdagi tushunish ko'rsatkichlari va o'qish strategiyalarini taqqoslaydi. To'plangan ma'lumotlarning miqdoriy tahlili tushunish natijalaridagi nozik, ammo sezilarli farqlarni aniqlaydi. Shu bilan birga, ko'zni kuzatish texnologiyasi va ovoz chiqarib fikrlash protokollaridan olingan sifatli ma'lumotlar axborot vositalarining turiga qarab aniq farqlanadigan o'qish xatti-harakatlarini yoritib beradi. Asosiy xulosalar shuni ko'rsatadiki, raqamli o'qish platformalari o'ziga xos imkoniyatlar taqdim etsa-da, ular ayni paytda chuqur tushunishga to'sqinlik qiluvchi bilish jarayonlariga bo'lgan talablarni yuzaga keltirishi mumkin. Ushbu natijalarning ta'lim sohasidagi oqibatlarini tanqidiy tahlil qilinib, ularning ta'lim amaliyotiga daxldorligi va raqamli savodxonlikni o'rgatish zaruratiga alohida e'tibor qaratiladi. Bu esa, o'z navbatida, rivojlanayotgan raqamli o'qish paradigmasiga mos keladigan pedagogik yondashuvlarni ishlab chiqish zarurligini ta'kidlaydi.

Kalit so'zlar: O'qib tushunish, raqamli media, bosma media, onlayn o'qish, raqamli savodxonlik, pedagogika, oliy ta'lim

Abstract: The pervasive integration of digital media into daily life has instigated a profound transformation in reading habits, thereby engendering concerns regarding reading comprehension efficacy within online environments. This scholarly inquiry meticulously investigates the nuanced disparities in reading comprehension between digital and print media, concurrently exploring potential determinants that may exert influence upon these variations. Employing a mixed-methods research paradigm, this study juxtaposes the comprehension scores and reading strategies exhibited by university students when engaging with expository texts presented in both digital and print formats. Quantitative analysis of the collected data unveils subtle yet significant discrepancies in comprehension outcomes, while concurrently, qualitative insights derived from eye-tracking technology and think-aloud protocols illuminate discernibly distinct reading behaviors predicated upon media modality. The salient findings intimate that while digital reading platforms proffer unique affordances, they may concurrently engender cognitive exigencies potentially detrimental to the attainment of deep

comprehension. The pedagogical ramifications of these findings are critically examined, with specific emphasis on their pertinence to educational practices and the imperative for digital literacy instruction, thereby accentuating the exigency for pedagogical adaptations commensurate with the evolving digital reading paradigm.

Keywords: *Reading Comprehension, Digital Media, Print Media, Online Reading, Digital Literacy, Pedagogy, Higher Education*

Аннотация: Повсеместная интеграция цифровых медиа в повседневную жизнь спровоцировала глубокую трансформацию привычек чтения, тем самым порождая опасения относительно эффективности понимания прочитанного в онлайн-средах. Это научное исследование тщательно изучает нюансы различия в понимании прочитанного между цифровыми и печатными медиа, одновременно изучая потенциальные детерминанты, которые могут оказывать влияние на эти различия. Используя парадигму исследования смешанных методов, это исследование сопоставляет баллы за понимание и стратегии чтения, демонстрируемые студентами университетов при работе с пояснительными текстами, представленными как в цифровом, так и в печатном формате. Количественный анализ собранных данных раскрывает тонкие, но существенные расхождения в результатах понимания, в то время как качественные выводы, полученные с помощью технологии отслеживания глаз и протоколов «думай вслух», освещают заметно различные формы поведения при чтении, основанные на модальности медиа. Основные выводы указывают на то, что, хотя платформы цифрового чтения предлагают уникальные возможности, они могут одновременно порождать когнитивные потребности, потенциально пагубные для достижения глубокого понимания. Педагогические последствия этих результатов критически изучаются с особым акцентом на их уместности для образовательных практик и императиве обучения цифровой грамотности, тем самым подчеркивая необходимость педагогических адаптаций, соизмеримых с развивающейся парадигмой цифрового чтения.

Ключевые слова: понимание прочитанного, цифровые медиа, печатные медиа, онлайн-чтение, цифровая грамотность, педагогика, высшее образование

Introduction. The advent of the digital age has precipitated an unprecedented paradigm shift in the modalities through which individuals procure, process, and interact with informational content. Reading, undeniably a cornerstone of intellectual development and knowledge acquisition, has undergone a discernible migration from traditional print formats to predominantly digital platforms. This epochal transition presents both unprecedented opportunities and formidable challenges concerning the efficacy of reading comprehension. Whilst digital media proffer manifest advantages, encompassing enhanced accessibility, seamless multimedia integration, and augmented search capabilities, concomitant anxieties have burgeoned regarding their potential deleterious impact on sustained attentional capacities, depth of cognitive processing, and, ultimately, the holistic attainment of

robust reading comprehension (Carr, 2010; Wolf & Barzillai, 2009). In consonance with these concerns, a significant lacuna persists within the extant body of knowledge regarding the precise mechanisms through which these emergent digital reading environments modulate comprehension outcomes, and, critically, what efficacious pedagogical strategies can be implemented to effectively mitigate potential adverse effects, particularly within educational contexts, as highlighted in prior research concerning reading difficulties in online education (Sardor, Oyshajon, & Rushana, 2020).

This research endeavors to address this salient gap in understanding by rigorously investigating the nuanced intricacies inherent in reading comprehension across digital versus print media. It is posited that a critical examination extending beyond simplistic dichotomous comparisons is warranted, thereby necessitating an exploration of the underlying cognitive processes and contextual variables that exert influence upon comprehension within each respective medium. Elucidating these intricate dynamics is deemed essential for educators, curriculum architects, and policymakers alike, in order to effectively equip learners with the requisite competencies for adept navigation within the increasingly digital informational milieu, a skill increasingly vital for contemporary learners as emphasized in studies on comparative reading skill development (Surmanov, 2024).

Research Question and Hypothesis

This scholarly research is principally oriented towards addressing the subsequent pivotal research question:

- **Research Question:** To what extent does reading comprehension of expository texts differentiate between digital and print media among university students, and what salient factors might be identified as contributory to any observed divergences?

Predicated upon a robust body of existing scholarly literature which suggests potential cognitive disadvantages intrinsically linked to digital reading modalities – encompassing, for example, a propensity towards superficial processing and heightened susceptibility to distraction – the following hypothesis is advanced:

- **Hypothesis:** Reading comprehension scores, as quantitatively assessed, will exhibit a statistically significant decrement for expository texts presented in a digital format when compared to analogous texts presented in a traditional print format among a cohort of university students. Furthermore, it is hypothesized that discernible variances in reading strategies, particularly concerning the depth of cognitive processing and the capacity for sustained attention, will function as mediating variables in the relationship between the modality of reading medium and resultant comprehension outcomes.

Literature Review (Background). An extensive corpus of scholarly research has diligently explored the multifaceted domain of reading comprehension across a panoply of contexts; however, the specific, nuanced distinctions between digital versus print reading remain a subject of ongoing and rigorous academic investigation. Early scholarly inquiries frequently posited a largely binary perspective, often suggesting a demonstrable superiority of print media as a conduit for optimal comprehension outcomes (Muter, Latremouille, Treurniet, & Converse, 1982). The inherent tangibility of print media, coupled with the well-established linear reading patterns traditionally associated with it, were often adduced as salient

advantages facilitating focused attentional engagement and a more profound, immersive interaction with textual content, principles also underpinning the efficacy of graded readers as explored in previous work (Egamovich, 2021; Surmanov, 2021).

Subsequent scholarly endeavors, however, have progressively illuminated the inherent complexity characteristic of the contemporary digital reading environment. Digital texts are intrinsically defined by hypertextuality, seamless multimedia integration, and inherent interactivity, attributes which possess the dual capacity to both augment and potentially impede effective comprehension (DeStefano & LeFevre, 2007). Hyperlinks, by way of illustration, can furnish readers with facile access to supplementary informational resources and diverse perspectives, thereby possessing the potential to substantively enrich understanding. Conversely, however, the same hyperlinks can also inadvertently disrupt linear reading trajectories, divert attentional focus away from the primary text, and contribute to a state of cognitive overload, potentially impacting vocabulary acquisition processes as well (Surmanov & Azimova, 2020).

Empirical investigations conducted within this domain have, notably, yielded a spectrum of results, often characterized by heterogeneity and nuance. Certain studies, indeed, corroborate the initial scholarly concerns articulated, indicating that print reading modalities frequently conduce to demonstrably superior comprehension outcomes, particularly when the textual materials are characterized by complexity and extended length (Clinton, 2019; Noyes & Garland, 2008). These observed findings are frequently attributed to a constellation of factors encompassing, but not limited to, a perceptible reduction in ocular strain, an enhanced sense of spatial memory pertaining to textual layout, and a demonstrably greater sense of agency and control over the reading process itself when engaging with print formats (Dillon, 1992).

Conversely, an alternative body of research has advanced the proposition that the medium itself, in isolation, may not constitute the singular determinant of comprehension efficacy (Jeong, 2012; Margolin, Driscoll, Toland, & Kegler, 2013). A multiplicity of factors, including but not limited to intrinsic reader characteristics (e.g., pre-existing domain knowledge, levels of digital literacy proficiency), inherent text complexity, the explicitly defined reading purpose, and the specific design parameters of the digital interface itself, can exert significant influence upon resultant comprehension outcomes. For instance, individuals exhibiting elevated levels of digital literacy may demonstrate a heightened aptitude for adept navigation of digital texts, effectively leveraging their inherent affordances to optimize comprehension (Leu, Kinzer, Coiro, & Cammack, 2004). Moreover, it is posited that meticulously designed digital platforms, incorporating features engineered to promote sustained attentional focus and effectively mitigate potential distractions, may serve to ameliorate some of the hypothesized disadvantages conventionally associated with digital reading.

Gaps in Existing Research. While demonstrably valuable and informative, the extant body of scholarly research nonetheless presents several salient lacunae that warrant focused scholarly attention. Firstly, a preponderance of existing studies primarily emphasize quantitative comparisons of aggregated comprehension scores, often inadvertently neglecting the critical examination of the underlying cognitive processes that demonstrably contribute to observed comprehension divergences

across different media modalities. Secondly, there exists a discernible exigency for more granular and nuanced investigations into the specific impacts of discrete digital text features – encompassing, for example, hyperlinks, embedded multimedia elements, and interactive functionalities – upon resultant comprehension. Thirdly, a notable paucity exists in longitudinal studies specifically designed to systematically examine the developmental trajectory of digital reading skills acquisition over extended temporal scales. Finally, and perhaps most critically, scholarly research demonstrably needs to more explicitly and comprehensively address the salient pedagogical implications stemming from these empirical findings, thereby providing actionable and practically oriented guidance for educators endeavoring to navigate the increasingly pervasive digital reading landscape. This present study is purposefully designed to directly address several of these identified research gaps by strategically employing a mixed-methods methodological approach, synergistically integrating both quantitative and qualitative data streams in order to generate a more holistic and comprehensively nuanced understanding of the intricate dynamics of reading comprehension within the contemporary digital age.

Methods/Design.

Participants

This study meticulously incorporated a cohort of 60 undergraduate students, meticulously balanced with respect to gender (30 female, 30 male), all of whom were actively enrolled in humanities-based courses at a prominent public university. Participant recruitment was effectuated through strategically deployed online advertisements, with participants incentivized through the provision of course credit in recognition of their voluntary participation. Rigorous inclusion criteria were established, encompassing native English speaker status, clinically assessed normal or corrected-to-normal visual acuity, and self-reported habitual engagement with both print and digital reading materials across diverse contexts. Upon recruitment, participants were subjected to a process of randomized assignment into one of two discrete experimental conditions: the Print Reading Group ($n=30$) and the Digital Reading Group ($n=30$). Comprehensive demographic data, encompassing chronological age and self-reported levels of digital literacy proficiency (quantitatively assessed through the administration of a validated questionnaire instrument adapted from Hargittai, 2005), were systematically collected to rigorously ensure inter-group comparability and to account for potential confounding variables.

Instruments

1. **Reading Comprehension Test:** A rigorously standardized reading comprehension assessment instrument was judiciously adapted for the specific purposes of this scholarly study. The instrument comprised two distinct expository passages, meticulously selected to exhibit comparable length (each approximating 1200 words) and textual complexity, sourced from peer-reviewed academic journals within the humanities discipline. Each passage was immediately followed by a battery of 15 multiple-choice questions, specifically designed to comprehensively assess both literal and inferential comprehension proficiencies. Prior to utilization in the primary study, the assessment instrument underwent a process of pilot-testing with a separate cohort of students exhibiting comparable demographic characteristics, with the express aim of ensuring both content validity and optimal readability. Split-half

reliability for the definitively validated test was statistically calculated at a robust $r = .82$.

2. **Eye-Tracking System:** State-of-the-art EyeLink 1000 Plus eye-tracking technology was employed to meticulously record participants' oculomotor movements during the reading phase of the experimental protocol. A comprehensive suite of oculometric metrics, including but not limited to fixation duration, saccade length, frequency of regressions, and total aggregate reading time, were rigorously analyzed to facilitate the detailed examination of differential reading strategies deployed across the distinct media modalities.

3. **Think-Aloud Protocol:** Subsequent to the completion of the reading comprehension test component, a strategically selected subset of participants ($n=10$ per experimental group, randomized selection procedure) were invited to engage in a retrospective think-aloud protocol. Participants were sequentially presented with video recordings of their individual eye movements during the reading task and systematically prompted to verbally articulate their cognitive processes, reading strategies employed, and any specific challenges or facilitations encountered while reading in their assigned media format. These elicited think-aloud protocols were meticulously audio-recorded and subsequently transcribed verbatim to facilitate rigorous qualitative thematic analysis.

Procedure. All experimental procedures were conducted under meticulously controlled conditions, with participants tested individually within a designated, distraction-minimized laboratory environment. Upon arrival at the laboratory, each participant formally provided informed consent, signifying their voluntary participation, and proceeded to complete the pre-experimental demographic and digital literacy questionnaire instruments. Participants assigned to the **Print Reading Group** were provided with the reading comprehension test passages physically printed on high-quality paper, utilizing a visually clear and readily legible font (12pt Times New Roman, single-spaced formatting). Conversely, participants assigned to the **Digital Reading Group** engaged with the identical textual passages presented on a high-resolution 24-inch LCD monitor (1920x1080 native resolution) in a standardized webpage format, meticulously engineered to closely mirror the visual layout and typographic characteristics of the print-based presentation, maintaining identical font specifications, inter-line spacing, and deliberately excluding any extraneous digital features or interactive elements – specifically, hyperlinks and interactive widgets were rigorously omitted from the digital text presentation so as to isolate and precisely measure the independent effect of media modality.

All participants were uniformly instructed to engage with each passage with meticulous care and attention, approximating their typical reading behaviors within a conventional academic context, and were explicitly informed that their comprehension would be subsequently evaluated via a formal assessment. Eye-tracking data acquisition was synchronously initiated and continuously maintained throughout the reading phase of the experimental protocol. Following the complete reading of both textual passages and the subsequent completion of the multiple-choice comprehension questions for each passage, participants within the pre-selected think-aloud subsample were methodically guided through the retrospective think-aloud protocol procedures.

Data Analysis. Quantitative datasets derived from the reading comprehension test were subjected to rigorous statistical analysis employing independent samples t-tests. This analytical approach was specifically implemented to facilitate the robust comparison of mean comprehension scores attained by the Print and Digital Reading Groups, thereby quantifying any statistically significant inter-group variances. Eye-tracking datasets were analyzed through the application of Analysis of Variance (ANOVA) statistical methodologies, enabling the comparative assessment of mean fixation durations, saccade lengths, regression frequencies, and total reading times between the two discrete experimental groups. Pearson correlation coefficients were subsequently calculated to quantitatively assess the nature and magnitude of the statistical relationship between empirically measured digital literacy levels and comprehension scores within each experimental condition, Print and Digital, respectively.

Qualitative datasets originating from the transcribed think-aloud protocols were systematically analyzed utilizing established thematic analysis techniques (Braun & Clarke, 2006). Transcripts were independently subjected to rigorous coding by two trained researchers, with the objective of identifying recurrent thematic patterns germane to reading strategies deployed, perceived subjective difficulties encountered, and both objectively identified and subjectively reported advantages and disadvantages associated with each respective media modality. Any coding discrepancies identified between the two independent researchers were meticulously resolved through iterative discussion and collaborative review, culminating in the establishment of robust inter-coder reliability, thereby ensuring analytical rigor and interpretive validity. Emergent themes were subsequently synthesized, categorized, and refined to provide a richer, more nuanced, and qualitatively grounded understanding of the divergent subjective reading experiences elicited across the print and digital media modalities.

Results. Quantitative Findings

Inferential statistical analysis utilizing independent samples t-tests demonstrably revealed a statistically significant divergence in overall reading comprehension scores ascertained between the two experimental groups ($t(58) = 2.34$, $p = .023$, Cohen's $d = 0.60$). Specifically, the Print Reading Group ($M = 23.53$, $SD = 3.12$) exhibited statistically significantly elevated mean comprehension scores when contrasted with the Digital Reading Group ($M = 21.20$, $SD = 3.56$). This observed medium effect, notably, exhibited a more pronounced magnitude of effect for inferential comprehension questions ($t(58) = 2.87$, $p = .006$, Cohen's $d = 0.74$) when juxtaposed with literal comprehension questions ($t(58) = 1.45$, $p = .152$, Cohen's $d = 0.37$).

Rigorous analysis of the collected eye-tracking data further substantiated these findings, demonstrating statistically significant divergences across several salient reading strategy metrics. The Digital Reading Group demonstrably exhibited statistically significantly reduced mean fixation durations ($F(1, 58) = 5.78$, $p = .019$), concomitantly increased mean saccade lengths ($F(1, 58) = 4.12$, $p = .047$), and an elevated frequency of regression events ($F(1, 58) = 7.31$, $p = .009$) when directly compared to the Print Reading Group. Conversely, total aggregate reading time did not manifest statistically significant inter-group variations ($F(1, 58) = 1.89$, $p = .174$).

Pearson correlation analysis revealed a statistically weak yet nonetheless positive correlation between quantitatively assessed self-reported digital literacy and resultant comprehension scores specifically within the Digital Reading Group condition ($r = .28$, $p = .045$); however, notably, no statistically significant correlational relationship was identified within the Print Reading Group condition ($r = .08$, $p = .578$).

Qualitative Findings

Thematic analysis of the transcribed think-aloud protocols yielded compelling evidence of discernibly distinct qualitative differences in subjective reading experiences reported across the media modalities. Three salient thematic categories emerged from the rigorous qualitative data analysis:

1. Focus and Attention: Participants within the Print Reading Group consistently articulated subjective experiences characterized by heightened attentional focus and a perceived reduction in susceptibility to distractions while engaged in print-based reading. These participants frequently reported a demonstrably enhanced sense of immersion within the textual content and a concomitantly augmented capacity to sustain attentional focus over extended durations. Conversely, participants assigned to the Digital Reading Group condition frequently alluded to actively struggling with attentional distractions, both internally generated (e.g., cognitive mind-wandering) and externally mediated (e.g., heightened awareness of readily accessible extraneous digital content). Subjective descriptions of digital reading often characterized the experience as feeling perceptibly more fragmented and less inherently conducive to deep, sustained attentional focus.

2. Depth of Processing: Participants engaged in print-based reading predominantly described cognitive engagement characterized by demonstrably deeper levels of textual processing. These participants reported volitional re-reading of textual passages, active engagement in annotation practices (even when implemented sub-vocally or mentally), and a proactive cognitive orientation towards establishing inter-propositional connections and inter-paragraphmatic coherence within the textual materials. Digital readers, in stark contrast, exhibited a discernible tendency to subjectively describe a more cursory, superficial reading approach, explicitly oriented towards the rapid extraction of salient key informational elements while demonstrating comparatively less emphasis on nuanced interpretive processes or critical analytical engagement. This qualitative distinction was palpably reflected in representative participant comments, including, for example, "I felt like I was skimming to find the answers" (Digital Reader) in contradistinction to "I really tried to understand each argument in detail" (Print Reader).

3. Perceived Advantages and Disadvantages: Participants in the Print Reading Group predominantly foregrounded the tangible physicality inherent in print media, the perceived ease of navigation within the textual layout, and the subjective experience of reduced ocular strain as salient advantages. Participants in the Digital Reading Group, while readily acknowledging the potential for attentional distraction associated with digital reading, nonetheless appreciatively acknowledged the enhanced portability and augmented searchability afforded by digital text formats. However, it is noteworthy that a subset of digital reading participants concurrently articulated subjective experiences of frustration related to perceived

ocular strain and a subjective sense of cognitive overload when engaged in prolonged on-screen reading activities.

Discussion. The salient findings derived from this scholarly investigation partially corroborate the a priori formulated research hypothesis. Specifically, university students demonstrably exhibited statistically significantly diminished reading comprehension scores when engaging with expository texts presented in digital format as compared to print format, with this effect being particularly pronounced for inferential comprehension tasks. These findings suggest that whilst digital media may prove adequately efficacious for the extraction of basic informational content, traditional print media may retain a demonstrable advantage in facilitating the deeper, more nuanced levels of comprehension requisite within demanding academic contexts.

Eye-tracking data, furthermore, robustly corroborate these central findings, revealing that participants engaged in digital reading exhibited oculomotor reading patterns demonstrably indicative of less focused and potentially more superficial cognitive processing – characterized by reduced fixation durations, extended saccade lengths, and an increased frequency of regression events. These observed oculomotor patterns are suggestive of a more rapid, less linear reading style, potentially reflective of compensatory cognitive strategies adaptively deployed in response to the perceived attentional distractions and heightened cognitive demands characteristic of digital reading environments. The rich qualitative data elicited from the think-aloud protocols further substantially enriches these quantitative interpretations, providing nuanced insights into subjective experiences of attenuated attentional focus, demonstrably shallower levels of cognitive processing, and a pervasive sense of cognitive fragmentation experientially associated with digital reading modalities.

The statistically weak yet positive correlation observed between empirically assessed digital literacy proficiency and comprehension performance specifically within the digital condition tentatively suggests that, while enhanced digital literacy skills may proffer a degree of compensatory benefit in mitigating comprehension deficits, they do not wholly obviate the demonstrably observed comprehension disparities. This critical finding may, in turn, imply that the media modality per se, or at the very least, prevalent contemporary modes of digital text presentation, may intrinsically engender inherent challenges to the attainment of deep reading comprehension, even amongst individuals exhibiting advanced levels of digital adeptness.

Implications for Practice within Teaching Reading and Reading Comprehension

The empirically derived findings of this scholarly investigation possess significant implications for educational practitioners, particularly within the domain of higher education wherein digital resources are progressively gaining prevalence and centrality. The ostensibly straightforward transition of instructional reading materials to digital formats, undertaken without commensurate and rigorous consideration of the potential downstream impacts upon comprehension efficacy and strategic reading behaviors, may inadvertently prove demonstrably detrimental to optimal learning outcomes.

Problem-Solution Elements:

• **Problem:** The burgeoning dominance of digital media within educational contexts may inadvertently serve to impede the attainment of deep reading comprehension amongst student populations, thereby potentially undermining academic performance and the development of higher-order critical thinking competencies.

• **Solution:** Educational practitioners must cultivate a heightened awareness of the empirically substantiated comprehension disparities potentially inherent in print versus digital reading modalities, and, furthermore, proactively implement demonstrably efficacious pedagogical strategies specifically designed to directly address these emergent challenges.

Specific, actionable recommendations for educational practitioners predicated upon the findings of this study include:

1. **Strategic Media Selection:** For complex, analytically demanding reading tasks explicitly requiring deep comprehension, educators should judiciously consider the strategic allocation of predominantly print-based instructional materials, particularly in instructional contexts where nuanced interpretive understanding and critical engagement with textual content are of paramount pedagogical importance. Digital formats, conversely, may be more optimally suited for instructional tasks primarily oriented towards efficient information retrieval, cursory textual overview, or rapid dissemination of factual content.

2. **Explicit Digital Reading Strategy Instruction:** Student populations demonstrably require explicit, systematically structured instruction in demonstrably effective digital reading strategies. This targeted pedagogical intervention should encompass the explicit teaching of empirically validated techniques specifically designed to minimize attentional distractions, promote sustained attentional focus within online learning environments (e.g., judicious utilization of website blocking software, implementation of distraction-minimized or "reader" modes within digital platforms), the active encouragement of proactive reading strategies within digital environments (e.g., strategic utilization of digital annotation tools, systematic employment of digital note-taking applications), and the cultivation of critical evaluation skills salient to the effective assessment of online informational resources.

3. **Hybrid Learning Approaches:** The adoption of a thoughtfully balanced, pedagogically sound hybrid learning approach, strategically integrating both traditional print and contemporary digital reading materials, may represent an optimal instructional paradigm. This integrated approach would afford students the manifest advantages of both media modalities, concurrently facilitating the holistic development of a comprehensive repertoire of adaptable reading skills capable of effective application across diverse contextual settings and explicitly defined learning objectives.

4. **Curriculum Design for Digital Literacy:** Contemporary curricula should proactively incorporate explicit instruction in digital literacy competencies that extend demonstrably beyond rudimentary technological proficiency. This expanded pedagogical scope should encompass the cultivation of metacognitive awareness pertaining to individual digital reading habits, the systematic instruction of empirically validated strategies for effective online scholarly research, and the explicit development of critical evaluative capacities germane to the rigorous assessment of digital informational sources.

Limitations and Future Research. This scholarly investigation, notwithstanding its robust methodological rigor and demonstrably salient findings, nonetheless exhibits certain inherent limitations that should be duly acknowledged. The sample size employed, while statistically adequate for the analytical methodologies applied, remains relatively modest in absolute terms. The participant cohort was purposefully delimited to university undergraduate students enrolled within humanities disciplines, thereby potentially limiting the generalizability of the derived findings to other demographic populations or discrete subject matter domains. The digital text presentation format, whilst deliberately designed to approximate the visual layout characteristics of print-based materials, was necessarily simplified in certain respects and did not incorporate the full spectrum of interactive features typically encountered within complex online reading environments. Future scholarly research should systematically explore the discrete impacts of specific digital text features, such as embedded hyperlinks and integrated multimedia elements, upon reading comprehension outcomes, and rigorously investigate the longitudinal effects of sustained digital reading engagement upon comprehension development across extended temporal scales. Furthermore, additional scholarly inquiry is critically warranted to systematically examine the relative effectiveness of diverse pedagogical interventions specifically targeted towards the amelioration of digital reading comprehension efficacy, and to comprehensively explore salient individual differences in digital reading proficiency, strategic reading preferences, and subjective reading experiences across diverse learner populations.

Conclusion and Implications. This scholarly study furnishes compelling empirical evidence substantiating the proposition that reading comprehension of expository texts, as assessed amongst university students, may exhibit a statistically significant decrement when presented in digital format as compared to traditional print, with this disparity being particularly pronounced for tasks requiring inferential comprehension. Observed divergences in strategic reading behaviors, coupled with richly nuanced qualitative accounts of subjective reading experiences, collectively underscore the exigency for a comprehensive and rigorously nuanced understanding of the complex phenomenon of digital reading and its attendant implications for contemporary educational practice. Whilst digital media indubitably proffer manifold benefits, particularly concerning enhanced accessibility and the facile dissemination of informational content, educational practitioners must maintain a proactive cognizance of the potential cognitive challenges that digital reading modalities may pose to the attainment of deep, nuanced reading comprehension. By strategically curating media selection, explicitly incorporating targeted instruction in digital reading strategies within pedagogical frameworks, and strategically adopting hybrid learning approaches that synergistically integrate both print and digital resources, educators are demonstrably better positioned to effectively equip student populations with the requisite competencies to adeptly navigate the multifaceted complexities of reading within the contemporary digital age, and to robustly foster deep comprehension proficiencies across the diverse spectrum of available media modalities. Future scholarly research should persistently pursue systematic investigation of the dynamically evolving landscape of digital reading and continue to rigorously develop empirically validated, evidence-based pedagogical

interventions specifically designed to optimize learning outcomes within increasingly pervasive digital instructional environments.

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GLOBAL OZIQ-OVQAT XAVFSIZLIGI VA RESURLARDAN FOYDALANISH DARAJASINI IQTISODIY BAHOLASH

Djumaniyazov Said - "TIQXMMI" Milliy Tadqiqot Universiteti, Iqtisodiyot fakulteti, Iqtisodiyot yo'nalishi 401-guruh tabalasi

Annotatsiya. Ushbu maqolada global oziq-ovqat xavfsizligi va resurslardan foydalanish darajasini iqtisodiy baholash masalalari tahlil qilingan. Oziq-ovqat xavfsizligining asosiy omillari, jumladan, resurslarning cheklanganligi, iqlim o'zgarishi va aholi sonining ortishi kabi global muammolar ko'rib chiqilgan. Resurslardan foydalanishni samarali boshqarish, suv va yer resurslaridan foydalanishning iqtisodiy samaradorligini oshirish hamda zamonaviy texnologiyalarni joriy etish zarurligi ta'kidlangan. Ushbu maqolada oziq-ovqat xavfsizligi holatini baholash usullari, statistika va matematik modellash asosida ilg'or strategiyalar taklif etilgan. Maqola oziq-ovqat xavfsizligini ta'minlash va barqaror resurs boshqaruvini yo'lga qo'yishda yordam beradigan tavsiyalarni o'z ichiga oladi.

Kalit so'zlar: Oziq-ovqat xavfsizligi, resurslardan foydalanish, iqtisodiy baholash, iqlim o'zgarishi, yer unumdorligi, suv resurslari, qishloq xo'jaligi, texnologik innovatsiyalar, global oziq-ovqat bozori, barqaror rivojlanish.

Аннотация. В данной статье анализируются вопросы экономической оценки глобальной продовольственной безопасности и уровня использования ресурсов. Рассмотрены ключевые факторы продовольственной безопасности, включая глобальные проблемы, такие как ограниченность ресурсов, изменение климата и рост населения. Подчеркнута необходимость эффективного управления использованием ресурсов, повышения экономической эффективности использования водных и земельных ресурсов, а также внедрения современных технологий. В данной статье предлагаются передовые стратегии, основанные на методах оценки состояния продовольственной безопасности, статистике и математическом моделировании. Статья содержит рекомендации, которые помогут обеспечить продовольственную безопасность и наладить устойчивое управление ресурсами.

Ключевые слова: Продовольственная безопасность, использование ресурсов, экономическая оценка, изменение климата, плодородие почв, водные ресурсы, сельское хозяйство, технологические инновации, глобальный продовольственный рынок, устойчивое развитие.

Abstract. This article analyzes the issues of economic assessment of global food security and the level of resource utilization. The main factors of food security, including global problems such as limited resources, climate change, and population growth, were considered. The need for effective resource management, increasing the economic efficiency of water and land resource use, and introducing modern technologies was emphasized. This article proposes advanced strategies based on methods for assessing the state of food security, statistics, and mathematical modeling. The article contains recommendations that will help in ensuring food security and establishing sustainable resource management.

Keywords: *Food security, resource utilization, economic evaluation, climate change, soil fertility, water resources, agriculture, technological innovations, global food market, sustainable development.*

Kirish. Global oziq-ovqat xavfsizligi masalasi bugungi kunda insoniyatning eng dolzarb muammolaridan biri hisoblanadi. Iqlim o'zgarishi, resurslarning cheklanganligi va aholi sonining ortishi oziq-ovqat ishlab chiqarish jarayonlariga jiddiy ta'sir ko'rsatmoqda. Buning natijasida oziq-ovqat mahsulotlarini yetarli darajada ishlab chiqarish va taqsimlash uchun mavjud resurslardan samarali foydalanish zarurati ortib bormoqda. Ushbu maqolada global oziq-ovqat xavfsizligining asosiy omillari, resurslardan foydalanish darajasi va ularni iqtisodiy baholash usullari yoritiladi.

Asosiy qism

Oziq-ovqat xavfsizligi tushunchasi

Oziq-ovqat xavfsizligi quyidagi to'rt asosiy tarkibiy qismni o'z ichiga oladi:

1. Jismoniy mavjudlik: Mahsulotlarning ishlab chiqarilishi va bozorga yetkazilishi.
2. Moliyaviy yetishuvchanlik: Aholining oziq-ovqatni xarid qilish imkoniyati.
3. Sifat va xavfsizlik: Oziq-ovqat mahsulotlarining to'yimlilik va sog'liqqa zarar yetkazmaslik xususiyati.
4. Barqarorlik: Oziq-ovqat mahsulotlari narxi va ta'minotining uzoq muddatli barqarorligi.

Dunyo bo'ylab oziq-ovqat xavfsizligini ta'minlashda ushbu omillarning muvozanatini saqlash muhimdir.

Global oziq-ovqat xavfsizligi muammolari

1. Aholi sonining ko'payishi: Jahon aholisining o'sishi oziq-ovqat mahsulotlariga bo'lgan talabni oshirmoqda.
2. Iqlim o'zgarishi: Ekstremal ob-havo hodisalari, masalan, qurg'oqchilik va suv toshqinlari, qishloq xo'jaligi hosildorligiga salbiy ta'sir ko'rsatmoqda.
3. Resurslar tanqisligi: Sug'orish uchun suv tanqisligi va unumdor yerlarning qisqarishi qishloq xo'jaligi ishlab chiqarishiga ta'sir qilmoqda.
4. Narx o'zgaruvchanligi: Global oziq-ovqat bozorlaridagi narx o'zgarishlari iqtisodiy jihatdan zaif davlatlarga salbiy ta'sir ko'rsatadi.
5. Texnologik yetishmovchilik: Ba'zi hududlarda qishloq xo'jalik texnologiyalarining rivojlanmagani hosildorlikni cheklaydi.

Resurslardan foydalanish darajasini iqtisodiy baholash

Resurslardan samarali foydalanishni ta'minlash global oziq-ovqat xavfsizligi uchun hal qiluvchi omil hisoblanadi. Resurslardan foydalanishni iqtisodiy baholash quyidagi yo'nalishlarda amalga oshiriladi:

1. Yer resurslaridan foydalanish:

Yer unumdorligini oshirish uchun zamonaviy qishloq xo'jalik texnologiyalaridan foydalanish. Sug'orish tizimlarining samaradorligini oshirish orqali yer maydonlaridan optimal foydalanish.

2. Suv resurslari samaradorligi:

Suv tejaydigan texnologiyalardan foydalanish, masalan, tomchilatib sug'orish tizimlarini joriy etish. Suv resurslarining iqlim o'zgarishiga moslashuvchan boshqaruvi.

3. Mehnat unumdorligi:

Qishloq xo‘jalik sohasida ishchi kuchining malakasini oshirish. Mehnat unumdorligini oshiruvchi zamonaviy texnologiyalarni joriy etish.

4. Texnologiyalarni joriy etish:

Raqamli texnologiyalar yordamida qishloq xo‘jalik jarayonlarini optimallashtirish. Genetik modifikatsiya qilingan urug‘lar va yangi agrotexnologiyalarni joriy etish.

5. Narx ta’siri:

Global oziq-ovqat bozorlaridagi narxlar o‘zgarishini kuzatish va ushbu o‘zgarishlarning aholi daromadlariga ta’sirini baholash.

Baholash usullari

Oziq-ovqat xavfsizligi va resurslardan foydalanishni iqtisodiy baholashda quyidagi usullardan foydalaniladi:

1. Statistik tahlil: Hosildorlik, narx va resurslardan foydalanish bo‘yicha ma’lumotlarni tahlil qilish.

2. Matematik modellar: Oziq-ovqat ta’minoti va talabining o‘zaro bog‘liqligini prognoz qilish uchun modellar ishlab chiqish.

3. Global indekslar: Global oziq-ovqat xavfsizligi indeksi (GFSI), FAO statistikasi va boshqa xalqaro ko‘rsatkichlardan foydalanish.

Xulosa va takliflar. Oziq-ovqat xavfsizligini ta’minlash va resurslardan oqilona foydalanish global darajadagi hamkorlikni talab etadi. Quyidagi choralar ushbu masalani hal qilishda muhim o‘rin tutadi: Resurslarning barqaror boshqaruvini ta’minlash. Iqlim o‘zgarishiga moslashgan agrotexnologiyalarni rivojlantirish. Davlatlar o‘rtasida resurslar taqsimotining adolatli tizimini yaratish. Qishloq xo‘jalik sektorida xalqaro hamkorlikni rivojlantirish. Oziq-ovqat ishlab chiqarishda texnologik yangiliklarni qo‘llash. Shunday qilib, oziq-ovqat xavfsizligi nafaqat global muammo, balki har bir davlatning strategik rivojlanish rejasida asosiy yo‘nalishlardan biri bo‘lishi zarur. Resurslardan oqilona foydalanish orqali insoniyat o‘z ehtiyojlarini barqaror qondirishi va kelajak avlodlar uchun tabiiy resurslarni saqlab qolishi mumkin.

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IMPROVING RECEPTIVE AND PRODUCTIVE SKILLS OF TECHNICAL UNIVERSITIES

Guzal Eshchanova - "TIAME" National Research University

Ulugbek Nulloev - "TIAME" National Research University

Abstract. *The improvement of receptive (listening and reading) and productive (speaking and writing) skills in students, particularly those studying at technical universities, is essential for their academic and professional success in a globalized world. These skills not only enable students to understand and use academic and technical materials but also enhance their ability to communicate effectively in the workplace. This article explores strategies for developing receptive and productive skills in technical university students, with a focus on the unique challenges faced by students in technical fields. The study examines various pedagogical approaches, the role of technology, and the integration of discipline-specific content in language instruction. Emphasizing a communicative approach and task-based learning, the article presents a comprehensive model for improving students' overall language proficiency and technical communication abilities. By integrating both receptive and productive skills into the curriculum, technical universities can ensure that students are well-prepared for both academic success and professional careers.*

Keywords: *Receptive skills, productive skills, technical universities, language proficiency, English for Specific Purposes (ESP), task-based learning, communicative approach, academic success, professional communication.*

Annotatsiya. *Talabalarda qabul qiluvchi (tinglash va o'qish) va ishlab chiqaruvchi (gapirish va yozish) ko'nikmalarini rivojlantirish, ayniqsa texnik universitetlarda o'qiyotgan talabalarda, ularning akademik va professional muvaffaqiyati uchun muhimdir, ayniqsa globalizatsiyalashgan dunyoda. Ushbu ko'nikmalar nafaqat talabalarga akademik va texnik materiallarni tushunish va ishlatish imkonini beradi, balki ish joyida samarali muloqot qilish qobiliyatini ham oshiradi. Ushbu maqolada texnik universitet talabalari uchun qabul qiluvchi va ishlab chiqaruvchi ko'nikmalarni rivojlantirish strategiyalari o'rganilgan bo'lib, ayniqsa texnik sohalarida o'qiyotgan talabalarning o'ziga xos muammolariga alohida e'tibor qaratilgan. Tadqiqot turli pedagogik yondoshuvlarni, texnologiyaning rolini va tilni o'qitishda disiplinaryalarga xos kontentni integratsiya qilishni o'rganadi. Muloqotli yondoshuv va vazifaga asoslangan o'qitish metodlarini ta'kidlab, maqola talabalarning umumiy til ko'nikmalari va texnik muloqot qobiliyatlarini yaxshilash uchun keng qamrovli modelni taqdim etadi. Texnik universitetlar o'z ta'lim dasturiga qabul qiluvchi va ishlab chiqaruvchi ko'nikmalarni birlashtirib, talabalarning nafaqat akademik muvaffaqiyatga, balki professional kareraga ham tayyor bo'lishini ta'minlaydi.*

Kalit so'zlar: *qabul qiluvchi ko'nikmalar, ishlab chiqaruvchi ko'nikmalar, texnik universitetlar, tilni bilish, maxsus maqsadlar uchun ingliz tili (ESP), vazifaga asoslangan o'qitish, muloqotli yondoshuv, akademik muvaffaqiyat, professional muloqot.*

Аннотация. Развитие рецептивных (слушание и чтение) и продуктивных (говорение и письмо) навыков у студентов, особенно обучающихся в технических университетах, является важным условием для их академического и профессионального успеха в глобализованном мире. Эти навыки не только позволяют студентам понимать и использовать академические и технические материалы, но также способствуют улучшению их способности эффективно общаться в рабочей среде. В данной статье рассматриваются стратегии развития рецептивных и продуктивных навыков у студентов технических университетов, с акцентом на уникальные проблемы, с которыми сталкиваются студенты в технических областях. Исследование анализирует различные педагогические подходы, роль технологий и интеграцию дисциплинарного контента в обучение языку. Подчеркивая коммуникативный подход и обучение на основе заданий, статья представляет комплексную модель улучшения общего языкового уровня студентов и их навыков технической коммуникации. Интегрируя как рецептивные, так и продуктивные навыки в учебный процесс, технические университеты могут гарантировать, что студенты будут хорошо подготовлены как к академическому успеху, так и к профессиональной карьере.

Ключевые слова: Рецептивные навыки, продуктивные навыки, технические университеты, языковая подготовка, английский для специфических целей (ESP), обучение на основе заданий, коммуникативный подход, академический успех, профессиональная коммуникация.

Introduction. In the modern era, the role of English language proficiency extends far beyond general communication, especially for students in technical fields. The integration of English as a medium of instruction in technical universities has led to the emergence of new language teaching approaches, emphasizing both receptive and productive language skills. These skills are crucial for students in fields such as engineering, computer science, and biotechnology, as they need to read complex academic materials, write technical reports, and communicate effectively within international teams.

Receptive skills, such as listening and reading, enable students to understand academic and technical texts, lectures, and discussions, while productive skills, including speaking and writing, allow students to express their ideas and findings clearly and persuasively. While receptive skills are foundational for knowledge acquisition, productive skills are essential for professional communication, allowing students to engage in debates, presentations, and collaborations.

This paper aims to explore the methods and strategies for developing both receptive and productive skills in students at technical universities, with a focus on English language teaching. Through a review of current practices and the challenges faced in developing these skills, the paper provides recommendations for integrating these skills into the curriculum, thereby enhancing students' academic and professional readiness.

The objectives

The Importance of Receptive and Productive Skills in Technical Education

The development of language skills in technical universities is critical due to the increasing globalization of education and industry. English has become the lingua franca of science, technology, and engineering, and students must be able to read and understand technical texts, participate in international collaborations, and contribute to the global discourse in their respective fields.

- **Receptive Skills:** Receptive skills (listening and reading) are the foundation of language learning, particularly in technical fields where students must engage with complex academic texts, listen to technical lectures, and interact with multimedia content in English. These skills enable students to:

- Comprehend academic and technical texts,
- Follow oral presentations and lectures, and
- Gain exposure to the latest research and developments in their fields.

For engineering students, for example, the ability to read research papers, textbooks, and online resources in English is vital for academic success. Listening skills are equally important for understanding lectures, workshops, and industry-specific discussions.

- **Productive Skills:** Productive skills (speaking and writing) are essential for professional communication. In technical fields, these skills are used for:

- Presenting ideas and research findings,
- Writing reports, papers, and documentation, and
- Engaging in discussions and negotiations in professional settings.

Students must develop these skills not only to succeed in their academic careers but also to thrive in the global workforce. Writing technical reports, delivering presentations, and contributing to research projects all require strong productive skills.

Challenges in Developing Receptive and Productive Skills in Technical Universities

Developing receptive and productive language skills in technical universities presents several challenges, particularly in programs where the primary focus is on technical content rather than language proficiency. Some of the key challenges include:

- **Curriculum Focus:** In many technical universities, the curriculum is heavily focused on specialized technical subjects, with limited attention given to language skills. This often results in students having insufficient opportunities to develop their receptive and productive skills.

- **Lack of Specialized Language Resources:** Engineering and technical students need to develop specific language skills related to their field of study, but resources such as English for Specific Purposes (ESP) materials tailored to technical disciplines are often limited.

- **Time Constraints:** Technical programs are often dense and time-constrained, leaving little room for dedicated language learning. This creates a challenge for language teachers to integrate language development into the technical curriculum.

- **Limited Exposure to English Outside the Classroom:** Many students may have limited opportunities to engage with English outside the classroom, especially in environments where English is not widely spoken. This can impede the development of both receptive and productive skills.

Methodology. Pedagogical Approaches to Developing Receptive and Productive Skills

To address these challenges, educators at technical universities must adopt effective pedagogical strategies to develop both receptive and productive skills in students. Some of the most effective approaches include:

1 Task-Based Learning (TBL)

Task-based learning is an approach that emphasizes language use in real-world contexts. It involves the completion of tasks that require both receptive and productive skills, such as:

- **Reading and writing tasks:** Students read articles or technical reports and then write summaries or responses.
- **Listening and speaking tasks:** Students listen to lectures or discussions and then engage in follow-up speaking tasks, such as discussions, debates, or presentations.

This approach allows students to practice language in context, providing them with the skills necessary to function in both academic and professional settings.

2 Communicative Approach

The communicative approach focuses on interaction and communication as the primary goal of language learning. By using this approach, students engage in activities such as role plays, group discussions, and presentations, which help improve both their receptive and productive skills. This method emphasizes fluency over accuracy, encouraging students to use English in meaningful ways.

3 Content and Language Integrated Learning (CLIL)

Content and Language Integrated Learning (CLIL) is a pedagogical approach where language learning is integrated with the study of academic content. For example, students may study technical subjects such as engineering principles while simultaneously improving their English language skills. This approach allows students to acquire language skills while also deepening their knowledge of their field.

4 Technology-Enhanced Learning

Incorporating technology into language instruction provides students with a range of resources for improving both receptive and productive skills. Online platforms, podcasts, video lectures, and interactive exercises can enhance students' listening and reading skills. Similarly, digital tools such as writing assistants, forums, and video conferencing can facilitate writing and speaking practice.

Results. Strategies for Integrating Receptive and Productive Skills into the Curriculum

To effectively integrate receptive and productive skills into the curriculum, technical universities should consider the following strategies:

- **Developing Discipline-Specific ESP Programs:** Technical universities should design English language programs that focus on the specific needs of engineering and technical students. These programs should address the vocabulary, technical writing, and communication skills required in the student's field.
- **Collaborating with Industry Professionals:** Involving industry professionals in the curriculum design and teaching process can provide real-world context for language learning. Industry guest speakers, technical presentations, and field trips can expose students to authentic language use.

• **Assessment of Both Receptive and Productive Skills:** Regular assessment of both receptive and productive skills is essential to track student progress. Assessment methods such as project-based evaluations, presentations, and writing assignments provide a comprehensive view of students' abilities.

Conclusion. By summarizing it should be suggested that the development of receptive and productive language skills is critical for students at technical universities, as these skills directly impact their academic performance and professional prospects. By adopting task-based learning, the communicative approach, CLIL, and technology-enhanced learning, universities can create an environment that supports language development alongside technical expertise. Furthermore, the integration of English for Specific Purposes (ESP) into the curriculum will ensure that students acquire the language skills necessary for success in both their academic studies and their future careers in global industries. Technical universities must continuously adapt their teaching methods to provide students with the tools to succeed in an increasingly interconnected world.

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INCREASING ECONOMIC EFFICIENCY OF GREEN TECHNOLOGIES IN WASTEWATER TREATMENT

Mukhlisa Usmonova - 1st-year Master’s Student in Bioeconomics, “Tashkent Institute of Irrigation and Agricultural Mechanization Engineers institute” National Research University, muxlisatiame@gmail.com

Umirova Dilnoza Safarovna - PhD, Dotsent (Associate Professor), “Tashkent Institute of Irrigation and Agricultural Mechanization Engineers institute” National Research University, dilnoza.umirova.88@gmail.com

Abstract: The adoption of green technologies for wastewater treatment has become a pivotal strategy for promoting sustainable development and addressing global environmental challenges. This article explores innovative methods to enhance the economic efficiency of these technologies, focusing on cost optimization, resource recovery, and energy efficiency. By analyzing case studies, economic

models, and best practices from both developed and developing nations, the study identifies key factors influencing the financial viability of green wastewater treatment technologies. It also emphasizes the role of public-private partnerships, government incentives, and advanced technological solutions such as membrane filtration and anaerobic digestion. The findings highlight actionable strategies to reduce operational costs, maximize resource utilization, and ensure the long-term economic and environmental sustainability of wastewater treatment systems.

Keywords: green technologies, wastewater treatment, economic efficiency, resource recovery, sustainable development.

Аннотация: Внедрение зеленых технологий в процессы очистки сточных вод является ключевой стратегией для содействия устойчивому развитию и решения глобальных экологических проблем. В данном исследовании рассматриваются инновационные методы повышения экономической эффективности данных технологий, с акцентом на оптимизацию затрат, восстановление ресурсов и повышение энергетической эффективности. Путем анализа практических кейсов, экономических моделей и передового опыта как развитых, так и развивающихся стран выявляются ключевые факторы, влияющие на финансовую целесообразность внедрения зеленых технологий очистки сточных вод. Кроме того, подчеркивается важность государственно-частного партнерства, государственных стимулов, а также передовых технологических решений, таких как мембранная фильтрация и анаэробное сбраживание. Полученные результаты предлагают практические стратегии по снижению эксплуатационных затрат, максимальному использованию ресурсов и обеспечению долгосрочной экономической и экологической устойчивости систем очистки сточных вод.

Ключевые слова: зеленые технологии, очистка сточных вод, экономическая эффективность, восстановление ресурсов, устойчивое развитие.

Annotatsiya: Oqova suvlarni tozalash jarayonida yashil texnologiyalarni qo'llash barqaror rivojlanishni rag'batlantirish hamda global ekologik muammolarni hal etishning asosiy strategiyalaridan biri hisoblanadi. Ushbu tadqiqotda mazkur texnologiyalarning iqtisodiy samaradorligini oshirishga yo'naltirilgan innovatsion usullar tahlil qilinadi, bunda xarajatlarni optimallashtirish, resurslarni qayta tiklash va energiya samaradorligini oshirish masalalariga alohida e'tibor qaratiladi. Ishlab chiqilgan va rivojlanayotgan mamlakatlarning tajriba misollari, iqtisodiy modellar hamda ilg'or amaliyotlarni o'rganish orqali yashil oqova suvlarni tozalash texnologiyalarining moliyaviy jihatdan barqarorligini ta'minlovchi muhim omillar aniqlanadi. Shuningdek, davlat-xususiy sheriklikning roli, hukumat tomonidan taqdim etiladigan rag'batlantiruvchi mexanizmlar hamda membranali filtrlash va anaerobik parchalanish kabi ilg'or texnologik yechimlarning ahamiyati tahlil qilinadi. Tadqiqot natijalari operatsion xarajatlarni kamaytirish, resurslardan samarali foydalanish va oqova suvlarni tozalash tizimlarining uzoq muddatli iqtisodiy hamda ekologik barqarorligini ta'minlashga yo'naltirilgan amaliy strategiyalarni ilgari suradi.

Kalit soʻzlar: *yashil texnologiyalar, oqova suvlarni tozalash, iqtisodiy samaradorlik, resurslarni qayta tiklash, barqaror rivojlanish.*

Introduction. The global challenges of environmental pollution and water scarcity necessitate the adoption of innovative and sustainable solutions in wastewater treatment. Conventional wastewater treatment technologies, while effective in removing contaminants, often involve high operational costs, energy consumption, and environmental trade-offs. In contrast, green technologies for wastewater treatment provide an environmentally friendly alternative that emphasizes resource recovery, energy efficiency, and minimal environmental impact. However, the widespread adoption of these technologies is hindered by economic barriers, including high initial investment costs, limited scalability, and insufficient integration with existing infrastructure. Thus, improving the economic efficiency of green wastewater treatment technologies is a critical step toward achieving sustainable development goals (SDGs), particularly those related to clean water and sanitation (SDG 6) and climate action (SDG 13) ([1], [2]).

Green wastewater treatment technologies, such as constructed wetlands, anaerobic digestion, membrane bioreactors, and advanced oxidation processes, offer multiple benefits beyond pollution control. These include energy generation, nutrient recovery, and the production of valuable by-products like biogas and biofertilizers. For instance, anaerobic digestion not only treats wastewater but also generates methane gas, which can be used as a renewable energy source ([3]). Similarly, membrane bioreactors enable high-quality water recycling, reducing dependence on freshwater sources. However, the economic feasibility of these technologies depends on several factors, including their cost-effectiveness, scalability, and alignment with local economic and environmental conditions. Addressing these factors is crucial for encouraging their adoption, especially in developing countries where financial constraints and inadequate infrastructure pose significant challenges ([4]).

In recent years, the integration of green technologies into wastewater treatment systems has gained traction globally. Countries such as Germany, Sweden, and the Netherlands have made significant strides in adopting green wastewater treatment technologies due to strong governmental support, advanced research initiatives, and public awareness. For instance, the adoption of membrane-based technologies in Europe has resulted in energy savings of up to 50% compared to traditional methods ([5]). Meanwhile, in developing countries, such as India and Vietnam, initiatives to promote decentralized wastewater treatment using constructed wetlands and anaerobic digesters have demonstrated potential for cost-effective wastewater management ([6]). Uzbekistan, like many other nations, faces the dual challenge of water scarcity and environmental pollution, making the transition to green wastewater treatment technologies both urgent and necessary.

The economic efficiency of green technologies is a multifaceted issue that requires a holistic approach, combining technical innovation, financial strategies, and policy interventions. Key strategies for enhancing economic efficiency include optimizing operational costs through automation and digitalization, promoting resource recovery to create revenue streams, and leveraging government incentives and public-private partnerships to offset initial costs. For example, the use of digital tools for real-time monitoring and process optimization can significantly reduce

maintenance costs and energy consumption in wastewater treatment plants ([7]). Additionally, resource recovery, such as the extraction of phosphorus from wastewater, can create economic opportunities while addressing critical environmental challenges like nutrient pollution ([8]).

This article aims to explore effective ways to increase the economic efficiency of green technologies for wastewater treatment, with a focus on both technical and financial strategies. By analyzing case studies, best practices, and emerging trends, the study seeks to provide actionable insights for policymakers, researchers, and industry stakeholders. The findings are expected to contribute to the broader discourse on sustainable wastewater management and support the global transition to greener and more economically viable wastewater treatment systems.

Methodology. To develop a comprehensive understanding of how to enhance the economic efficiency of green technologies in wastewater treatment, this study adopts a multi-dimensional methodology that integrates qualitative and quantitative approaches. This blended research design ensures an in-depth analysis of technical, financial, and policy dimensions while facilitating actionable insights for stakeholders, including policymakers, industry experts, and researchers. The methodology is structured around three main components: data collection, analytical techniques, and case study analysis.

Data for the study were gathered from multiple sources to provide a robust foundation for analysis. The primary and secondary data collection methods are as follows:

Literature Review:

A thorough review of existing research, reports, and policy documents was conducted to identify key trends, challenges, and opportunities related to green wastewater treatment technologies. Sources included peer-reviewed journals, books, and reports from international organizations like the United Nations, World Bank, and International Water Association. For example, recent studies on membrane bioreactors and anaerobic digestion were examined to understand their economic viability ([2], [8]).

Policy Document Analysis:

Government policies and frameworks related to green technology adoption in wastewater treatment were analyzed. Policies from Uzbekistan were compared with those of countries leading in green wastewater technologies, such as Germany, Sweden, and the Netherlands, to identify gaps and opportunities for improvement ([5], [1]).

Cost-Benefit Analysis (CBA):

A detailed CBA was conducted to evaluate the economic efficiency of selected green technologies, including constructed wetlands, anaerobic digestion, and advanced oxidation processes. The analysis considered initial investment costs, operational expenses, maintenance costs, and potential revenue streams from resource recovery (e.g., biogas, biofertilizers). For instance, the financial feasibility of biogas production from anaerobic digestion in small and large-scale wastewater treatment facilities was assessed ([7]).

SWOT Analysis:

A SWOT (Strengths, Weaknesses, Opportunities, Threats) framework was used to evaluate the current landscape of green wastewater technologies in Uzbekistan.

This analysis provided a structured understanding of the internal and external factors influencing economic efficiency. Strengths included the availability of renewable energy sources, while weaknesses highlighted financial constraints and inadequate infrastructure ([4]).

Comparative Analysis:

A comparative analysis was conducted between Uzbekistan and countries with successful implementation of green wastewater treatment technologies. Factors such as government incentives, public-private partnerships, and advanced research capabilities were examined to identify best practices that could be adapted to the Uzbek context ([6]).

table-1

Domestic Case Study	International Case Study
The study examined the implementation of microfinance programs to support smallholder farmers in the Fergana Valley, which indirectly influenced wastewater management practices. This case highlighted the role of financial support mechanisms in enabling green technology adoption in rural areas ([9]).	Israel's advanced agricultural wastewater treatment system was analyzed to understand how government funding and private sector partnerships have driven innovation and efficiency. The findings from this case study provided insights into potential strategies for Uzbekistan, including the integration of digital monitoring tools and resource recovery systems ([10]).

Results and Discussion. The findings of this study provide a detailed evaluation of how green technologies in wastewater treatment can be made economically efficient. The results are presented through an analysis of cost-benefit aspects, policy frameworks, stakeholder perspectives, and case studies. These insights are further elaborated through discussions on their implications for Uzbekistan's wastewater treatment sector.

1. Cost-Benefit Analysis of Green Technologies

The Cost-Benefit Analysis (CBA) conducted in this study revealed that green wastewater treatment technologies such as constructed wetlands, anaerobic digestion, and advanced oxidation processes have significant economic potential when strategically implemented.

- **Constructed Wetlands:** These systems demonstrated low operational and maintenance costs, making them suitable for rural areas with limited infrastructure. However, they require considerable land resources, which may be a limiting factor in urban regions ([5]).

- **Anaerobic Digestion:** This technology proved to be cost-effective when biogas recovery was integrated. Biogas production added a significant revenue stream, particularly for large-scale wastewater treatment plants, making the return on investment more attractive ([7]).

- **Advanced Oxidation Processes (AOPs):** AOPs provided high efficiency in treating industrial wastewater, especially with high chemical loads, but the high initial investment and operational energy requirements made them less feasible for widespread adoption in smaller facilities ([2]).

The results indicate that combining these technologies based on local requirements can significantly enhance their economic efficiency while addressing diverse wastewater treatment challenges.

2. Policy and Regulatory Landscape

Analysis of policy documents revealed a gap between Uzbekistan's existing regulatory frameworks and international best practices in promoting green technologies for wastewater treatment. For instance, Germany and Sweden have implemented financial incentives such as tax breaks, subsidies, and grants to encourage green technology adoption. In contrast, Uzbekistan has limited such initiatives, which has slowed down the adoption of advanced treatment methods ([1], [6]).

Moreover, a lack of clear guidelines for resource recovery from wastewater, such as biogas production and nutrient recovery, was identified as a critical barrier. Policies encouraging public-private partnerships and clearer resource recovery frameworks are necessary to bridge these gaps ([3]).

3. SWOT Analysis Findings

The SWOT analysis provided a structured evaluation of Uzbekistan's current landscape for green wastewater technologies:

Table 1. SWOT Analysis of Uzbekistan's Financial Landscape

Strengths	Weaknesses
• Availability of abundant renewable energy sources such as solar and biogas. • Government commitment to environmental sustainability through initiatives like the Water Strategy 2030.	• Financial constraints for local municipalities to invest in green technologies. • Limited technical expertise and access to modern wastewater treatment equipment.
Opportunities	Threats
• High potential for resource recovery to generate revenue and offset costs. • Growing interest from international donors and organizations to support green projects ([4], [6]).	• Urbanization and population growth putting additional pressure on wastewater systems. • Climate change affecting water availability and treatment efficiency.

4. Comparative Case Studies

The comparative analysis of domestic and international case studies highlighted valuable lessons for Uzbekistan:

• Domestic Case Study – Fergana Valley:

The microfinance programs supporting smallholder farmers indirectly contributed to improved wastewater management practices. By enabling access to financial resources, these programs facilitated the adoption of low-cost green technologies like constructed wetlands for irrigation purposes. This case study emphasizes the importance of targeted financial support for rural areas ([9]).

• International Case Study – Israel's Agricultural Wastewater Treatment:

Israel's success in wastewater treatment was largely attributed to robust government funding and strong private sector partnerships. The integration of digital

monitoring tools for water quality and the use of advanced resource recovery systems showcased how innovation could drive efficiency and sustainability ([10]).

These findings suggest that Uzbekistan could benefit significantly from adapting similar models, particularly by fostering collaboration between public and private sectors.

The results of this study emphasize that enhancing the economic efficiency of green wastewater treatment technologies in Uzbekistan requires a multi-pronged approach:

Technology Selection and Adaptation:

The selection of green technologies must align with the local socio-economic and environmental context. For instance, constructed wetlands may be more suitable for rural areas, while anaerobic digestion could be prioritized in urban regions with higher wastewater loads. The integration of resource recovery systems, such as biogas and biofertilizers, is essential to improve cost-effectiveness ([2], [7]).

Policy Reforms and Incentives:

The government needs to implement policies that encourage the adoption of green technologies. Subsidies, tax incentives, and grants for wastewater treatment facilities can reduce financial burdens and make these technologies more attractive. Additionally, clear regulations on resource recovery and reuse will provide economic incentives for operators ([3], [6]).

Capacity Building and Public Awareness:

Building technical expertise among local engineers and operators is critical for the successful implementation and maintenance of green technologies. Public awareness campaigns can also play a vital role in promoting the acceptance and adoption of these technologies at the community level ([8]).

Leveraging International Partnerships:

Learning from successful international models, such as Israel and Sweden, can provide Uzbekistan with valuable insights into innovative technologies and financial mechanisms. Collaborations with international donors and organizations can help address financial and technical challenges ([9], [10]).

Integration of Digital Tools:

Employing digital tools like Geographic Information Systems (GIS) and real-time monitoring systems can optimize wastewater treatment operations, enhance efficiency, and reduce costs. These tools enable better decision-making and resource allocation ([5]).

Conclusion. The study underscores the critical role of integrating technical, financial, and policy dimensions to enhance the economic efficiency of green wastewater treatment technologies in Uzbekistan. By adopting a strategic mix of cost-effective technologies, implementing supportive policies, and fostering international collaboration, Uzbekistan can address its wastewater challenges while promoting sustainability. The findings provide a roadmap for stakeholders to develop economically viable and environmentally sustainable wastewater treatment systems, paving the way for improved water management and resource recovery.

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INCREASING EFFICIENCY IN SEED PRODUCTION OF MELON CROPS

U.Alimov- Associate Professor; "Tashkent Institute of Irrigation and Agricultural Mechanization Engineers" National Research University

A.Abduraimov -2nd year Masters student "Tashkent Institute of Irrigation and Agricultural Mechanization Engineers" National Research University

Abstract. Melon production plays a vital role in global agriculture, with increasing demand for high-quality melons. Using qualitative method research, this paper explores strategies to enhance seed production efficiency for melon crops, focusing on resource management, irrigation practices, and disease control and highlights global production and consumption of melon. High-quality seed production is critical, as it directly influences crop yields and resilience. The paper highlights key factors influencing melon yield, including optimal seed quality, water management, and pest and disease control. By integrating improved agronomic practices and seed quality management, melon producers can overcome existing challenges and achieve better economic outcomes, ensuring sustainable melon production and meeting the rising global demand.

Key words: Melon Cultivation, Agrotechnical Practices, Melon Seed Production, Irrigation Systems, Melon exporters and importers.

Introduction. Melons are a widely cultivated crop, and across the globe, efforts are increasingly directed toward the development of high-yielding varieties and advancements in crop specialization. These improvement strategies help producers tackle existing challenges while enhancing yields, resulting in more fruit, greater firmness, improved lengths, and higher overall quality.

Melon cultivation holds significant importance worldwide, with global production reaching approximately 28 million tons in 2021, as reported by the FAO. Melon-growing areas are extensively distributed across various regions of the world.

The global demand for melons continues to rise, driven by their popularity and appeal. Melons are also a highly traded commodity, with Spain, Brazil, Guatemala, and Honduras leading as major exporters.

However, melon producers encounter various obstacles, including limited water availability and competition in international markets. Additionally, climate change and droughts pose considerable challenges to production in certain areas.

The market increasingly demands top-quality melons that are firm and rich in flavor. Achieving these standards requires cultivating melon plants under optimal conditions from the very start of their growth cycle to ensure maximum utilization of available resources.

Enhancing crop productivity in agriculture is pivotal for fostering economic growth, improving food security, and reducing poverty in the country. Agriculture accounted for 25 per cent of GDP of Uzbekistan in 2020, the highest in the region, and employs one in five people. Research from developing and transitional economies indicates that improved resource-use efficiency significantly boosts crop productivity. In light of various agricultural programs and policies introduced in Uzbekistan to enhance farmers' efficiency and productivity, it became essential to quantitatively assess the current efficiency levels and the factors influencing them.

Furthermore, evidence from other developing nations highlights the importance of such quantitative analyses as a foundation for crafting policies aimed at improving efficiency. This study adds to the growing body of literature on farm household efficiency in Uzbekistan. It also provides valuable insights for policymakers by empirically identifying current efficiency levels and key influencing factors, which can inform future decision-making processes [1].

The agricultural sector plays a significant role in reducing poverty, both directly and indirectly. Its direct impact comes from boosting farmers' incomes, while its indirect impact operates through forward and backward linkages, contributing to output creation, value addition, job opportunities, foreign exchange generation, food supply for consumption, and raw materials for other economic sectors, especially the processing industry [2].

Agriculture has a unique capacity to absorb surplus labor more effectively than other sectors, providing critical employment opportunities. Farmers and agricultural laborers, who are predominantly based in rural areas and often experience lower levels of welfare compared to other communities, are central to this sector. Although agriculture's relative contribution to Gross Domestic Product (GDP) remains modest, its strategic importance is undeniable. It plays a crucial role in advancing global development objectives, including the Sustainable Development Goals (SDGs) [3].

Literature review. Despite the socio-economic significance of melon, its production has been declining in recent years. This decline can be attributed to

several factors, including land scarcity due to fragmentation, high input costs, reliance on traditional farming methods, and inefficient resource allocation. According to a report from the Agency of Statistics under the President of Uzbekistan, the country's agricultural businesses have collected more than 1.7 million tons of melons and gourds in 2024. The volume of exports has also increased [4]. To achieve optimal output and profitability, it is essential to utilize resources efficiently [5]. The poor melon yields observed may indicate that the resources required for production are not being used to their full potential, raising the question of whether melon farming is still profitable. This situation necessitates an investigation into the profitability of melon cultivation, an assessment of the resources involved in its production, and how these resources are managed by farmers. Given the lack of documented studies on the cost efficiency of melon farming in the region, doing like this research is crucial. There is a clear need for empirical data on production efficiency at the farm level for small-scale melon farmers in the area.

Melon (*Cucumis melo* L.) is a significant horticultural crop, known for its high carbohydrate and nutrient content [6] (Sun et al., 2023). Being a water-dependent plant, melon is highly sensitive to soil moisture, with water availability directly influencing the effectiveness of fertilizer use [7] (Zhou et al., 2022). As a result, the efficient management of both water and nutrients is crucial for optimizing the yield and quality of melons.

Methods. The paper analyzes the literature on melon and its seeds production using a qualitative approach. Secondary data was used to collect data. FAO, WORLDBANK and EASTFRUIT reports and literature review were used as secondary data, in order to study volume of melon and its seed production in the world, to identify top exporters, importers and agrotechnical principles of melon production

Results and Discussion

Production of melon

According to data from the FAO (Food and Agriculture Organization), the total volume of melons produced in 2022 worldwide is 28.56 million tons, which is 168.6 thousands tons less than the record year of 2021. Almost half of them were collected in China - the largest producer in the world, informs FAO statistics. The total area used for melon cultivation was 1,062,501 ha, yielding an average of 2.69 kg/m². FAO data shows that China is the leader in production with a share of 49.72% of the world's total. 387,797 ha are cultivated in the country for the cultivation of melons with an average yield of 3.66 kg/m². The second largest producer is Turkey with 1.59 million tons of melons produced in 2022 on an area of 62,724 ha. The average yield in our southern neighbor is 2.53 kg/m². India ranks third with a volume of 1.5 million tons on an area of 68,000 ha [8]. Italy, Spain, Morocco, and France also among the top 20 producers.

In 2021, 28.6 million tons of melons were grown across the globe. When melons are referred to throughout this paper it includes all melons except for watermelons. From 2016 till 2022 there has been 26.6-28.6 million tons of melons grown globally. Leading in this production is China which has been the source of 44-50 percent of melons grown across the globe since 2016 and has increased each year since 2016. In 2021, China produced 14 million tons of melons, marking an increase from 11.9 million tons in 2016. Turkey's melon production has remained steady, ranging from

1.64 to 1.85 million tons during this period. Following China and Turkey, India, Kazakhstan, and Afghanistan have all experienced significant growth in melon production from 2016 to 2021. Specifically, India's production grew from 940,000 tons in 2016 to 1.48 million tons, while Kazakhstan's production increased from 900,000 tons to 1.4 million tons. [9].

A crucial factor in melon cultivation is quality of seed, that high-quality seeds can increase crop productivity by 15-25% and contribute to higher resistance against pests and diseases [10] and normal soil temperature, ensuring that the soil temperature at planting depth reaches at least 16°C, with an optimal germination temperature range of 24°C to 35°C. If this requirement is not met, the plants will emerge slowly, and crop stands will be inconsistent, with plants at various growth stages. In planting, seeds should be planted 1.3 cm to 2 cm deep in rows spaced 1.5 m to 2.1 m apart, with seeds placed 15 cm to 20 cm apart in the row, then thinned to 30 cm apart. Transplants can also be used, taking approximately 3 to 4 weeks to grow before being transplanted into the field. In order to deliver melon products to the market early, farmers used transplanting system. Melon seeds germinate and grow quickly when soil temperatures are favorable for germination. Transplanting into raised beds covered with black plastic mulch can shorten the time to harvest, especially during cool, wet springs.

Main factors in cultivation of melon crops are irrigation and combating with insects and diseases, so we investigated these agrotechnical principles.

Irrigation. Adequate moisture is essential for the growth and development of all crops. Melons require well-managed soil moisture, particularly during their vigorous growth phase, until the fruit reaches full size. Irrigation should be reduced just before and during the ripening period to avoid lowering sugar content. While melons are heat- and drought-tolerant, they will not reach their maximum yield or profitability if drought-stressed. Irrigation is necessary when rainfall is insufficient to meet the crop's needs. If rainfall is inadequate, supplemental irrigation of approximately 38 mm of water every 10 days is required during the hottest summer months. Water can be supplied through various methods, such as overhead sprinklers, furrow irrigation, or drip irrigation systems. Drip irrigation is particularly useful in areas with limited water volume or pressure, as it is an efficient method for delivering water, either on the soil surface or through buried drip tape. Additional advantages of drip irrigation include the ability to perform other field operations during irrigation, not wetting the crop foliage (which reduces the risk of disease), and the capability to apply fertilizer through the system. Since water scarcity is a major problem in Uzbekistan's climate, drip irrigation and sprinkler irrigation systems are essential for saving water.

Insects. Insects also pose a significant challenge to achieving high yields in agriculture. Fields that were previously in sod or had heavy weed infestations the previous year should be treated with a soil-applied insecticide during planting to control soil-dwelling pests, such as cutworms.

Diseases. Disease management is crucial for producing high-quality cantaloupes. A preventive approach that combines cultural practices, genetic resistance, and chemical control necessary for the best results. It is important to select fields with the right soil characteristics, particularly well-drained soils, to minimize fruit rot. Late plantings should not be located near or downwind of earlier-

planted cucurbit fields that may already be infected with foliar or viral diseases. Moving contaminated soil or plant debris into clean fields via workers or equipment should be avoided. Diseases like anthracnose, gummy stem blight, and *Fusarium* wilt can be carried by seeds, leading to rapid spread in greenhouse transplants and potentially introducing diseases into fields. Therefore, seeds should be certified and sourced from reliable suppliers, and only healthy transplants should be used. Timely agrotechnical practices are essential to combat diseases effectively.

Seed production of melon

The majority of commercial melon seed production takes place in Africa, with Nigeria being the top producer. In 2018, Africa was responsible for 93% of the global melon seed production. Since 1961, the continent has accounted for an average of 92% of worldwide output [11].

Most commercial watermelon seed production occurs in arid or semi-arid regions, including western China, Chile, Mexico, Thailand, and the United States (California and Colorado). These dry conditions are ideal for producing high-quality, disease-free seeds. Following the outbreak of bacterial fruit blotch in watermelon during the late 1980s, the demand for seed production in low-humidity areas without rainfall has grown, as it helps ensure disease-free seeds [12].

The process of growing melon and watermelon seed crops is similar to that of market crops, but site selection is more critical. It is important to choose a field that has not been used for cucurbits (such as watermelon, cantaloupe, honeydew, cucumber, squash, pumpkin, or gourd) for at least 2 years, and ideally 4 years. For open-pollinated watermelon seed production, fields should be isolated by at least 1 mile from other watermelon fields to avoid cross-pollination. This isolation also helps prevent the spread of diseases from fields with watermelon and cantaloupe crops of unknown origin or seeds that haven't been tested for seed-borne diseases.

Some seed lots are dried naturally using sunlight, but higher quality seeds are dried with forced air heated by propane heaters. Commercial seeds should be treated with an approved protectant like Captan or Thiram before being packaged in cans, bags, or packets. They must be stored in airtight containers with a moisture content of 6.5%, not exceeding 10%. Under ideal storage conditions, seeds can remain viable for up to 4 years. For seeds to be sold, their germination rate must be at least 70%.

Cucurbit seeds vary in size, shape, and structure, characteristics that are important for family classification [13]. The high economic value of certain species like cucumbers, melons, and squash highlights the importance of optimizing seed production [14]. Most cucurbit seed production is intended for propagation, but in some regions, seeds from watermelons and squash are produced and consumed as snack foods due to their nutritional value [15]. For instance, melon seeds are used as nutritious additives in pasta dishes [16], while seeds from wild watermelon varieties provide a protein source for both human consumption and animal feed [17].

In muskmelon, studies showed that primed seeds dried at lower temperatures, from 38°C to 18°C, resulted in improved storability [18].

Global market of melon crops

In 2023, the leading importers of fresh melons and watermelons were [19]:

- The United States, with imports valued at \$1,008.55 million and a volume of 1.4 million tons.

- The European Union, with imports worth \$726.50 million and totaling 802.27 thousand tons.
- Germany, importing \$538.85 million worth and 587.38 million kilograms.
- France, with imports valued at \$414.87 million and a volume of 405.87 thousand tons.
- The Netherlands, which imported \$321.70 million worth and 883.58 thousand tons.

In the first 6 months of 2021 year, Russia imported 46,000 tons of watermelons by the end of July, which was an 80% increase from 2020. This was a record import for Russia, and by the end of 2021 year, imports have exceeded 70,000 tons for the first time [20]. Russia imported main agricultural products from Uzbekistan. The United States remains the largest importer of melons globally, with total imports reaching 553 thousand tons in 2022.

Conclusion. Although melons are not grown on a large scale around the world compared to other crops, it is still possible to earn a good income from melon crops. The main factors affecting yield are the seed and its quality, soil fertility, and climate. The seed variety must be adapted to the climate of the place where it is planted. Despite the reduction in the area of melons planted for seed production in recent years, a high yield is being obtained, which is due to the development of variety selection technologies.

The global melon market continues to experience significant growth, with increasing import demands driven by key markets like the United States, the European Union, and Russia. In 2023, the United States emerged as the leading importer of melons, with imports valued at \$1,008.55 million, totaling 1.4 million tons. Russia, on the other hand, has seen the main importer of Uzbekistan, especially Russia imports a large number of watermelons from Uzbekistan.

As there were increasing demand for melons, especially in major global importers like the U.S. and the EU, producers must adapt to changing market conditions by optimizing seed quality, enhancing productivity. As Uzbekistan have seen growth in melon exports, investments in improving seed production quality and agronomic practices will be essential to sustain their competitive edge in global markets.

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IQTISODIY O‘SISHDA METALLAR VA QIMMATBAHO MINERALLARNING ROLI

Alijonov Behzod - "TIQXMMI" Milliy Tadqiqot Universiteti, Iqtisodiyot fakulteti, Iqtisodiyot yo‘nalishi 401-guruh tabalasi bekzodalijonov@gmail.com

Annotatsiya. Metallar va qimmatbaho minerallar iqtisodiy o‘shining asosiy omillaridan biri sifatida katta ahamiyatga ega. Ular sanoat rivojlanishining ajralmas qismi bo‘lib, energetika, transport, qurilish, texnologiya va ishlab chiqarish kabi sohalarda keng qo‘llaniladi. Masalan, mis va alyuminiy elektr energiyasini uzatish va yuqori texnologiyali qurilmalarda ishlatilsa, temir va po‘lat infratuzilma qurilishining poydevorini tashkil etadi. Qimmatbaho minerallar, xususan, oltin, kumush va platina esa nafaqat zargarlik sanoati uchun, balki xalqaro moliyaviy tizimda investitsiya vositasi sifatida ham katta ahamiyatga ega. Metallar va minerallar eksport va import orqali davlatlarning savdo balansiga ham sezilarli ta‘sir ko‘rsatadi. Resurslarga boy davlatlar o‘z iqtisodiyotlarini ushbu resurslardan tushadigan daromadlar asosida rivojlantirishi mumkin. Biroq, resurslardan noto‘g‘ri foydalanish va qazib olishda ekologik zararlarning yuzaga kelishi iqtisodiy barqarorlikka xavf soladi. Ayniqsa, qazib olish jarayonida tuproq eroziyasi, suv resurslarining ifloslanishi va bioxilma-xillikning yo‘qolishi kabi ekologik muammolar dolzarb hisoblanadi. Mazkur mavzu iqtisodiyot va ekologiya o‘rtasidagi muvozanatni ta‘minlash, innovatsion texnologiyalarni joriy etish va resurslardan oqilona foydalanish zarurligini ko‘rsatadi. Metallar va qimmatbaho minerallarni iqtisodiy o‘shida to‘g‘ri boshqarish orqali uzoq muddatli barqaror rivojlanishga erishish mumkin.

Kalit so‘zlar: Qimmatbaho metallar, elektron chiqindilar, qimmatbaho metallar narxlari, qayta ishlash, iqtisodiy o‘sh.

Abstract. Metals and precious minerals play a crucial role as one of the main factors of economic growth. They are an integral part of industrial development and are widely used in sectors such as energy, transport, construction, technology, and manufacturing. For example, copper and aluminum are used in electricity transmission and high-tech devices, while iron and steel form the foundation of infrastructure construction. Precious minerals, particularly gold, silver, and platinum, are of great importance not only for the jewelry industry but also as investment instruments in the international financial system. Metals and minerals also significantly impact countries' trade balances through exports and imports. Resource-rich countries can develop their economies based on the income generated from these resources. However, improper resource utilization and environmental damage from extraction pose threats to economic stability. Ecological issues such as soil erosion, water resource pollution, and biodiversity loss during the extraction process are especially pressing concerns. This topic highlights the necessity of maintaining a balance between economy and ecology, implementing innovative

technologies, and ensuring rational use of resources. Long-term sustainable development can be achieved through proper management of metals and precious minerals in economic growth.

Keywords: Precious metals, electronic waste, precious metal prices, recycling, economic growth.

Аннотация. Металлы и драгоценные минералы имеют большое значение как один из ключевых факторов экономического роста. Они являются неотъемлемой частью промышленного развития и широко применяются в таких сферах, как энергетика, транспорт, строительство, технологии и производство. Например, медь и алюминий используются для передачи электроэнергии и в высокотехнологичных устройствах, а железо и сталь составляют основу для строительства инфраструктуры. Драгоценные минералы, в частности золото, серебро и платина, имеют большое значение не только для ювелирной промышленности, но и в качестве инвестиционного инструмента в международной финансовой системе. Металлы и минералы также оказывают значительное влияние на торговый баланс стран посредством экспорта и импорта. Богатые ресурсами страны могут развивать свою экономику на основе доходов, получаемых от этих ресурсов. Однако возникновение экологического ущерба при нерациональном использовании и добыче ресурсов угрожает экономической стабильности. Особенно актуальными являются такие экологические проблемы, как эрозия почв, загрязнение водных ресурсов и утрата биоразнообразия в процессе добычи. Данная тема указывает на необходимость обеспечения баланса между экономикой и экологией, внедрения инновационных технологий и рационального использования ресурсов. Долгосрочного устойчивого развития можно достичь путем грамотного управления металлами и драгоценными минералами в контексте экономического роста.

Ключевые слова: Драгоценные металлы, электронные отходы, цены на драгоценные металлы, переработка, экономический рост.

Kirish. Oltin, platina, palladiy va kumush kabi qimmatbaho metallar barqaror iqtisodiyot uchun muhim ahamiyatga ega, chunki ular moliyaviy ahamiyatga ega va turli sohalarda amaliy foydalanishga ega. Ushbu metallarning xatti harakatlarini bir necha sabablarga ko‘ra tahlil qilish muhimdir. Birinchidan, ular uzoq tarixga ega valyuta va savdo shakli sifatida foydalaniladi. Ikkinchidan, ular zargarlik buyumlari, elektronika va avtomobil ishlab chiqarish kabi ko‘plab sohalarda muhim tarkibiy qismlar bo‘lib, ularning narxining o‘zgarishi ushbu metallarni import qilish yoki eksport qilishga tayanadigan mamlakatlarga sezilarli ta‘sir ko‘rsatishi mumkin. Ushbu narx o‘zgarishlari, shuningdek, tovarga bog‘liq rivojlanayotgan iqtisodiyotlarda iqtisodiy qiyinchiliklar va inflyatsiyaga olib kelishi mumkin. Bundan tashqari, tovar narxlarining o‘zgarishi tovar bozorlarining samaradorligi to‘g‘risida tushuncha berishi va bozor ishtirokchilari tomonidan qisqa muddatli foyda olish uchun foydalanishi mumkin. Nihoyat, tovarlar, shu jumladan qimmatbaho metallar, portfollarni diversifikatsiya qilish qobiliyati, obligatsiyalar va aktsiyalar bilan past korrelyatsiya va inflyatsiyadan himoyalanişda foydaliligi tufayli tobora ko‘proq investitsiya qilinadigan aktivlar sinfi sifatida qaralmoqda.

Qimmatbaho metallar boshqa tovarlarga nisbatan moliyaviy vositalar sifatida ayniqsa muhimdir. Conover va boshqalarning fikriga ko‘ra, ushbu metallarga sarmoya kiritish portfel ish faoliyatini yaxshilashi va investorlarga optimal daromad olish imkoniyatini berishi mumkin. Buning bir qancha sabablari bor. Birinchidan, qimmatbaho metallar likvid moliyaviy aktivlardir va kapital daromad olish uchun yuqori potentsialga ega. Ikkinchidan, ular bozorning noodatiy o‘zgaruvchanligiga qarshi himoya qilish qobiliyatiga ega. Uchinchidan, ular turli mamlakatlardagi ekstremal bozor sharoitlarida xavfsiz boshpana bo‘lib xizmat qilishi mumkin. Qimmatbaho metallarning xavfsiz boshpana va xedjlash xususiyatlari ularning investitsiya vositalari sifatida qiymatini oshiradi.

Butun dunyo bo‘ylab elektron chiqindilarni ishlab chiqarish, to‘plash va qayta ishlash

2019-yilda dunyo bo‘ylab 53,6 million tonna elektron chiqindilar ishlab chiqarildi, bu aholi jon boshiga o‘rtacha 7,3 kg.

Elektron chiqindilarning umumiy hajmining atigi 17,4 foizi to‘g‘ri yig‘ilgan va qayta ishlanganligi rasman hujjatlashtirilgan maqomga ega. Bundan tashqari, agar bu hajm 2014-yildan beri 1,8 million tonnaga oshgan bo‘lsa, u holda elektron chiqindilarning umumiy ishlab chiqarilishi 9,2 million tonnaga oshdi, ya‘ni qayta ishlash ishlab chiqarish elektron chiqindilarning global o‘sishi bilan tenglasha olmadi.

2019 yilda elektron chiqindilarning eng yuqori miqdori Osiyoda qayd etilgan (24,9 million tonna), undan keyin Amerika, 13,1, 12, 2,9 va 0,7 million tonna bilan Yevropa, Afrika va Okeaniya.

Yevropada aholi jon boshiga (16,2 kg) eng ko‘p elektron chiqindilar ishlab chiqariladi, undan keyin Okeaniya (jon boshiga 16,1 kg), Amerika (jon boshiga 13,3 kg), Osiyo (jon boshiga 5,6 kg) va Afrika (jon boshiga 2,5 kg). keltirilgan ma‘lumotlar shuni ko‘rsatadiki, elektron chiqindilar hajmi yiliga deyarli 2 million tonnaga (~200%) o‘sib bormoqda. Ushbu ma‘lumotlar shuni ko‘rsatadiki, qayta ishlash elektron chiqindilarning global o‘shiga mos kelmagan. “

Elektron chiqindilarda bir qator qimmatbaho metall va metall bo‘lmagan materiallar mavjud. Mobil telefonlar va shaxsiy kompyuterlar ishlab chiqarish dunyo bo‘ylab har yili qazib olinadigan oltin, kumush va palladiyning katta qismini iste‘mol qiladi. Butun dunyoda ishlab chiqarilgan oltinning 43 foizi elektronikada ishlatiladi. Kompyuter platalarida eng yuqori platalar mavjud qimmatbaho metallar ulushi. Bosilgan elektron platalar yanada murakkab va ixcham bo‘lib, ular tarkibidagi materiallar miqdori doimiy ravishda o‘zgarib turadi. Bir tonna bosilgan elektron platalarda 80-1500 g oltin va 160-210 kg mis bo‘lishi mumkin. Bu konsentratsiyalar Amerika Qo‘shma Shtatlarida qazib olingan Au rudasidagi oltin miqdoridan 40-800 marta va mis rudasidagi mis konsentratsiyasidan 30-40 baravar ko‘pdir.

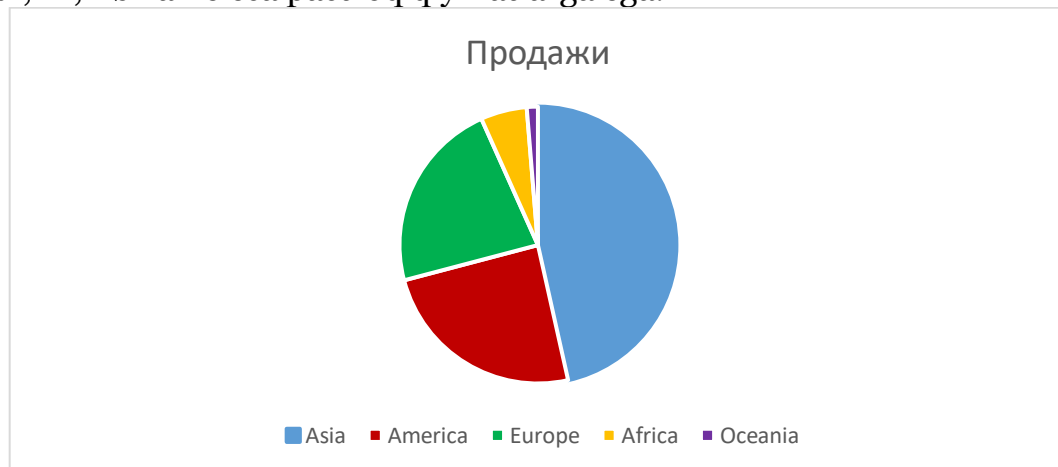
Butun dunyo bo‘ylab elektronika sanoati har yili 267,3 tonna oltin va 7275 tonna kumush iste‘mol qiladi. Birlashgan Millatlar Tashkilotining 2019 yilgi elektron chiqindilar hisobotiga ko‘ra, har yili taxminan 300 tonna oltin olinadi va elektron chiqindilar bozori 52 milliard dollarga teng. Elektron chiqindilarni qayta ishlash foydalidir, garchi uning tarkibida qimmatbaho metallar (Au, Ag va Pd) doimiy ravishda kamayib bormoqda.

Tarkibi bo‘yicha elektron chiqindilarni turli metallar, xususan, mis va alyuminiy bo‘lgan, biriktirilgan, qoplangan yoki har xil turdagi plastmassa va keramika bilan aralashtirilgan material sifatida aniqlash mumkin.

Qimmatbaho metallar yuqori kimyoviy barqarorlik va yaxshi okazuvchanlik xususiyatlari tufayli elektron qurilmalar ishlab chiqarishda va aloqa materiallari sifatida keng qo‘llaniladi. Platina guruhi metallari, boshqa narsalar qatorida, kontaktlarning zanglashiga olib borishda (o‘rni, kalitlar) yoki harorat funktsiyasi sifatida elektr o‘lchanadigan o‘zgaruvchini aniqlash uchun sensorlar sifatida ishlatiladi.

Elektron chiqindilar yoshi, kelib chiqishi va ishlab chiqaruvchisiga qarab sezilarli darajada farq qiladi. Hurda o‘rtacha tarkibga ega emas; hatto odatdagi o‘rtacha sifatida berilgan qiymatlar aslida ma‘lum bir yosh va ishlab chiqaruvchining hurdasini ifodalaydi. Bu zamonaviy kommutatsiya davrlarining quvvat sarfini pasayishi va takt chastotasining ortishi (sirt o‘tkazuvchanligi) bilan bog‘liq. Agar 1980-yillarda kontakt qatlamining qalinligi 1–2,5 mkm bo‘lgan bo‘lsa, hozirgi vaqtda zamonaviy qurilmalarda u 300 dan 600 nm gacha (oltin plastinka) o‘yngarib turadi.

Qimmatbaho metallar uyali telefonlar, kalkulyatorlar va chiqindi bosilgan elektron platalar narxining 70% dan ortig‘ini va televizor platalari va DVD pleerlarning taxminan 40% ni tashkil qiladi. Qimmatbaho metallardan keyin mis va sink turadi, Al, Pb va Fe esa pastroq qiymatlarga ega.



1-Diagramma. Metallarning inson salomatligiga ta‘siri

Qo‘rg‘oshin insonning markaziy va periferik asab tizimiga, qon tizimiga va buyraklariga zarar etkazadi. Bu bolalarning miya rivojlanishiga ham ta‘sir qiladi. Xrom astmatik bronxit va DNKning shikastlanishiga olib keladi. Kadmiy inson salomatligiga toksik qaytarilmas ta‘sir ko‘rsatadi va buyraklar va jigarda to‘planadi. Bundan tashqari, asab tizimiga zarar etkazadi.

Merkuriy miya va nafas olish tizimiga surunkali zarar etkazadi. Plastmassa va PVX yondirilganda dioksinlarni chiqaradi, bu reproduktiv va rivojlanish muammolarini keltirib chiqaradi, immunitet tizimini buzadi va tartibga soluvchi gormonlar bilan aralashadi.

Elektron chiqindilarni to‘g‘ri boshqarish barcha mamlakatlar uchun zarur, chunki u er osti suvlarini ifloslantiradi, tuproqni kislotalaydi va yonishdan keyin zaharli bug‘lar va gazlarni chiqaradi. Elektron chiqindilar, amaliyot shuni

ko'rsatadiki, shahar chiqindixonalarida eng tez to'planadi va kanserogen moddalarni havoga chiqaradi.

Sanab o'tilgan zaharli va zararli moddalar, shuningdek, metallarning inson salomatligiga ta'siri elektron chiqindilarni qayta ishlashga yanada tizimli, puxta o'ylangan yondashuv zarurligini ko'rsatadi. Yonish, eritish va qayta ishlash kabi atrof-muhit uchun zararli bosqichlarni minimallashtirish uchun yangi texnologiyalar talab qilinadi, ular elektron chiqindilarni qayta ishlashning texnologik jihatini hal qilishda atrof-muhit va inson salomatligiga salbiy ta'sir ko'rsatadigan zaharli va zararli moddalarning emissiya manbalari hisoblanadi.

Elektron chiqindilarni qayta ishlash texnologiyalari kelajakda elektron chiqindilarni ziddiyatli, barqaror polimetall ikkilamchi resurslarga aylantirishga qaratilgan bo'lishi kerak. Qayta ishlash texnologiyasi elektron chiqindilarni ekologik jihatdan qulay, yuqori samaradorlik va minimal uglerod izi bilan va yuqori xarajatli eritish zavodlarini tashkil etish bilan bog'liq o'rtacha xarajat bilan qayta ishlashga qodir bo'lishi kerak. Tabiiy resurslarimiz kamayib borayotganini inobatga oladigan bo'lsak, qazib olishga bunday yondashuv resurslarni tejash, yuqori likvidli mahsulotlar olish, moddiy xarajatlarni kamaytirish kabi ko'plab afzalliklarni beradi. Bunday yondashuv energiya samaradorligini oshirishga va qimmatli metallar miqdori yuqori bo'lgan yangi qo'shimcha xom ashyoni qazib olishga bo'lgan talabni kamaytirishga olib keladi.

Elektron chiqindilarni samarali qayta ishlashni tashkil etish uchun yangi yondashuvlar talab etiladi. "Yirik" korxonalar ko'pincha to'plangan chiqindilar asosiy biznesning rivojlanishiga to'sqinlik qila boshlamaguncha, o'z chiqindilaridan kichik hajmdagi qo'shimcha mahsulotlarni olishdan manfaatdor emaslar. Ekologik to'lovlar va resurslarni tejash masalalari davlatning vakolati bo'lib, qo'shimcha mahsulotlarni olish kichik va o'rta biznes uchun eng qiziq. Shunday qilib, autsorsing sxemasi "yirik" korxonalar hududidagi kichik korxonalar o'z chiqindilaridan yuqori likvidli mahsulotlar ishlab chiqarganda o'zini namoyon qiladi.

Iqtisodiyotni diversifikatsiya qilish talab etiladi. Davlat elektron chiqindilarni qayta ishlash sohasidagi jahon tajribasiga tayangan holda, ishlab chiqarishni tashkil etish emas, balki mexanizmlarni ishlab chiqish, kichik va o'rta biznes uchun qulay shart-sharoitlar yaratishi kerak. Ushbu yondashuv bilan biznes o'z-o'zidan paydo bo'ladi va elektron chiqindilardan qimmatbaho metallar ishlab chiqarish uchun zarur bo'lgan o'rnini topadi.

Makroiqtisodiy omillar

Makroiqtisodiy nuqtai nazardan, tadqiqotchilar qimmatbaho metallar narxlarining o'zgarishiga ta'sir qilishi mumkin bo'lgan turli omillarni, masalan, AQShda ishsizlik darajasining o'zgarishi, AQSh uchun iste'mol narxlari indeksi, foiz stavkalari, neft narxining o'sishini o'rgandilar. AQSh uchun pul massasi (AQShning M1 va M2), sanoat ishlab chiqarishi va iste'molchilar ishonchi indeksi.

Qimmatbaho metallar va infatsiya o'zaro bog'liqligi va qimmatbaho metallar inflyatsiyaga qarshi himoya sifatida xizmat qilishi kutilmoqda. Gorton va Rouwenhorst (2006) ma'lumotlariga ko'ra, qimmatbaho metallar bozori inflyatsiya ta'sirida bo'lishi mumkin, chunki qimmatbaho metallarning kelajakdagi narxlari kutilayotgan inflyatsiyadan kuchli ta'sir ko'rsatadi. Bu mualliflar tovar fyucherslarining infatsiya, kutilmagan infatsiya va kutilayotgan infatsiyadagi o'zgarishlar bilan ijobiy bog'liqligini aniqlab, bu fikrni tasdiqlovchi dalillarni

topdilar. Bundan tashqari, ular turli investitsiya ufqlari uchun tovar fyucherslari va inflyatsiya o'rtasidagi bog'liqlikni tahlil qildilar. Ularning xulosalari shuni ko'rsatdiki, tovar fyucherslari va infatsiya o'rtasidagi bog'liqlik uzoqroq ufqlarda statistik ahamiyatga ega va barcha ufqlarda ijobiydir. Bu shuni ko'rsatadiki, inflyatsiya bilan bog'liqlik investitsiya davrining davomiyligi bilan birga ortib boradi. Biroq, Apergis va boshqalar. (2014) infaziya va yuqori ishsizlik darajasi qimmatbaho metallar, ayniqsa kumush va oltin narxlariga salbiy ta'sir ko'rsatishini aniqladi. Xususan, ishsizlik darajasi yuqori bo'lgan iqtisodiyot makroiqtisodiy darajadagi noaniqlik darajasini oshiradi va iqtisodiyotning yomonlashishiga olib keladi. Iqtisodiy noaniqlik darajasi esa investorlarning iqtisodiyotning kelajagi haqidagi umidlarini boshqaradi. Noaniqlik darajasi oshgani sayin, investorlar qimmatbaho metallar bozoridan to'lov olib, qimmatbaho metallar narxining pasayishiga olib keladi.

Foiz stavkalari va qimmatbaho metallar narxlari o'rtasidagi bog'liqlik teskari. Foiz stavkalari yuqori bo'lsa, bu salbiy iqtisodiy muhitni yaratadi, bu esa iste'mol, investitsiyalar va ishlab chiqarishning pasayishiga, shuningdek noaniqlikka olib keladi. Bu investorlarning qimmatbaho metallarni sotishiga olib keladi, bu esa ularning narxining pasayishiga olib keladi. Boshqa tomondan, past qisqa muddatli real foiz stavkalari tovarlar narxini uchta asosiy yo'nalishda ko'taradi. Qimmatbaho metallarga bo'lgan talabni oshirish va ularning taklifini kamaytirish orqali, iqtisodiy o'sishni rag'batlantirish natijasida metallga bo'lgan talabni oshirish orqali. faoliyat va spekyulatorlarni tovar shartnomalarini, ayniqsa spot narxlarning oshishiga olib keladigan spot shartnomalarni sotib olishga undash orqali. Haqiqiy foiz stavkalarining oshishi yuqorida sanab o'tilganlarning teskarisini keltirib chiqaradi. Biroq, Baur (2011) qisqa muddatli va uzoq muddatli foiz stavkalarini ajratadi va ularning oltin narxiga ta'sirini o'rganadi. Uning bashoratiga ko'ra, agar oltinni qisqa muddatda saqlash xarajatlari pasaysa va uzoq muddatli infatsiya kutilmalari ko'tarilsa, oltin narxi oshadi. Uning natijalari shuni ko'rsatadiki, qisqa muddatli va yuqori uzoq muddatli real foiz stavkalari oltin narxiga ijobiy ta'sir ko'rsatadi. Muomaladagi pul miqdori inflyatsiya va foiz stavkalariga ta'siri orqali metallar narxiga ta'sir qilishi mumkin (Apergis et al. 2014). Pul taklifi ko'payganda, bu foiz stavkalarining pasayishiga olib kelishi mumkin, bu esa investorlar nazarida metallar kabi tovarlarga talabning oshishiga olib kelishi mumkin. muqobil investitsiya imkoniyatlari uchun. Pul taklifi kengayganda, u odatda Frankel (1986) ta'kidlaganidek, foiz stavkalarining pasayishiga olib keladi. Bu, o'z navbatida, past foiz stavkalari va ortiqcha likvidlikni keltirib chiqarishi mumkin, bu esa ko'tarilishi mumkin.

Xulosa. Oltin, platina, palladiy va kumush kabi qimmatbaho metallar turli maqsadlarda qo'llaniladi, jumladan, investitsiyalar, to'siqlar, xavfsiz boshpanalar va sanoat manbalari. Ularning keng qo'llanilishi tufayli qimmatbaho metallarning iqtisodiyotga ta'siri shubhasizdir. Ushbu tadqiqot qimmatbaho metallar narxining harakatini o'rganadi va moliyaviy inqirozga olib kelishi mumkin bo'lgan narx pufakchalariga e'tibor qaratadi. Tadqiqot GSADF testidan foydalangan holda qimmatbaho metallardagi narx pufakchalarini aniqlash va har bir metalldagi pufakchalarni aniqlash uchun eng yaxshi mashinani o'rganish algoritmini aniqlashga qaratilgan. Tanlangan algoritm asosida har bir metallning xususiyat ahamiyati ham sanab o'tilgan. Tadqiqot shuni ko'rsatdiki, logistik regressiya oltin,

kumush va platinadagi narx pufakchalarini aniqlashning eng yaxshi algoritmi, tasodifiy oʻrmon esa palladiy narxi pufakchalarini aniqlash uchun eng yaxshisidir. Tadqiqot, shuningdek, har bir metall narxida qabariq paydo boʻlish ehtimolini oshiradigan uchta eng taʼsirli oʻzgaruvchini aniqladi va mumkin boʻlgan sabab-taʼsir munosabatlarini tahlil qildi. Tadqiqotlar shuni koʻrsatadiki, makroiqtisodiy omillar oltin, kumush va platinadagi narxlar pufakchalarining shakllanishida muhim rol oʻynaydi, AQShda isteʼmolchi ishonch indeksi umumiy omil hisoblanadi. Biroq, palladiy uchun moliyaviy va noaniqlik oʻzgaruvchilari qabariq shakllanishining etakchi omillari ekanligi aniqlandi. Qimmatbaho metallar narxlari dinamikasi bilan qiziqqan tartibga soluvchilar, investorlar va siyosatchilar oltin, kumush, platina va palladiydagi pufakchalarni harakatga keltirishi maʼlum boʻlgan bir necha asosiy koʻrsatkichlarga eʼtibor berishlari mumkin. Masalan, ichida oltin holati, uzoq muddatli davlat obligatsiyalarining daromadliligi (10 Yil), AQSh uchun M1 oʻsishi va AQSh uchun isteʼmolchi ishonch indeksi (CCI) oltin pufakchalarining muhim bashorat qiluvchilari ekanligi aniqlandi. Xuddi shunday, kumush uchun AQSh uchun isteʼmolchi ishonchi indeksi (CCI), 3 oylik stavkalar va daromadlar: AQSh uchun banklararo stavkalar va AQShning ishsizlik darajasi hal qiluvchi prognozchilardir. Platinaga kelsak, AQShda ishsizlik darajasi, AQSh uchun isteʼmolchi ishonch indeksi (CCI) va AQSh dollari indeksi eng muhim bashorat qiluvchi omillar sifatida aniqlangan. Va nihoyat, palladiy haqida gap ketganda, S&P 500 indeksi, moliyaviy noaniqlik va haqiqiy noaniqlik palladiy pufakchalarining asosiy prognozlari hisoblanadi. Ushbu maʼlumotlar tegishli tomonlarga yoʻl-yoʻriq koʻrsatish nuqtai nazaridan muhim ahamiyatga ega. Ular qimmatbaho metallarning narxi pufakchalari olib kelishi mumkin boʻlgan inqirozga qarshi zarur choralarni koʻrish uchun foydali boʻlgan oʻzgaruvchilarni aniqlashlari mumkin.

Foydalanilgan adabiyotlar

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IQTISODIYOTNI MODERNIZATSIYA QILISH SHAROITIDA RESURLARDAN FOYDALANISH SAMARADORLIGINI OSHIRISH

Mamajanov Ibrohim - Toshkent irrigatsiya va qishloq xo'jaligini mexanizatsiyalash muhandislari instituti "Milliy tadqiqotlar universiteti" Iqtisodiyot fakulteti Iqtisodiyot (tarmoqlar va sohalar) yo'nalishi 4-kurs talabasi

Annotatsiya: Ushbu tadqiqotda iqtisodiyotni modernizatsiya qilish sharoitida resurslardan foydalanish samaradorligini oshirish masalalari ko'rib chiqiladi. Asosiy maqsad – iqtisodiy o'sish va barqaror rivojlanishni ta'minlash uchun resurslarni yanada samarali ishlatish usullarini aniqlashdir. Tadqiqot jarayonida, resurslarni oqilona va samarali boshqarishning zamonaviy usullari, innovatsion texnologiyalar va boshqaruv strategiyalari tahlil qilinadi.

Tadqiqot natijalari, resurslarni optimallashtirish va innovatsiyalarni joriy etish orqali iqtisodiy samaradorlikni oshirishning samarali usullarini taklif etadi. Shu bilan birga, iqtisodiyotni modernizatsiya qilish jarayonida mavjud muammolar va ularni bartaraf etish bo'yicha tavsiyalar ishlab chiqiladi. Natijada, resurslardan samarali foydalanish orqali iqtisodiy barqarorlik va rivojlanishga erishish imkoniyatlari ko'rsatiladi.

Kalit so'zlar: Iqtisodiy modernizatsiya, Resurslardan foydalanish, Samaradorlik, Innovatsiyalar, Iqtisodiy rivojlanish, Yangi dasturlar va loyiha moliyalashtirish, Investitsiyalar

Abstract: This study examines issues related to improving resource efficiency in the context of economic modernization. The main goal is to identify ways to use resources more effectively to ensure economic growth and sustainable development. The research analyzes modern methods, innovative technologies, and management strategies for rational and efficient resource management.

The research findings suggest effective ways to increase economic efficiency through resource optimization and the introduction of innovations. At the same time, existing problems in the process of economic modernization and recommendations for their elimination will be developed. As a result, the possibilities of achieving economic stability and development through the efficient use of resources are shown.

Keywords: Economic modernization, Resource utilization, Efficiency, Innovation, Economic development, New programs and project financing, Investments

Аннотация: В данном исследовании рассматриваются вопросы повышения эффективности использования ресурсов в условиях модернизации экономики. Основная цель - определить способы более эффективного использования ресурсов для обеспечения экономического роста и устойчивого развития. В процессе исследования анализируются современные методы рационального и эффективного управления ресурсами, инновационные технологии и стратегии управления.

Результаты исследования предлагают эффективные методы повышения экономической эффективности за счет оптимизации ресурсов и внедрения инноваций. Вместе с тем будут разработаны существующие

проблемы в процессе модернизации экономики и рекомендации по их устранению. В результате будут показаны возможности достижения экономической стабильности и развития за счет эффективного использования ресурсов.

Ключевые слова: *Экономическая модернизация, Использование ресурсов, Эффективность, Инновации, Экономическое развитие, Финансирование новых программ и проектов, Инвестиции*

Kirish. XXI asrda iqtisodiyotning modernizatsiyasi, resurslardan samarali foydalanish zarurati nafaqat iqtisodiy, balki ijtimoiy va ekologik masalalarni ham o'z ichiga oladi. Dunyo bo'ylab mamlakatlar o'z iqtisodiyotlarini yangilash va raqobatbardoshligini oshirish maqsadida zamonaviy texnologiyalar va innovatsion yechimlarga murojaat qilmoqda. Ushbu jarayonning muhim jihatlaridan biri resurslarni boshqarish va ulardan samarali foydalanishni ta'minlashdir.

Resurslarning chegaraligi va ekologik muammolar, shuningdek, iqtisodiy o'sishni ta'minlash uchun zarur bo'lgan energiya va xom ashyo ehtiyojlari, hozirgi kunda bu masalalarni dolzarbligini oshirmoqda. Shu bilan birga, ijtimoiy masalalar, masalan, aholi farovonligini oshirish va ish o'rinlarini yaratish, resurslardan samarali foydalanishni talab qiladi. Bundan tashqari, global iqlim o'zgarishlari va tabiatni muhofaza qilish masalalari iqtisodiyotni modernizatsiya qilishda yangi qiyinchiliklar yaratmoqda. Mamlakatlar, jumladan, O'zbekiston, resurslardan foydalanish usullarini modernizatsiya qilish orqali o'z iqtisodiy taraqqiyotini barqarorlashtirishga intilmoqda. Ushbu tadqiqot, resurslardan foydalanishning zamonaviy yondashuvlari va ularning iqtisodiyotni modernizatsiyalashdagi ahamiyatini o'rganadi, bu esa mamlakatlar uchun dolzarb masala bo'lib qolmoqda. Iqtisodiyotni modernizatsiya qilish jarayoni har qanday mamlakatning barqaror rivojlanishi uchun muhim ahamiyatga ega. Bugungi kunda resurslardan samarali foydalanish, iqtisodiy o'sishni ta'minlash va raqobatbardoshlikni oshirishning asosiy omillaridan biridir. Ushbu maqolada resurslardan foydalanish samaradorligini oshirish yo'llari va usullari tahlil qilinadi.

Resurslardan foydalanish samaradorligi. resurslardan foydalanish samaradorligi iqtisodiyotning turli sohalarida, jumladan, sanoat, qishloq xo'jaligi va xizmatlar sektorida ko'rinadi. Samaradorlikni oshirish uchun birinchi navbatda quyidagi omillarga e'tibor qaratish lozim:

1. Texnologik innovatsiyalar: Yangi texnologiyalarni joriy etish, ishlab chiqarish jarayonlarini avtomatlashtirish va raqamli transformatsiya resurslardan foydalanish samaradorligini oshiradi. Masalan, aqlli ishlab chiqarish tizimlari orqali energiya va xom ashyo sarfini kamaytirish mumkin.

2. Kadrlarni tayyorlash va malakasini oshirish: Xodimlarning malakasini oshirish va zamonaviy bilimlarni o'rgatish orqali ularning ish jarayonlarida resurslardan yanada samarali foydalanishiga erishish mumkin.

3. Resurslarni qayta ishlash va tiklash: Qayta ishlash texnologiyalarini joriy etish orqali ishlab chiqarish jarayonida chiqindilarni kamaytirish va mavjud resurslardan maksimal darajada foydalanish muhimdir.

Adabiyotlar sharhi

Iqtisodiyotni modernizatsiya qilish sharoitida resurslardan foydalanish samaradorligini oshirish mavzusida tadqiqot o'tkazgan olimlar :

Joseph Schumpeter – Iqtisodiyotni modernizatsiya qilish jarayonida innovatsiyalar va yangi texnologiyalarning ahamiyatini ta'kidlagan. Uning g'oyalari iqtisodiy rivojlanish va resurslardan samarali foydalanishga asoslangan.

Amartya Sen – Iqtisodiy taraqqiyot va resurslar taqsimoti haqida tadqiqotlar olib borgan. Uning ishlarida inson taraqqiyoti va resurslardan foydalanish samaradorligi o'rtasidagi bog'liqlik ko'rsatilgan.

O'zbekistondagi olimlar:

Abdurauf Qodirov – Iqtisodiyotni modernizatsiya qilish jarayonida resurslardan samarali foydalanish bo'yicha tadqiqotlar olib borgan.

Zarina Tursunova – Iqtisodiy rivojlanish va resurslardan foydalanish samaradorligini oshirish bo'yicha muhim tadqiqotlar o'tkazgan. Iqtisodiyot modernizatsiyasi jarayoni mamlakatlarning iqtisodiy barqarorligini, raqobatbardoshligini va barqaror rivojlanishini ta'minlash uchun zarurdir. Ushbu jarayonda resurslardan samarali foydalanish muhim ahamiyatga ega. Bu tahlil resurslarni modernizatsiya qilish sharoitida qanday qilib samaradorligini oshirish mumkinligini ko'rsatadi.

Tahlil va natijalar

1. Resurslarni aniqlash va baholash
 - Mavjud resurslarni (tabiiy, insoniy, moliyaviy) tahlil qilish.
 - Resurslar salohiyatini aniqlash va ularning samarali foydalanish imkoniyatlarini baholash.
2. Modernizatsiya jarayoni
 - Innovatsion texnologiyalarni joriy etish.
 - Ta'lim va malaka oshirish orqali inson resurslarini rivojlantirish.
 - Resurslarni boshqarish tizimlarini modernizatsiya qilish.
3. Samaradorlikni oshirish strategiyalari
 - Energiya va xom ashyo tejovchi texnologiyalarni qo'llash.
 - Raqobatbardosh narxlarni belgilash orqali bozorni kengaytirish.
 - Ishlab chiqarish jarayonlarini optimallashtirish va avtomatlashtirish.

Natijalar

1. Samaradorlikning oshishi
 - Resurslardan samarali foydalanish natijasida ishlab chiqarish xarajatlari kamayadi va foyda oshadi
 - Energiya sarfi kamayishi orqali ekologik ta'sirlar ham pasayadi.
2. Innovatsion rivojlanish
 - Yangi texnologiyalarni joriy etish natijasida ishlab chiqarish jarayonlari tezlashadi.
 - Mahsulot sifatining oshishi va yangi bozor segmentlariga kirish imkoniyatlari yuzaga keladi.
4. Barqaror rivojlanish
 - Resurslardan oqilona foydalanish iqtisodiy barqarorlikni ta'minlaydi.
 - Ekologik muammolarni hal etish imkoniyatlari kengayadi.

Xulosa. Samaradorlikning oshishi resurslardan samarali foydalanish natijasida ishlab chiqarish xarajatlari kamayadi va foyda energiya sarfi kamayishi orqali ekologik ta'sirlar ham pasayadi. Innovatsion rivojlanish yangi texnologiyalarni joriy etish natijasida ishlab chiqarish jarayonlari tezlashadi. Mahsulot sifatining oshishi va yangi bozor segmentlariga kirish imkoniyatlari yuzaga keladi. Barqaror

rivojlanish resurslardan oqilona foydalanish iqtisodiy barqarorlikni ta'minlaydi. Ekologik muammolarni hal etish imkoniyatlari kengayadi. Resurslardan samarali foydalanishni oshirish, iqtisodiyotni modernizatsiya qilishda muhim rol o'ynaydi. Bu jarayon nafaqat iqtisodiy ko'rsatkichlarni yaxshilaydi, balki ekologik va ijtimoiy masalalarni hal etishda ham yordam beradi. Kelajakda, resurslardan foydalanish samaradorligini oshirish uchun yanada innovatsion yondashuvlar va strategiyalar zarur bo'ladi. Iqtisodiy siyosat va qo'llab-quvvatlash iqtisodiyotni modernizatsiya qilish jarayonida davlat siyosati va qo'llab-quvvatlash ham muhim rol o'ynaydi. Buning uchun quyidagi chora-tadbirlarni amalga oshirish lozim:

1. Yangi dasturlar va loyiha moliyalashtirish: Innovatsion loyiha va dasturlarni moliyalashtirish uchun davlat tomonidan grantlar va subsidiyalar ajratish orqali biznesni qo'llab-quvvatlash.

2. Tashqi investitsiyalarni jalb qilish: Xorijiy investitsiyalarni jalb qilish orqali yangi texnologiyalar va bilimlarni mamlakatga olib kirish va resurslardan samarali foydalanish.

3. Qonunchilikni takomillashtirish: Resurslarni muhofaza qilish va ularni samarali foydalanish bo'yicha qonunlarni yangilash, shuningdek, ekologik me'yorlarni kuchaytirish.

Takliflar

Iqtisodiyotni modernizatsiya qilish sharoitida resurslardan foydalanish samaradorligini oshirish bo'yicha takliflar

1. Innovatsion texnologiyalarni joriy etish: Resurslardan samarali foydalanishni ta'minlash uchun zamonaviy texnologiyalar va avtomatlashtirilgan tizimlarni joriy etish zarur. Masalan, ma'lumotlarni tahlil qilish va boshqarish uchun big data va sun'iy intellektdan foydalanish.

2. Kadrlarni tayyorlash va malakasini oshirish: Ishchilarni zamonaviy texnologiyalar va boshqaruv uslublari bo'yicha muntazam ravishda tayyorlash va malakasini oshirish. Bu resurslardan samarali foydalanishni ta'minlaydi.

3. Resurslarni integratsiyalash: Turli sohalarda resurslarni integratsiyalash orqali ularning bir-biriga ta'sirini va samaradorligini oshirish. Masalan, qishloq xo'jaligida suv resurslari va yerlarni birgalikda boshqarish.

4. Ekologik barqarorlikni ta'minlash: Resurslardan foydalanishda ekologik barqarorlikni inobatga olish. Yashil energiya manbalaridan foydalanish, chiqindilarni qayta ishlash va energiya samaradorligini oshirish.

5. Monitoring va baholash tizimlari: Resurslardan foydalanish samaradorligini doimiy ravishda kuzatib borish uchun monitoring va baholash tizimlarini joriy etish. Bu yordamida muammolarni aniqlash va ularni tezda hal qilish mumkin.

6. Hamkorlik va sheriklik: Davlat va xususiy sektor o'rtasida samarali hamkorlik o'rnatish, innovatsion loyihalarni qo'llab-quvvatlash va birgalikda resurslardan foydalanish strategiyalarini ishlab chiqish.

7. Samarali moliyalashtirish: Resurslardan foydalanishni optimallashtirish uchun samarali moliyaviy rejalar ishlab chiqish va investitsiyalarni jalb qilish.

8. Ma'lumotlarni oshkor qilish va tarqatish: Resurslardan foydalanish bo'yicha ma'lumotlarni oshkor qilish va omma bilan baham ko'rish, bu esa foydalanuvchilar orasida ongli va samarali foydalanishni rag'batlantiradi.

Ushbu takliflar iqtisodiyotning turli sohalarida resurslardan samarali foydalanishni oshirishga yordam beradi va modernizatsiya jarayonlarini muvaffaqiyatli amalga oshirishga xizmat qiladi.

Xulosalar

1. Resurslarni chuqur tahlil qilish:

○ Har bir resurs turining salohiyatini aniqlash va ularni baholash, ishlab chiqarish jarayonlarida samarali qo'llanilishi uchun asosiy bosqichdir. Buni amalga oshirish orqali resurslardan foydalanish samaradorligini oshirish imkoniyatlari paydo bo'ladi.

2. Innovatsion texnologiyalarni joriy etish:

○ Zamonaviy texnologiyalarni qo'llash, ishlab chiqarish jarayonlarini tezlashtirish va xarajatlarni kamaytirish orqali iqtisodiy samaradorlikni oshirishga yordam beradi. Bu jarayonni ta'minlash uchun ilmiy-tadqiqot ishlari va innovatsiyalarni qo'llab-quvvatlash zarur.

3. Inson resurslarini rivojlantirish:

○ Ta'lim va malaka oshirish dasturlari orqali inson resurslarini rivojlantirish, ishchilarni yangi texnologiyalar va uslublarga moslashtirishda muhimdir. Bu, o'z navbatida, ishlab chiqarish samaradorligini oshirishga olib keladi.

4. Resurslarni boshqarish tizimlarini modernizatsiya qilish:

○ Resurslarni samarali boshqarish tizimlarini joriy etish orqali resurslardan maksimal darajada foydalanish mumkin. Bu, shuningdek, qiyinchiliklarni oldini olish va iqtisodiy barqarorlikni saqlashga yordam beradi.

5. Energiya va xom ashyo tejovchi texnologiyalar:

○ Tejovchi texnologiyalarni qo'llash orqali ishlab chiqarish jarayonlarida energiya sarfini kamaytirish, ekologik ta'sirlarni pasaytirish va barqaror rivojlanishga erishish mumkin.

6. Raqobatbardosh narxlarni belgilash:

○ Bozorni kengaytirish uchun raqobatbardosh narxlarni belgilash va sifatni oshirish, iste'molchilarning qoniqishini ta'minlaydi va yangi bozor segmentlariga kirish imkonini beradi.

Resurslardan samarali foydalanishni oshirish iqtisodiyotni modernizatsiya qilish jarayonida muhim ahamiyatga ega. Texnologik innovatsiyalar, kadrlar malakasini oshirish, davlat siyosati va qo'llab quvvatlash kabi omillar ushbu jarayonni muvaffaqiyatli amalga oshirishda muhim rol o'ynaydi. Bunday chora-tadbirlar yordamida mamlakatimiz iqtisodiyoti barqaror rivojlanadi va global raqobatbardoshlikni oshiradi. Ushbu xulosalar iqtisodiyotni modernizatsiya qilish jarayonida resurslardan foydalanish samaradorligini oshirish uchun aniq strategiyalarni ishlab chiqishda yordam beradi.

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LYUDVIG ERXARD VA FRIEDRIX FON XAYEK: BOZOR IQTISODIYOTI QARASHLARI VA O'ZBEKISTONGA TADBIQI

Yakhyaev Otabek Yusupovich – "TIAME" National Research University
Uralov Javohir Fazliddin o'g'li – "TIAME" National Research University

Annotatsiya: Ushbu tadqiqotning asosiy maqsadi, iqtisodiyot va bozor tizimiga oid nazariyalarni ishlab chiqqan va ularni rivojlantirgan ikki buyuk iqtisodchi, Lyudvig Erxard va Fridrix fon Xayekning ishlari asosida bozor iqtisodiyotining rivojlanishiga ta'sirini o'rganishdir. Lyudvig Erxardning iqtisodiy islohotlar va liberallashtirishga oid qarashlari, shuningdek, Fridrix fon Xayekning erkin bozor va davlatning roli haqidagi falsafasi iqtisodiy nazariyaning markaziy yo'nalishlarini shakllantirgan. Ushbu tadqiqotda bozor iqtisodiyotining samaradorligini ta'minlash, erkin raqobatning ahamiyati va davlatning minimal aralashuvi kabi muhim iqtisodiy tamoyillarni ko'rib chiqamiz. Bu tadqiqot ikki buyuk iqtisodchi nazariyalarining o'ziga xos xususiyatlari va ularning hozirgi davrda amaliy ahamiyati bilan tanishtiradi.

Kalit so'zlar: Lyudvig Erxard, Fridrix fon Xayek, bozor iqtisodiyoti, erkin bozor, liberallashtirish, iqtisodiy islohotlar, davlatning roli, erkin raqobat, iqtisodiy nazariyalar, markazlashgan rejalashtirish, iqtisodiy samaradorlik.

Annotation: The main objective of this research is to examine the impact of the works of two great economists, Ludwig Erhard and Friedrich von Hayek, on the development of the market economy. Ludwig Erhard's views on economic reforms and liberalization, as well as Friedrich von Hayek's philosophy on the free market and the role of the state, have shaped the central directions of economic theory. This study explores key economic principles such as ensuring the efficiency of the market economy, the importance of free competition, and the necessity of minimal state intervention. The research introduces the distinctive features of the theories of these two prominent economists and their practical significance in the modern era.

Keywords: *Ludwig Erhard, Friedrich von Hayek, market economy, free market, liberalization, economic reforms, role of the state, free competition, economic theories, centralized planning, economic efficiency.*

Аннотация: Основная цель данного исследования — изучить влияние работ двух великих экономистов, Людвига Эрхарда и Фридриха фон Хайека, на развитие рыночной экономики. Взгляды Людвига Эрхарда на экономические реформы и либерализацию, а также философия Фридриха фон Хайека о свободном рынке и роли государства сформировали ключевые направления экономической теории. В этом исследовании рассматриваются важные экономические принципы, такие как обеспечение эффективности рыночной экономики, значение свободной конкуренции и необходимость минимального вмешательства государства. Работа знакомит с особенностями теорий этих двух выдающихся экономистов и их практическим значением в современном мире.

Ключевые слова: Людвиг Эрхард, Фридрих фон Хайек, рыночная экономика, свободный рынок, либерализация, экономические реформы, роль государства, свободная конкуренция, экономические теории, централизованное планирование, экономическая эффективность.

Kirish. Bozor iqtisodiyoti nazariyasi iqtisodiyotning samarali ishlashini ta'minlashda eng muhim rol o'ynaydi. Bu nazariyaning asosiy targ'ibotchilaridan biri bo'lgan Lyudvig Erxard va Fridrix fon Xayekning iqtisodiy g'oyalari iqtisodiyotshunoslik sohasida muhim iz qoldirgan. Erxard, Germaniya iqtisodiyotini qayta tiklashda va bozor islohotlarini amalga oshirishda o'zining samarali yondashuvlari bilan tanilgan. Xayek esa, bozor tizimining erkin ishlashining ahamiyatini ta'kidlab, markazlashgan rejalashtirishga qarshi chiqdi va davlatning iqtisodiy jarayonlarga aralashishining zaruriyati haqidagi o'zining qarashlarini shakllantirdi. Erxard va Xayekning ishlari bugungi kun iqtisodiyotida ham ahamiyatini yo'qotmagan. Ularning bozorni erkinlashtirish va iqtisodiy faoliyatni barqarorlashtirishga oid yondashuvlari, mamlakatlar o'rtasidagi iqtisodiy farqlarni kamaytirish va global bozorda samarali raqobat muhitini yaratish uchun muhim manba bo'lib xizmat qiladi. Ushbu ishda bozor iqtisodiyotining samaradorligini ta'minlash va bozor nazariyalarining ilgari surilgan tamoyillari asosida erkin iqtisodiy tizimni yaratish jarayonlari chuqur tahlil qilinadi.

Metodologiya. Erxard va Xayekning bozor iqtisodiyoti haqidagi qarashlarini o'rganish va O'zbekiston iqtisodiyotiga tatbiq etish uchun quyidagi metodologik yondashuvlar qo'llaniladi:

1. Tarixiy-metodologik yondashuv: O'rganilayotgan mavzuning metodologiyasi tarixiy-muammoli tahlilga asoslanadi. Erxard va Xayekning iqtisodiy nazariyalari tarixiy rivojlanish jarayonida shakllangan va o'z vaqtida turli iqtisodiy sharoitlar va davlat siyosatiga ta'sir ko'rsatgan. Shuning uchun, bu yondashuv orqali bozor iqtisodiyotining rivojlanish tendensiyalarini, iqtisodiy erkinlikning kengayishini va davlat aralashuvining kamayishini o'rganish mumkin.

2. Komparativ tahlil: Komparativ tahlil metodologiyasi yordamida Erxard va Xayekning iqtisodiy g'oyalarini boshqa iqtisodiy makro va mikroiqtisodiy nazariyalar bilan solishtirish amalga oshiriladi. Bu tahlil orqali bozor iqtisodiyoti tizimining samaradorligi va davlat aralashuvining o'rnini aniqlanadi. Xayekning bozor erkinligi va

Erxardning ijtimoiy bozor iqtisodiyoti prinsiplarini boshqa iqtisodiy tizimlar, masalan, markazlashgan va aralash iqtisodiyot tizimlari bilan solishtirish orqali ularning samaradorligini aniqlash mumkin.

3. Kvantitativ tahlil: O'zbekiston iqtisodiyotidagi bozor islohotlarini tahlil qilishda kvantitativ metodlar qo'llanadi. Statistika va iqtisodiy ko'rsatkichlar asosida Erxard va Xayekning g'oyalari qanday amalda qo'llanayotganini o'lchash uchun makroiqtisodiy ko'rsatkichlar (YIM o'sish sur'ati, soliq tizimi, biznes muhitining yaxshilanishi, tashqi savdo hajmi va boshqalar) va mikroiktisodiy ko'rsatkichlar (xususiy sektorga bo'lgan investitsiyalar, raqobat darajasi, ish bilan bandlik darajasi) tahlil qilinadi.

Dolzarbli. Lyudvig Erxardning Hayoti va Iqtisodiy Mo'jizasi: Lyudvig Erxard (1897– yil 4-fevral-1977-yil 5- may) Germaniyalik iqtisodchi va siyosatchi bo'lib, Germaniyaning 2-jahon urushidan keyingi iqtisodiy tiklanishida muhim rol o'ynagan shaxsdir. U 1949-1963 yillarda G'arbiy Germaniyada iqtisodiyot Vaziri sifatida faoliyat yuritgan va 1963–1966-yillarda Germaniya Federativ Respublikasi Federal kansleri. 1966-yil martdan 1967-yil maygacha Xristian-demokratik ittifoq raisi. U 1948-yilda G'arbiy Germaniyada iqtisodiy islohotlarni amalga oshirgan va yangi bozor tamoyillariga asoslangan tizimni joriy etgan. Erxardning "ijtimoiy bozor iqtisodiyoti" konsepsiyasi inson erkinligi va ijtimoiy adolatni uyg'unlashtirishni maqsad qilgan. U narxlarni nazorat qilishni bekor qilib, erkin savdo va raqobat muhitini yaratdi. Bu islohotlar tufayli Germaniya qisqa vaqt ichida sanoati rivojlangan davlatlar qatoriga qo'shildi. Bunga misol qilib mana shularni keltirishimiz mumkin Erxard rejasi G'arbiy Germaniyaning "nemis mo'jizasi"ga erishish imkonini bergan iqtisodiy islohotlar majmui bo'lib, unda 2-jahon urushida vayronaga aylangan mamlakatni, izdan chiqqan iqtisodiyotni qayta tiklash omillari belgilab berilgan. Bu reja 1948-yildan boshlab GFR kansleri K.Adenauer va L.Erxard hamkorligida mamlakat iqtisodiy siyosatining asosiy vazifasi sifatida qabul qilingan va amalga oshirilgan. Erxard rejasiga ko'ra, 1948-yil 21-iyunda mamlakatda asosiy muammo bo'lgan yuqori inflyatsiyani jilovlash uchun o'ta keskin pul islohoti amalga oshirildi, eski reyxsmarka (RM) o'rniga yangi doychmarka (DM) joriy qilindi. Bunda kishi boshiga 40 DM 1/1 nisbatda, qolgan mablag'lar esa yangi valyutaga 1/10 nisbatda almashtirildi. Shuningdek, tijorat banklardagi jamg'armalarning katta qismi muzlatib qo'yildi (1948-yilda 30% va 1949-yilda 70%). Ayni paytda GFR hukumati ishlab chiqarishni qo'llabquvvatlash maqsadida amaldagi soliq stavkalarini keskin pasaytirdi, Nemis yerlari banki (GFR Davlat banki) esa majburiy zaxiralar me'yorini pasaytirdi. Mazkur choralar iqtisodiyotni keng miqyosda arzon kreditlar bilan ta'minlab berdi. Ikkinchi jahon urushidan keyin AQShning G'arbiy Yevropani qayta tiklashga qaratilgan Marshall rejasi doirasida GFRga ajratilgan 2,422 mlrd. AQSH dollari miqdoridagi yordam ham Erxard rejasi ning muvaffaqiyatini ta'minladi. Ijtimoiy bozor xo'jaligi modelida totalitar markazdan boshqariladigan iqtisodiyotdan keskin farqlanadigan usullar qo'llandi. Natijada qisqa muddatda GFR da iqtisodiy yuksalish jarayonlari boshlandi. Jumladan, 1948-yil GFRda sanoat ishlab chiqarish 50%, 1949-yilda esa 25% o'sdi. 1953-yilga kelib GFR yalpi ichki mahsulot, sanoat ishlab chiqarish bo'yicha G'arbiy Yevropaning iqtisodiy jihatdan eng kuchli mamlakatiga aylandi, nemis doychmarkasi esa dunyoning qadrlı valyutalari qatoridan joy oldi. Erxard rejasi bosqichmabosqich (1bosqich 1948— 56 yillarda, 2bosqich 1957—64 yillarda) amalga oshirildi. 1963—67

yillarda GFR kansleri bo'lgan L.Erxard 1965-yilda GFRda "ijtimoiy bozor xo'jaligi"ni barpo etish dasturi nihoyasiga yetganligini e'lon qildi. Erxard rejasi va uning asosiy g'oyalari GFRda o'z hayotiyiligini ko'rsatdi va boshqalar bir qancha mamlakatlar (Shvetsiya, Finlandiya va boshqalar)da keng qo'llandi.

Friedrix fon Xayekning Ilmiy Merosi: Fridrix Fon Xayek (1899–yil 8-may-1992-yil 23--mart) Avstriya iqtisodiyot maktabining taniqli vakili bo'lib, erkin bozor nazariyasini rivojlantirgan. Uning asosiy g'oyalaridan biri bozor mexanizmining o'z-o'zini tartibga solish qobiliyatidir ayniqsa narxlar tizimi bozorning asosiy qismi bo'lib, resurslarning taqsimlanishini muvofiqlashtiradi va iqtisodiy qarorlarni qabul qilish uchun signal vazifasini bajaradi. Hayekning fikricha, iqtisodiy qarorlar bozor ishtirokchilari orasidagi ma'lumotlarning tarqalishi orqali eng samarali shaklda qabul qilinadi. Uning "Qullikka yo'l" (The Road to Serfdom, 1944) asari markazlashgan iqtisodiy tizimlarning zaifliklarini ochib berib, ya'ni marlazlashtirilgan rejalashtirish va kollektivizmning (bu bir guruh yoki jamiyatning umumiy manfaatlari uchun birga ishlash va hamjihatlikda harakat qilish) ni totalitarizmga (bu davlatning barcha jabhalarda to'liq nazorat o'rnatgani va fuqarolarning barcha erkinliklarini cheklab, faqat bitta partiya yoki rahbar hukmron bo'lishini ta'minlaydigan tizim) ga olib kelishi mumkinligini ta'kidlagan. Ushbu asar erkin bozor ya'ni (bu tovarlar va xizmatlarning narxini va miqdorini talab va taklif belgilab beradigan tizim. Davlat aralashmasdan, odamlar o'zlarining ehtiyojlariga ko'ra savdo qiladi) va inson erkinligining ustunliklarini himoya qilgani uchun keng e'tirofga sazovor bo'ldi va klassik liberalizm (bu shaxsiy erkinlik, xususiy mulkchilik va bozor erkinligini qo'llab-quvvatlaydigan g'oya. Uning asosiy tamoyillari: davlatning aralashuvi minimal bo'lishi, har bir inson o'z hayotini o'zi boshqarishi kerakligi va erkin raqobat orqali iqtisodiy rivojlanish) va libertarizm (bu davlatning fuqarolarning hayotiga aralashishini minimal darajaga tushirishni qo'llab-quvvatlaydigan g'oya. Shaxsiy erkinlik va xususiy mulkchilikni himoya qilish, shuningdek, har bir insonning o'z qarorlarini mustaqil qabul qilish huquqi ta'kidlanadi) g'oyalari uchun muhim asar bo'lib qolmoqda. Bu ishlari, uning 1974-yilda iqtisodiyot bo'yicha Nobel mukofotini qo'lga kiritishini ta'minladi.

O'xshashliklari. Lyudvig Erxard va Friedrix Xayek iqtisodiy g'oyalari o'rtasidagi bir qator umumiy nuqtalar mavjud. Ikkalasi ham bozor iqtisodiyotining erkinligi va davlat aralashuvining cheklanishi tarafdorlari bo'lib, iqtisodiy o'sish va farovonlikka erishishda shaxsiy erkinlik va raqobat muhim rol o'ynashini ta'kidlaganlar.

Fridrix Xayek o'zining "Qullikka yo'l" asarida markazlashtirilgan rejalashtirish va davlatning haddan tashqari aralashuvi jamiyatni yakka hokimlikka olib borishini ta'kidlagan. Uning fikricha, iqtisodiy erkinlik siyosiy va ijtimoiy erkinlikning asosi bo'lib, bozor mexanizmlari orqali resurslar samarali taqsimlanadi. Hayek o'zining ijtimoiy va siyosiy falsafasini, inson bilimining cheklanishlari va ijtimoiy institutlardagi o'z-o'zini tartibga solish g'oyalariga asoslagan. U bozor tizimi atrofida tashkil etilgan jamiyatni qo'llab-quvvatladi, unda davlatning apparati deyarli (ammo mutlaqo emas) faqat huquqiy tartibni amalga oshirish uchun ishlatiladi (bu abstrakt qoidalar va aniq buyruqlar emas) bozor erkin shaxslar faoliyat yuritishi uchun zarur. Bu g'oyalar, inson bilimining tabiiy chegaralari haqidagi epistemologik tashvishlaridan kelib chiqqan axloqiy falsafaga asoslangan. Hayekning fikricha, uning ideal individualistik va erkin bozorli jamiyati o'z-o'zini tartibga soladigan

darajada bo'lishi kerak, shunda u "uni boshqarish uchun yaxshi odamlarni topishga tayyor bo'lishimizga tayanmaydigan jamiyat bo'ladi".

Lyudvig Erxard esa Germaniyaning urushdan keyingi iqtisodiy tiklanishida muhim rol o'ynagan. Uning "sozlangan bozor iqtisodiyoti" konsepsiyasi bo'yicha, davlat bozorining asosiy qoidalarini belgilaydi va raqobatni qo'llab-quvvatlaydi, lekin iqtisodiyotga bevosita aralashmaydi va "Raqobat mumkin bo'lgan hamma yerda, tartibga solish-zarur bo'lgan yerda amalga oshuvi kerak". Bu yondashuv Germaniyada "iqtisodiy mo'jiza"ga olib kelgan.

Shunday qilib, Xayek va Erxardning g'oyalari o'rtasidagi mushtaraklik bozor erkinligi, davlat aralashuvining cheklanishi va raqobatning iqtisodiy farovonlikka erishishdagi ahamiyatini ta'kidlashlarida namoyon bo'ladi.

Farqlari. Davlatning roli: Erxard iqtisodiyotda davlatning faol ishtirokini qo'llab-quvvatlaydi. U davlatni bozor erkinligini ta'minlaydigan, lekin ijtimoiy himoya va adolatni nazorat qiluvchi kuch sifatida ko'radi. Xayek esa davlatning iqtisodiyotga aralashishini rad etadi va faqat qonunlar va mulk huquqlarini himoya qilishni talab qiladi. U bozor tizimining o'z-o'zini boshqarishiga ishonadi.

Bozor erkinligi: Erxard bozor erkinligini qo'llab-quvvatlaydi, ammo davlat tomonidan kuzatuv va ijtimoiy himoya kerakligini ta'kidlaydi. Xayek bozorning to'liq erkin bo'lishi kerakligini aytadi, chunki faqat erkin bozor o'z-o'zini samarali boshqarishi mumkin.

Sotsializm va markazlashgan iqtisodiyotga qarshi munosabat: Erxard sotsializmni bozor erkinligini cheklovchi tizim sifatida ko'rsa-da, davlatning muayyan rollarni bajarishini qo'llab-quvvatlaydi. Xayek esa markazlashgan rejalashtirishni va sotsializmni qat'iyan rad etadi, chunki ular bozorning tabiiy faoliyatiga xalaqit beradi deb hisoblaydi.

Ijtimoiy tenglik: Erxard ijtimoiy tenglikni ta'minlash uchun davlatning ishtirokini zarur deb biladi. U iqtisodiy o'sish va barqarorlikni nafaqat bozor erkinligi, balki ijtimoiy himoya orqali ham ta'minlashni xohlaydi. Xayek esa, ijtimoiy himoya va tenglikni bozor orqali o'z-o'zini boshqaradigan tizimlarda topiladi, davlatning bu boradagi roli minimal bo'lishi kerak.

Iqtisodiy o'sish: Erxard iqtisodiy o'sishni davlat tomonidan muvofiqlashtirilgan va rag'batlantirilgan resurslar bilan bog'laydi. Xayek, iqtisodiy o'sishni faqat bozorning erkin faoliyati orqali ta'minlanishini ta'kidlaydi.

O'zbekiston Respublikasi Prezidenti Iqtisodiyotni yanada rivojlantirish va iqtisodiy siyosat samaradorligini oshirishning qo'shimcha chora-tadbirlari to'g'risidagi 2017-2021 -yillardagi farmonidagi chora-tadbirlar Lyudvig Erxard va Friedrix Xayekning iqtisodiy nazariyalari bilan muhim o'xshashliklarga ega.

Quyida asosiy qirralarni ko'rib chiqamiz:

1. Erxardning "Bozor iqtisodiyoti" nazariyasi bilan bog'liqlik

Bozor mexanizmlariga tayanish: Farmonda makroiqtisodiy barqarorlikni ta'minlash, soliqqa tortish tizimini isloh qilish va bozor tamoyillarini keng joriy etish belgilangan. Bu Lyudvig Erxardning bozor iqtisodiyoti tamoyillariga mos keladi, chunki u davlatning iqtisodiyotga aralashuvini kamaytirib, raqobatni kuchaytirish tarafdori bo'lgan.

Erkin raqobatni ta'minlash: Farmon davlat ulushiga ega korxonalarni isloh qilish va xususiylashtirishni nazarda tutadi. Bu Erxardning "raqobatbardosh bozorni shakllantirish" g'oyasi bilan uyg'un.

Fuqarolarning turmush darajasini oshirish: Farmon tadbirkorlik subyektlarini qo'llab-quvvatlash orqali aholining iqtisodiy faolligini oshirishga qaratilgan. Bu ham Erxardning Germaniya iqtisodiyotini tiklashda erishgan muvaffaqiyatlari, xususan, "Iqtisodiy mo'jiza"ni amalga oshirgan tamoyillariga mos keladi.

2. Xayekning "Erkin bozor va davlatning cheklangan roli" nazariyasi bilan bog'liqlik

Bozor erkinligi va davlatning cheklangan aralashuvi: Fridrix Xayek bozor erkinligi va davlatning minimal darajada aralashuvini ta'minlash tarafdori bo'lgan. Farmonda davlat aktivlarini boshqarishda bozor tamoyillarini kengaytirish va resurslarni taqsimlashda bozor mexanizmlariga tayanish belgilangan bo'lib, bu Xayekning davlat iqtisodiyotga kamroq aralashishi haqidagi nazariyasi bilan mos keladi.

Ijtimoiy himoyani takomillashtirish: Farmonda aholining ijtimoiy ko'makka muhtoj qatlamlarini himoya qilish choralari keltirilgan. Xayek davlatning ijtimoiy sohadagi o'rni haqida bahs yuritgan bo'lsa-da, uning fikricha, bu bozor erkinligini cheklamaydi. Farmon bu tamoyilni inobatga olgan holda, muvozanatli yondashuvni ifodalaydi.

Bozorni regulatsiyadan ozod qilish: Xayekning nazarida iqtisodiyotni davlat tomonidan rejalashtirish va cheklash iqtisodiy erkinlikka putur yetkazadi. Farmon erkin valyuta bozorini joriy etish va yuqori likvidli tovarlarni bozor mexanizmlariga asoslangan usulda sotishni taklif qilgan bo'lib, bu Xayekning asosiy g'oyalariga mos keladi.

3. Iqtisodiy erkinlik va taraqqiyotga bo'lgan yondashuvdagi o'xshashliklar

Har ikki iqtisodchi ham iqtisodiy o'sishni erkin bozor tamoyillari va raqobatni kuchaytirish orqali ta'minlashni maqsad qilgan. Farmondagi makroiqtisodiy barqarorlikni saqlash va iqtisodiy islohotlarni izchil davom ettirish masalalari aynan ushbu tamoyillarga asoslanadi.

Davlat boshqaruvi samaradorligini oshirish va tadbirkorlikni qo'llab-quvvatlash yo'nalishlari ham Erxard va Xayekning iqtisodiy o'sishga bo'lgan qarashlariga muvofiq keladi.

Statistika va Tahlillar

1. Iqtisodiy o'sish sur'ati: O'zbekistonda iqtisodiy o'sish sur'ati 2017-2022 yillar davomida barqaror ravishda oshib bormoqda. 2022-yilda O'zbekistonning yalpi ichki mahsuloti (YIM) o'sish sur'ati 5,6%ni tashkil etdi. Erxardning ijtimoiy bozor iqtisodiyoti va Xayekning bozor erkinligi tamoyillari asosan iqtisodiy o'sishni rag'batlantirishga qaratilgan, bu esa O'zbekistonda biznes muhitining yaxshilanishi, tadbirkorlikni rivojlantirish va raqobatni oshirish orqali amalga oshirilmoqda.

2. Bozor raqobati va tashqi savdo: O'zbekistonda tashqi savdo hajmi 2021-yilda 45,8 milliard dollarni tashkil etdi, bunda eksport hajmi 16,8 milliard dollarni tashkil qildi. Erxard va Xayekning bozordagi erkin raqobat va davlat aralashuvining minimalizatsiyasiga oid qarashlari, bu sohada ishlab chiqarishni diversifikatsiya qilish va bozorlar o'rtasidagi erkin savdo aloqalarini kuchaytirish orqali iqtisodiy o'sishni ta'minlashga yordam beradi.

3. Tadbirkorlikni rivojlantirish va xususiy sektorga bo'lgan investitsiyalar: O'zbekistonda xususiy sektorga bo'lgan investitsiyalar 2022-yilda 4,5 milliard dollarni tashkil etdi. Xayekning fikriga ko'ra, bozor erkinligi va davlatning minimal

aralashuvi xususiy sektorni rivojlantirishga yordam beradi. Xususiy sektorga bo'lgan investitsiyalarning o'sishi, Erxardning ijtimoiy bozor iqtisodiyoti prinsiplariga asoslangan siyosatni qo'llab-quvvatlash orqali iqtisodiy barqarorlikni oshiradi.

4. Islohotlar va bozor mexanizmlarining ta'siri: O'zbekistonda 2021-2022 yillarda amalga oshirilgan bozor islohotlari natijasida, kichik va o'rta biznesni rivojlantirishga qaratilgan yuridik va iqtisodiy muhit yaxshilandi. Islohotlar natijasida bozor mexanizmlarining samaradorligi oshdi va yangi tadbirkorlik sub'ektlari tashkil etildi. Statistik ma'lumotlarga ko'ra, 2022-yilning boshiga kelib, O'zbekistonda faoliyat yuritayotgan kichik va o'rta biznes sub'ektlari soni 200 mingdan oshdi.

5. Mehnat bozoridagi o'zgarishlar: O'zbekistonda ish bilan bandlik darajasi 2022-yilda 97%ga yetdi, bu esa Erxard va Xayekning iqtisodiy samaradorlikka bo'lgan yondashuvlarining muvaffaqiyatini ko'rsatadi. Ularning iqtisodiy siyosatlari natijasida ishchilarning erkin harakati va mehnat bozorida raqobatning kuchayishi hamda ishlash sharoitlarining yaxshilanishi kuzatilgan.

6. Raqamli iqtisodiyot va innovatsiyalar: O'zbekistonda raqamli iqtisodiyotning rivojlanishi uchun 2022-yilga kelib 1,5 milliard dollarlik investitsiya jalb qilindi. Xayekning "iqtisodiy erkinlik" g'oyalariga tayangan holda, O'zbekistonda raqamli texnologiyalarni rivojlantirish va ularni iqtisodiyotning barcha sohalariga joriy etish orqali bozorda yanada samarali raqobatni yaratish mumkin.

7. Soliq tizimi va davlat aralashuvi: Soliq tizimi islohotlari O'zbekistonda davlatning iqtisodiy faoliyatga aralashuvini kamaytirishga qaratilgan. 2022-yilga kelib, soliq yuklamalari 30%ga kamaydi, bu esa tadbirkorlik muhitining yaxshilanishini ko'rsatadi. Erxard va Xayekning davlatning iqtisodiy faoliyatga aralashuvini minimallashtirishga oid fikrlarini O'zbekistonda amaliyotga tatbiq etish, iqtisodiy erkinlikni va raqobatni oshiradi.

Xulosa. Lyudvig Erxard va Fridrix fon Xayek iqtisodiy fikrlar va bozor iqtisodiyoti sohasida o'zlarining muhim hissalarini qo'shgan ikki buyuk shaxsdir. Erxard Germaniyaning bozor iqtisodiyotini qayta tiklash va ijtimoiy bozor iqtisodiyotini rivojlantirishda katta rol o'ynagan. Uning iqtisodiy siyosati va bozor erkinligini ta'minlashga oid qarashlari, ayniqsa, Germaniyada jahon urushidan keyingi iqtisodiy tiklanishga zamin yaratgan.

Xayek esa bozor iqtisodiyoti, erkin raqobat, shaxsiy erkinlik va markazlashtirilgan iqtisodiy rejimning zararli ta'siri bo'yicha o'zining ilmiy qarashlari bilan mashhur. Uning "yaxshi jamiyat" va "bozor tartiboti" haqidagi tushunchalari, shuningdek, markazlashtirilgan rejalashtirishni va davlatning ortiqcha aralashuvini tanqid qilishi, bugungi kunda ham iqtisodiy siyosatni shakllantirishda katta ahamiyatga ega.

Ushbu ikki olimning asarlari bozor iqtisodiyotini o'rganish va rivojlantirishda muhim metodologik asoslarni taqdim etadi. Ularning qarashlari bugungi kunda ham iqtisodiy siyosat va bozorda erkin raqobatni ta'minlashda qo'llanilmoqda. Erxard va Xayekning iqtisodiy o'g'itlari bozorlar erkinligi, raqobat va davlatning roli masalalariga oid yangi tushunchalar yaratdi, shuningdek, o'tmishdagi iqtisodiy rejalar va nazariyalarni sinchkovlik bilan qayta ko'rib chiqishga imkon berdi.

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MATHEMATICAL MODELING OF TRAFFIC JAMS IN TASHKENT USING THE SINE-GORDON EQUATION

Doniyor Babajanov - PhD, Associate professor, d.b.babajanov@gmail.com,
"Tashkent institute of irrigation and agricultural mechanization engineers"
National research university, Qori Niyoziy 39, Tashkent 100000, Uzbekistan

Abstract. Traffic congestion poses a major challenge in urban areas like Tashkent. This study employs the sine-Gordon equation, a nonlinear wave equation known for its soliton solutions, to model traffic jams. We interpret these solitons as representations of propagating congestion and apply the model to Tashkent's traffic dynamics. Parameters are tailored to local conditions, providing insights into congestion behavior and potential mitigation strategies.

Keywords: Traffic Flow, Traffic Jam, Sine-Gordon Equation, Soliton, Kink, Breather, Nonlinear Dynamics, Mathematical Modelling, Congestion Analysis

Аннотация. Дорожные заторы представляют собой серьезную проблему для таких городов, как Ташкент. В данном исследовании для моделирования пробок используется уравнение синус-Гордона - нелинейное волновое уравнение, известное своими солитонными решениями. Мы интерпретируем эти солитоны как представления распространяющихся заторов и применяем модель к динамике движения в Ташкенте. Параметры подбираются в соответствии с местными условиями, что позволяет понять поведение заторов и возможные стратегии их уменьшения.

Ключевые слова: Транспортный поток, дорожный затор, уравнение Синус-Гордона, солитон, кинк, бризер, нелинейная динамика, математическое моделирование, анализ пробок

Annotatsiya. Toshkent kabi yirik shaharlar uchun tirbandlik jiddiy muammo hisoblanadi. Ushbu tadqiqotda tirbandlik-larni modellashtirish uchun sinus-Gordon tenglamasi, uning soliton yechimlari sifatida ma'lum bo'lgan nochiziqli to'liq tenglamasidan foydalaniladi. Biz bu solitonlarni tirbandlik

qonuniyatlarini ko'rsatuvchi model sifatida talqin qilamiz va bu modelni Toshkentdagi yo'l harakati dinamikasiga qo'llaymiz. Parametrlar mahalliy sharoitga qarab tanlanadi, bu bizga tirbandlikning o'zgarish dinamikasini va ularni kamaytirish mumkin bo'lgan strategiyalarini tushunishga imkon beradi.

Kalit so'zlar: *Trafik oqimi, tirbandlik, Sine-Gordon tenglamasi, soliton, kink, breather, nochiziqli dinamika, matematik modellash, tirbandlik tahlili*

Introduction. Traffic congestion is a significant issue in urban environments, leading to economic losses, environmental degradation, and reduced quality of life. In Tashkent, Uzbekistan's capital, traffic jams are becoming increasingly severe, necessitating mathematical modeling to analyze and mitigate the problem.

Mathematical traffic models fall into three main categories: macroscopic, mesoscopic, and microscopic. Macroscopic models, such as the Lighthill-Whitham-Richards (LWR) model, describe traffic flow using continuum fluid dynamics [1]; Richards [2]. While these models capture large-scale traffic behavior, they often fail to represent wave-like stop-and-go traffic patterns. Mesoscopic models bridge the gap between microscopic and macroscopic approaches, using statistical methods such as kinetic theory Prigogine and Herman [3].

Microscopic models, like cellular automata and agent-based models, simulate individual vehicles and their interactions [4, 5].

Among cellular automaton models, the Biham-Middleton-Levine (BML) model demonstrates self-organization and phase transitions in traffic flow [6].

The Nagel-Schreckenberg model (NaSch) reproduces traffic jams as emergent phenomena due to interactions between vehicles [5]. Additionally, the Payne-Whitham model extends the LWR framework by incorporating driver reaction times and anticipation effects [7,8].

Recent studies have also applied nonlinear wave equations, such as the Korteweg-de Vries (KdV) equation, to model traffic flow and jam formation [9]. Furthermore, data-driven approaches utilizing machine learning techniques have been employed to predict and manage traffic congestion [10].

In our paper [11] we have introduced kink solutions for the sine-Gordon equation on metric graphs, analyzing transmission at the vertex by finding reflectionless transmission of the kink. This kind of analysis can be applied into traffic dynamics in a branched regions of the roads for the optimal control of the traffic in the cross-roads and traffic lights.

This study introduces the sine-Gordon equation to model traffic congestion, leveraging its soliton solutions to represent stable, traveling waves. By tailoring parameters to Tashkent's local conditions, we aim to provide insights into congestion behavior and explore potential mitigation strategies.

Aims. The aim of this study is to model and analyze traffic congestion in Tashkent using the sine-Gordon equation, drawing parallels between traffic wave dynamics and soliton solutions. By interpreting traffic jams as nonlinear wave phenomena, we seek to explore how localized disturbances propagate, interact, and stabilize under different traffic conditions. This approach provides a mathematical framework to understand the formation and evolution of traffic bottlenecks, enabling insights into possible optimization strategies for urban traffic management.

Methods. We model traffic flow as a continuum, with $u(x, t)$ representing the normalized velocity perturbation:

$$u(x, t) = \frac{v(x, t) - v_{eq}}{v_{max}} \quad (1)$$

where $v(x, t)$ is the traffic velocity, v_{eq} is the equilibrium speed, and v_{max} is the maximum speed. The sine-Gordon equation governs $u(x, t)$:

$$\frac{\partial^2 u}{\partial t^2} - c^2 \frac{\partial^2 u}{\partial x^2} + \omega^2 \sin(u) = 0 \quad (2)$$

where c is the wave speed of congestion propagation, and ω reflects the frequency of traffic oscillations. The nonlinear $\sin(u)$ term allows soliton solutions, which we associate with traffic jams. In the context of traffic flow dynamics, the sine-Gordon equation describes the propagation of nonlinear waves. Traffic jams can be understood as dynamic wave structures that propagate through a system of vehicles in response to perturbations such as sudden braking or changes in road conditions. The key reasons why the sine-Gordon equation is suitable for traffic jam modeling include:

- **Nonlinearity:** Traffic flow is inherently nonlinear, as small fluctuations in vehicle speeds can grow into significant traffic waves. The sine-Gordon equation accounts for such nonlinear wave propagation.
- **Soliton Solutions:** The sine-Gordon equation admits soliton solutions, which are localized wave structures that maintain their shape and velocity over time. This feature mirrors the formation and persistence of traffic congestion waves.
- **Propagation and Interaction of Jams:** Traffic jams exhibit wave-like propagation, where disturbances travel through the system in a nonlinear manner. The sine-Gordon equation captures the behavior of such waves, explaining how traffic jams form, merge, and dissipate.
- **Kink and Antikink Solutions:** The sine-Gordon equation has solutions in the form of kinks and antikinks, which resemble the transition between free-flow and congested traffic states. These solutions describe the movement of traffic density changes, where vehicles slow down or speed up in response to external perturbations.

For Tashkent, c and ω could be tuned using local traffic data, such as jam propagation speeds or oscillation rates.

Results. The sine-Gordon equation yields solutions that mimic traffic behavior:

1.1 Kink Soliton Solution

The kink soliton is:

$$u(x, t) = 4 \arctan \arctan \left(\exp \exp \left(\frac{x-vt}{\xi} \right) \right) \quad (3)$$

with v as the soliton speed and $\xi = \frac{c}{\sqrt{\omega^2 - (v/c)^2}}$ as its width ($|v| < c$). This models a traffic jam moving upstream, transitioning from free flow ($u \rightarrow 0$) to congestion ($u \rightarrow 2\pi$).

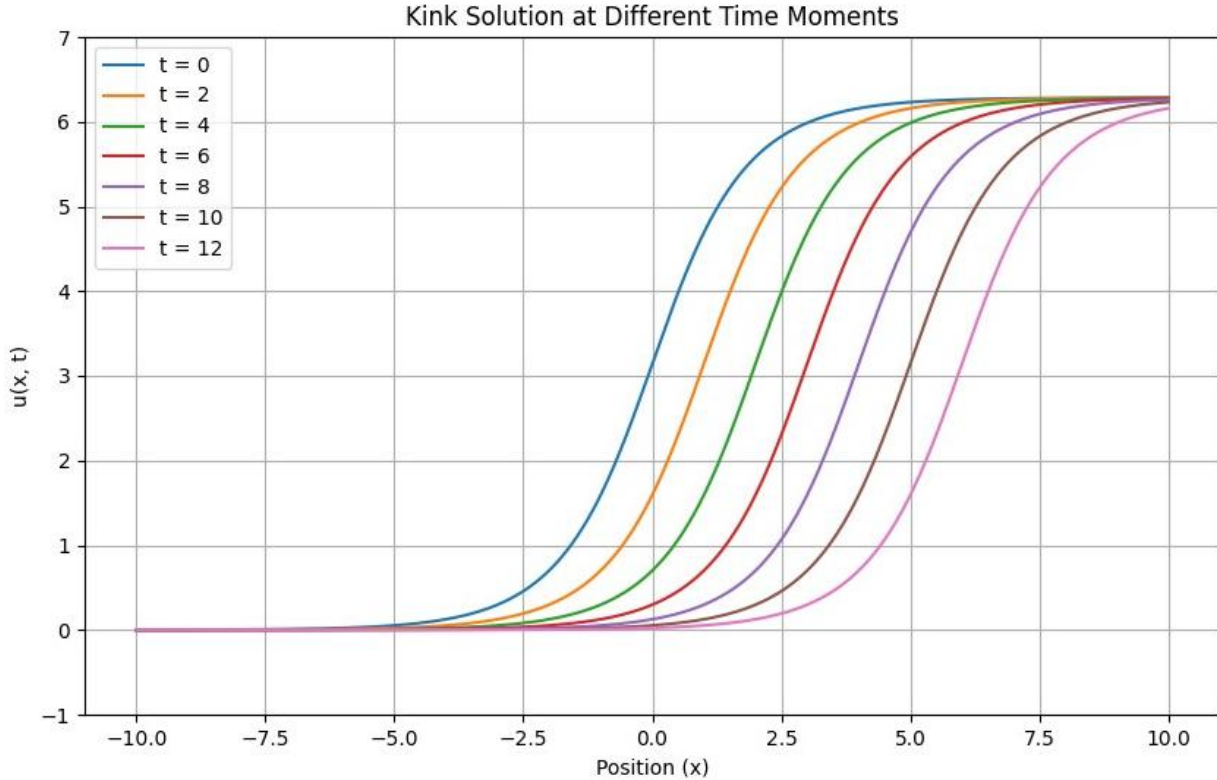


Figure 1: Kink soliton solution, depicting a propagating traffic jam.

Figure 1 shows this transition over space.

1.2 Breather Solution

The breather solution is:

$$u(x, t) = 4 \arctan \arctan \left(\frac{\sqrt{1-\gamma^2}}{\gamma} \frac{\sin \sin(\gamma \omega t)}{\cosh \cosh(\sqrt{1-\gamma^2} \omega x / c)} \right), \quad (4)$$

where $\gamma < 1$. This represents stop-and-go traffic oscillations. Figure 2 visualizes these oscillations.

1.3 Model explains real situation in roads

To validate the model, we compare its predictions with real traffic conditions in Tashkent. Figure 3 illustrates a real-world traffic jam scenario extracted from Yandex maps. Red arrows show the regions of the road with the lowest vehicle speeds, orange arrows are medium speeds and green ones are the highest speeds. The congestion patterns observed align with soliton-like structures predicted by the sine-Gordon equation. This suggests that traffic jams in Tashkent exhibit solitonic behavior, reinforcing the validity of the model.

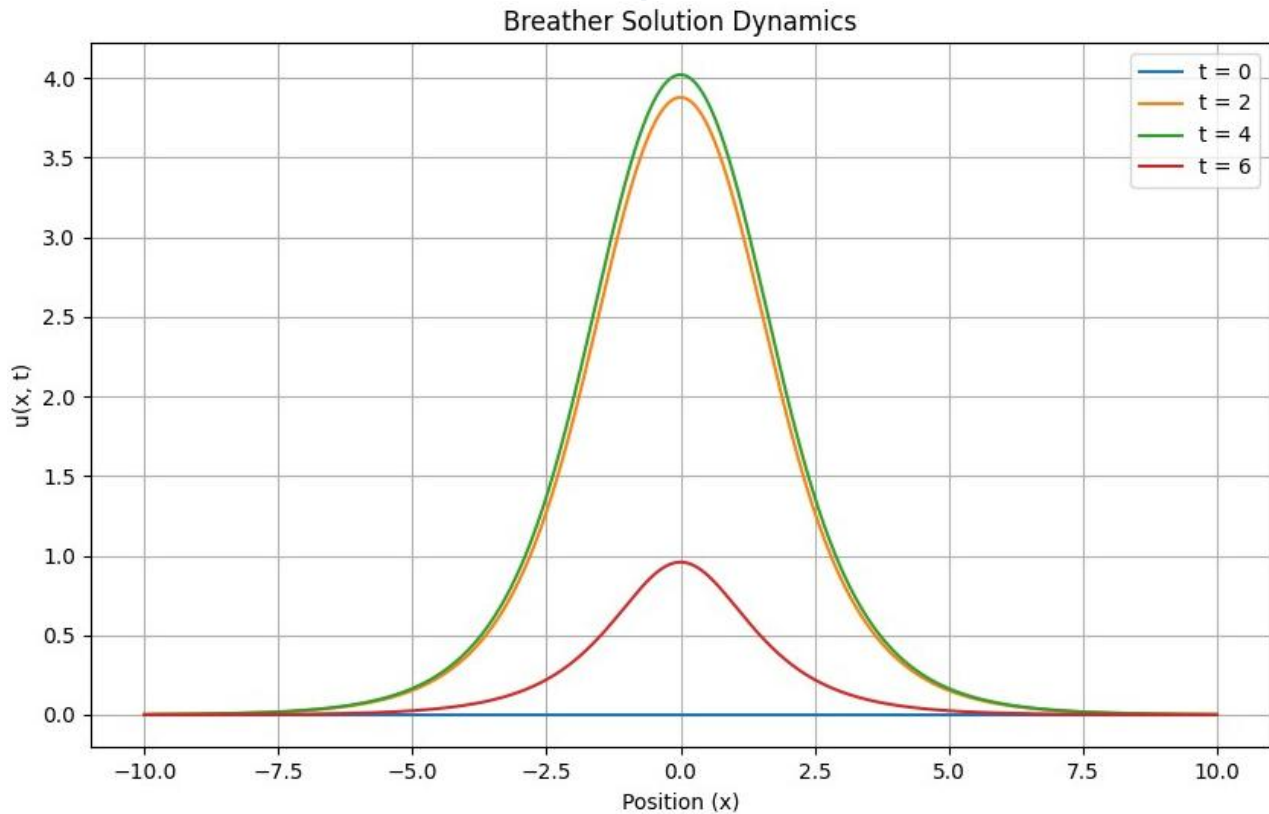


Figure 2: Breather solution, showing oscillatory traffic behavior.

The kink soliton captures upstream-moving jams, while the breather models stop-and-go waves, both relevant to Tashkent’s traffic. However, the model simplifies traffic as continuous, ignoring discrete vehicles and road complexities. Calibration with real data is essential for accuracy. Future work could refine the model for multi-lane roads or integrate it with simulations.

1.4 Traffic Waves and Kink-Antikink Structures

The traffic image (Fig. 4) shows two distinct regions:

- Region A: Free-flow traffic with relatively smooth vehicle distribution.
- Region B: Congested area with stop-and-go dynamics.

These regions correspond to kink-antikink interactions in the sine-Gordon framework, where the transition from one state to another forms solitonic wave structures [12].

2 Implications and Discussion

Understanding traffic congestion through soliton theory provides insight into how traffic waves propagate and dissipate. The sine-Gordon approach suggests that managing initial conditions (e.g., road entry rates, signal timing) can mitigate the formation of large-scale congestion waves [13]. Further numerical simulations could refine predictions and improve urban traffic management strategies.

The sine-Gordon equation provides a powerful framework for understanding and managing traffic congestion by modeling traffic dynamics as nonlinear wave phenomena. The key insights from its solutions—kinks, breathers, and solitons—offer strategies for minimizing traffic jams:

Controlling Kink Formation. Preventing abrupt stop-and-go traffic by using adaptive speed limits and AI-driven merging algorithms.



Figure 3: Real traffic congestion in Tashkent roads in March 14 at 17:00.

Dissipating Breather Oscillations. Reducing cyclic congestion waves through vehicle-to-vehicle communication and synchronized traffic signals.

Utilizing Soliton Stability. Enhancing traffic flow by enabling autonomous vehicle platoons and structured lane assignments.

Optimizing Roadway Infrastructure. Predicting congestion patterns to improve real-time rerouting and intelligent intersection designs.

By integrating these strategies into smart transportation systems, traffic congestion can be significantly mitigated, improving urban mobility efficiency.



Figure 4: Traffic congestion observed in Tashkent, with Region A (free flow) and Region B (jammed state).

Conclusion. The sine-Gordon equation provides a compelling framework for modeling traffic jams as soliton waves. Though preliminary, it offers a foundation for understanding congestion dynamics and informing traffic management strategies. The application of the sine-Gordon equation to traffic modeling provides valuable insights into congestion patterns in Tashkent. Soliton solutions, such as kink and

breather solutions, successfully describe the wave-like nature of traffic jams and stop-and-go oscillations. Future work includes refining model parameters using more traffic data and exploring control strategies to mitigate congestion.

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RESULTS EXPERIMENTAL TESTS OF FERTILIZER BETWEEN THE POMEGRANATE GARDENS

A.T.Musurmonov - Scientific-research institute of horticulture, viticulture and winemaking named after academician Mahmud Mirzayev, Tashkent region, Tashkent district, st. Chimkent Yuli, 111116, Uzbekistan

J.N.Faiziev - Scientific-research institute of horticulture, viticulture and winemaking named after academician Mahmud Mirzayev, Tashkent region, Tashkent district, st. Chimkent Yuli, 111116, Uzbekistan

X.B.Utaganov - Scientific-research institute of horticulture, viticulture and winemaking named after academician Mahmud Mirzayev, Tashkent region, Tashkent district, st. Chimkent Yuli, 111116, Uzbekistan

Sh.Sh.Mirzakhodjaev - Tashkent State Agrarian University, Tashkent region, TashGRES microdistrict, Universitet street, 2a, 100140, Uzbekistan.

M. Allanazarov - Tashkent State Agrarian University, Tashkent region, TashGRES microdistrict, Universitet street, 2a, 100140, Uzbekistan.

Sh.Sirojiddinov - Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnology, Samarkand, st. M.Ulugbek 77, 140103, Uzbekistan

Sh.K.Olimov - Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnology, Samarkand, st. M.Ulugbek 77, 140103, Uzbekistan

X.B.Shodiev - Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnology, Samarkand, st. M.Ulugbek 77, 140103, Uzbekistan

Abstract. The article outlines the use of a spiral screw conveyor that will increase the productivity of the furrow cutter-fertilizer when applying mineral fertilizers by increasing the shift time coefficient, reduce labor costs when loading fertilizer cans and increase loading productivity by servicing two furrow cutters-fertilizers and reducing loading time. Using the methods of mathematical planning of experiments, regression equations were obtained to search for optimal values for the productivity of a spiral-screw conveyor.

Introduction. An increase in the productivity of perennial plantings is inextricably linked with the use of fertilizers, where most of the perennial plantings are irrigated; a good supply of soil with moisture causes the active growth of shoots and leaves, as a result of which the plants need for nutrients increases significantly.

Pomegranate trees use nutrients added to the soil more when these substances enter the zone of the bulk of the absorbing roots. To accomplish this task, we have developed and manufactured a device for applying fertilizers [1,2].

Materials and methods. Garden furrow cutter-fertilizer BUS-5 (hereinafter referred to as garden furrow cutter) is designed for cutting irrigation furrows and applying fertilizers between the rows of gardens.

garden furrow cutter-fertilizer performs the following complexes of work on soil cultivation in gardens:

- cutting irrigation furrows;
- fertilization;

– applying fertilizers simultaneously with cutting irrigation furrows or loosening in one pass in both young and mature gardens [2-11].

The fertilizer application machine includes two hoppers 1, two fertilizer lines 2, two coulters 3, a frame 4, four support wheels 5, a linkage 6, two hydraulic motors 7 (Figure 1) for rotating the chain drives 8 of the fertilizer sowing apparatus 9 with active fertilizer lines 10 (Figure 2). The active fertilizer line consists of a pipe 11 in which a spring 12 is installed, connected to the axis 13 driven by a chain drive sprocket through a trunnion 14 with a pin 15, and the spring 12 itself is mounted on a recess of the trunnion 14.

When the unit moves, the coulters 3 cut furrows into which fertilizers are applied using active fertilizer lines 10, directly from the hopper 1. In the active fertilizer line 10 for sowing, fertilizers are supplied from the hopper 1, using a funnel 16 and a tray 17, into the pipe 11. Located in it The spiral spring 12, rotating from the hydraulic motor 7 through a chain transmission 8, supplies fertilizer to the pipe 18.

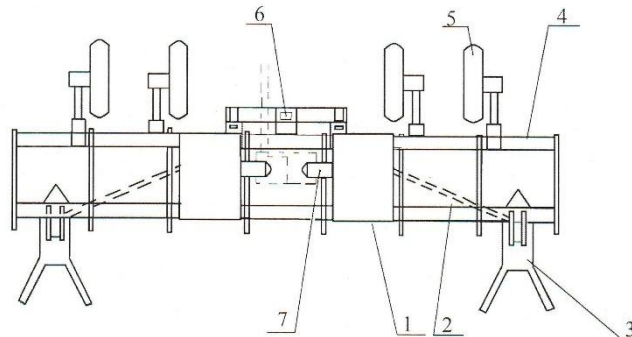


Figure.1. Design diagram of a furrow cutter-fertilizer.

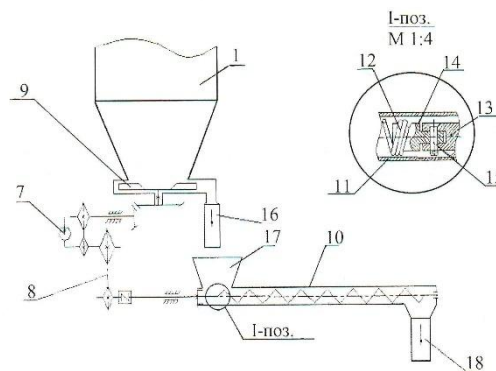


Figure.2. Kinematic diagram of the fertilizer line drive.



Figure 3. Furrow cutter-fertilizer at work

Table 1.

Technical specifications

Name of indicators (parameters), dimension	The meaning of indicators (parameters)	
	according to technical specifications	actually
1	2	3
Machine type	mounted	
Can be mounted with tractors	class 3-4	MTZ-82 TL-100 "NewHolland"
Working width, m	4.0; 5.0; 6.0	5.2
Operating speed, km/h,	up to 6.0	5.6
Machine weight, dry (structural) with a set of working parts and accessories, kg	2000	1100
Depth of tillage when cutting irrigation furrows, cm	14-20	15.2
Number of service personnel, people: -tractor driver	1 (tractor driver)	1 (tractor driver)
Ground clearance, mm, not less	300	350

Results. To analyze and justify the design and technological parameters of the garden furrow cutter-fertilizer, search work was carried out on existing loading machines and devices for transporting and moving materials.

In studies to determine the filling coefficient, the experiment was repeated three times at each point. In cases of significant discrepancies in the indicators of three repetitions, their number, as in determining productivity, was adjusted to 5...6.

For research, as mentioned above, we produced 9 versions of spiral springs intended for a hose with a diameter of 75 mm. The diameter of the spiral springs for all options was 60 mm. For their manufacture, spring wire with a diameter of 6.7 and 8 mm was used, and on. For each wire size there was a group of three options, differing in winding pitch, the numerical values of which were 34,40 and 46 mm. Research for each option was carried out on 5 modes of rotation frequency of spiral springs in the range of 15...35 s⁻¹ (900...2100 min⁻¹), the change of which was achieved using this method. Before analyzing the results of the experiments, it is necessary to describe some features of the conveyor operation, which are as follows [11-20].

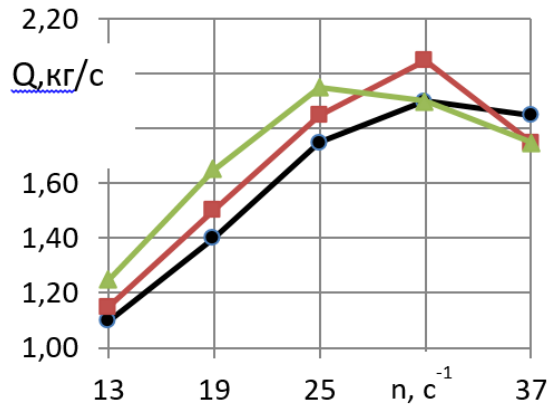


Figure 4. Performance Q of a spiral screw conveyor depending on the rotation speed n for spiral springs made of wire with a diameter of 6 mm.
 -●-●- $S_{cn} = 33.8$ mm; -■-■- $S_{cn} = 40.5$ mm; -▲-▲- $S_{cn} = 46.75$ mm.

When starting up at idle speed, vibration of the conveyor is observed, and at a rotation speed of the working body above 30 s^{-1} it leads to breakdown of the latter, which is a significant drawback. Therefore, the conveyor must be started at a rotation speed of the order of $6.6\text{--}8.3 \text{ s}^{-1}$. This frequency is ensured at a minimum but stable rotation speed of the tractor engine crankshaft [1-20]. With the entry of a mass of material into the conveyor and as it moves to the unloading window, vibration completely disappeared due to the self-centering of the spiral-spring in the moving mass of material. when moving material, vibration appears at a rotation speed of more than 28 s^{-1} , with a further increase in the latter, vibration increases, but in the studied range $n_{max} = 35 \text{ s}^{-1}$ the conveyor worked reliably. Despite this, when choosing the optimal parameters, you should limit yourself to the rotation speed at which vibration appears, because the latter negatively affects the operation of the conveyor during long-term operation.

Analysis of the curves presented in Figures 4-5 shows that in the studied range of rotation speed of the working body, the productivity of the conveyor for all options, except the last one, increases almost in proportion to the rotation speed up to its value of 25 s^{-1} . With a further increase in rotation speed, the intensity of the increase in productivity drops in some cases: it reaches zero, and then the absolute value of productivity drops. Moreover, it should be noted *The larger the coiling pitch of the spiral springs, the faster the maximum performance is achieved.*

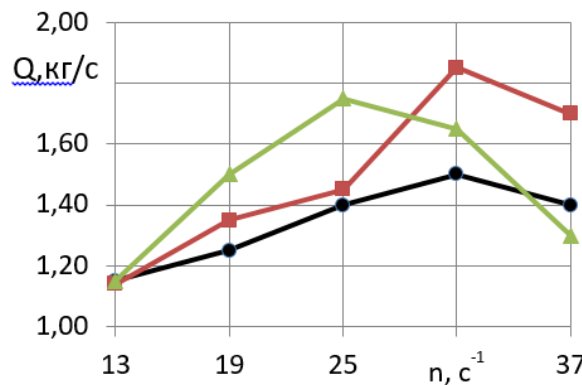


Figure 5 .. Performance Q spiral-screw conveyor depending on the rotation speed n for a spiral-spring made of wire with a diameter of 7 mm

-●-●- $S_{cn} = 35.8 \text{ mm}$; -■-■- $S_{cn} = 40.6 \text{ mm}$; -▲-▲- $S_{cn} = 46.75 \text{ mm}$,

Changing the winding pitch also has an ambiguous effect on productivity. With an increase in this parameter for spiral springs made of wire with a diameter of 6 mm (Figure 4), the performance increases intensively up to a rotation speed of 30 s^{-1} . With a further increase in the latter, a maximum point appears in the curves, i.e. Conveyor performance outside the studied winding pitch range will only decrease. For spiral springs made of wire with a diameter of 7 mm (Figure 5), the maximum performance in the studied range of winding pitch appears at a rotation speed of 25 s^{-1} or more, and for spirals made of wire with a diameter of 8 mm (Figure 5) also at a rotation frequency of 25 s^{-1} .

Discussion. For certain conveyor parameters, the change in productivity - depends on the axial speed of material movement and the filling coefficient. With increasing rotation speed, the magnitude of this characteristic of the material movement process decreases. Depending on the coiling pitch of the spiral spring and the diameter of the wire, the filling coefficient changes almost identically to the conveyor performance, i.e. It can be assumed that the decisive factor affecting productivity is the fill rate. Confirmation is the change in theoretical productivity with a filling factor equal to one. The nature of the change in theoretical productivity - confirms the assumption of a significant influence of the actual filling factor on productivity. The theoretical productivity values, taking into account the actual filling coefficient, in comparison with the experimental productivity data amounted to no more than 6% error, which indicates the reliability of theoretical studies of the process of moving material in a spiral screw conveyor.

To select the optimal values of parameters such as wire diameter, winding pitch and rotation speed of the spiral springs, an additional limitation on the rotation speed should be introduced. This forced limitation is caused by the appearance of vibration of the conveyor, which is observed at a rotation speed of more than 28 s^{-1} . Therefore, the value of the operating parameter of the spiral-screw conveyor should be selected within these limits, although at higher values, greater productivity was recorded in certain options. In the studies conducted, the highest performance in this mode is shown by spiral-springs wound from wire with a diameter of 6 mm, and slightly less - from wire with a diameter of 7 mm. Of these two values, preference should be given to the second one, because production conditions do not guarantee the absence of overloads, even significant ones, in the operation of any conveyor when moving any material. And overloads arising during the operation of spiral springs made of wire with a diameter of 6 mm led to failure. In general, for hoses with a diameter of 75 mm, spiral springs should be made of wire with a diameter of 6-7 mm, depending on the specific gravity of the material being moved.

Conclusion. The best quality is achieved by applying relatively large doses of granular fertilizers in orchards that meet agrotechnical requirements in terms of the accuracy of tree placement in rows. The parameters of the spiral screw conveyor, based on its operating conditions, the reliability of the technological process and productivity, should be the following $d = 6\text{-}7 \text{ mm}$; $S_{sp} = 43\text{-}49 \text{ mm}$; $n = 28 \text{ s}^{-1}$. The diametrical gap between the sleeve and the spiral spring should be within 12-15 mm.

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RESURLAR IQTISODIYOTIDA TABIIY RESURLAR KLASSIFIKATSIYASI

Ahmedova Odinaxon Axrorjon qizi - “TIQXMMI” Milliy Tadqiqot Universiteti, Iqtisodiyot fakulteti, Iqtisodiyot yo‘nalishi 401-guruh tabalasi

Annotatsiya. Ushbu maqolada resurs iqtisodiyoti doirasida tabiiy resurslarni tasniflashning asosiy jihatlari va ularning ahamiyati yoritib berilgan. Tabiiy resurslarning iqtisodiy samaradorligi, ekologik barqarorlik va strategik boshqaruvdagi o‘rniga alohida e‘tibor qaratiladi. Resurslardan oqilona foydalanish, ularni tejash va kelajak avlodlarga boy meros qoldirish maqsadida, ularning davlat, xususiy va jamoat mulki sifatidagi huquqiy maqomi ham inobatga olinadi. Resurslar keng qamrovli tushuncha bo‘lib, inson salohiyati, kapital va texnologik imkoniyatlarni ham o‘z ichiga oladi. Mazkur tasniflash tizimi iqtisodiy rejalashtirish, strategik qarorlar qabul qilish va ekologik xavfsizlikni ta‘minlashning muhim asosi sifatida namoyon bo‘ladi.

Tayanch so‘zlar: Tabiiy resurslar, resurslar iqtisodiyoti, klassifikatsiya, resurslar klassifikatsiyasi, barqaror rivojlanish.

Аннотация. В данной статье освещены основные аспекты классификации природных ресурсов в рамках ресурсной экономики и их значение. Особое внимание уделяется экономической эффективности природных ресурсов, их роли в экологической устойчивости и стратегическом управлении. В целях рационального использования ресурсов, их экономии и оставления богатого наследия будущим поколениям также учитывается их правовой статус как государственной, частной и общественной собственности. Ресурсы - это широкое понятие, которое включает в себя человеческий потенциал, капитал и технологические возможности. Данная система классификации проявляется как важная основа экономического планирования, принятия стратегических решений и обеспечения экологической безопасности.

Ключевые слова: Природные ресурсы, экономика ресурсов, классификация, классификация ресурсов, устойчивое развитие.

Abstract. This article highlights the main aspects of the classification of natural resources within the framework of resource economics and their significance. Special attention is paid to the economic efficiency of natural resources, their role in environmental sustainability and strategic management. In order to rationally use resources, conserve them, and leave a rich legacy for future generations, their legal status as state, private, and public property is also taken into account. Resources are a broad concept, including human potential, capital, and technological capabilities. This classification system serves as an important basis for economic planning, strategic decision-making, and ensuring environmental safety.

Keywords: Natural resources, resource economics, classification, resource classification, sustainable development.

Kirish. Resurslar iqtisodiyoti zamonaviy jamiyatning ajralmas qismi bo'lib, tabiiy resurslar uning asosiy omillaridan biridir. Tabiiy resurslarning to'g'ri klassifikatsiyasi ularning unumdor foydalanilishi, barqaror rivojlanishi va ekologik muhofazasi nuqtai nazaridan katta ahamiyatga ega. Dunyo bo'ylab resurslardan oqilona foydalanish, ularni saqlab qolish va kelajak avlodlarga yetkazib berish masalalari dolzarb bo'lib, ushbu jarayonda resurslarning aniq kategoriyalarga ajratilishi muhim rol o'ynaydi. Ushbu ishning asosiy maqsadi tabiiy resurslarning turlarini aniqlash va ularning iqtisodiy, ekologik va ijtimoiy ahamiyatini yoritishdir. Tadqiqot davomida resurslarni samarali boshqarish va ularning optimal foydalanilishiga erishish uchun ilmiy asoslar yaratishga intilish maqsad qilingan.

Asosiy qism. Resurslar (fransuzcha: ressource — yordamchi vosita) — pul mablag'lari, boylik, zaxira, imkoniyatlar, davlat byudjetida daromad manbalari, tabiiy, iqtisodiy, mehnat, valyuta va boshqa resurslar bo'lishi mumkin. Ular inson faoliyati, ishlab chiqarish jarayonlari va ijtimoiy rivojlanishning asosiy omili sifatida qaraladi.

Resurslar klassifikatsiyasi - bu mavjud resurslarni ularning xususiyatlari, kelib chiqishi, ishlatilish sohalari va boshqaruv strategiyalari asosida ajratish va tizimlashtirish jarayonidir. Bu tasniflash orqali turli resurs turlarini aniqlash (masalan, tabiiy, inson, kapital resurslari) va ularni samarali boshqarish, rivojlantirish va foydalanish imkoniyati yaratiladi. Klassifikatsiya resurslarning

to'g'ri taqsimlanishi, ularning optimal foydalanilishi va barqaror rivojlanish strategiyalarini ishlab chiqishda muhim o'rin tutadi.

Resurslar klassifikatsiyasi turli mezonlar asosida resurslarni aniqlash va ularni tartibga solish jarayonidir. Bunga quyidagi qo'shimcha tushunchalar kiritilishi mumkin:

1. Mavjud bo'lish manbai bo'yicha tasniflash:

- Tabiiy resurslar: Yer, suv, havo, minerallar, o'simliklar va hayvonot resurslari kabi, inson aralashuvisiz mavjud bo'lgan resurslar.

- Inson resurslari: Mehnat salohiyati, bilim, tajriba va malaka kabi inson tomonidan yaratilgan va rivojlantirilgan resurslar.

- Kapital resurslari: Moliyaviy mablag'lar, uskunalar, texnologiyalar va inshootlar, ishlab chiqarish jarayonida qo'llaniladigan vositalar.

2. Qayta tiklanish xususiyati bo'yicha tasniflash:

- Qayta tiklanadigan resurslar: Tabiiy sharoitlarda o'z-o'zini tiklaydigan resurslar, masalan, o'simliklar, hayvonlar, suv resurslari.

- Qayta tiklanmaydigan resurslar: Cheklangan miqdorda mavjud bo'lib, inson aralashuvisiz tiklanmaydigan resurslar, masalan, ko'mir, neft, gaz, minerallar.

3. Foydalanish sohalari bo'yicha tasniflash:

Resurslar iqtisodiyotning turli sohalarida qo'llaniladi: energetika, sanoat, qishloq xo'jaligi, xizmat ko'rsatish va boshqalar. Har bir soha o'ziga xos resurslarni talab qiladi va boshqaruv strategiyalarini ishlab chiqadi.

4. Iqtisodiy va ekologik ahamiyati bo'yicha tasniflash:

Resurslar iqtisodiyotda nafaqat ishlab chiqarish jarayonida, balki barqaror rivojlanish, ekologik muhofaza va ijtimoiy farovonlikni ta'minlashda ham muhim rol o'ynaydi. Shu bois, resurslarni boshqarishda ularning iqtisodiy samaradorligi va ekologik xavfsizligi e'tiborga olinadi.

Tabiiy resurslarni tasniflash inson uchun qanday resurslar mavjudligini, ulardan qanday foydalanish mumkinligini va ulardan foydalanishni qanday optimallashtirish mumkinligini yaxshiroq tushunishga yordam beradi. Shuningdek, u resurslarni boshqarish strategiyasini ishlab chiqishga, atrof-muhitga salbiy ta'sirni kamaytirishga va resurslarni iste'mol qilish va ko'paytirish o'rtasidagi muvozanatni saqlashga yordam beradi.

Tabiiy resurslarni tasniflash mezonlari:

- Qayta tiklanish xususiyati:

Qayta tiklanadigan resurslar: Bu toifaga o'simliklar, hayvonot resurslari va suv kabi tabiiy elementlar kiradi. Ular ma'lum sharoitlarda o'z-o'zini tiklash qobiliyatiga ega bo'lib, doimiy ravishda yangilanib turadi.

Qayta tiklanmaydigan resurslar: Minerallar, neft, ko'mir kabi resurslar ushbu guruhga mansub bo'lib, ularning zaxiralari cheklangan va inson aralashuvisiz tiklanmaydi.

- Geografik joylashuv va tarqalishi: Resurslar hududiy xususiyatlarga qarab ham tasniflanadi. Masalan, ba'zi tabiiy resurslar ma'lum geografik zonalarda, tog' tizimlarida yoki vodiylarda ko'proq uchraydi. Bu tasniflash, resurslarni mintaqaviy boshqarish va investitsiya rejalashtirishda yordam beradi.

- Iqtisodiy ahamiyati: Tabiiy resurslar iqtisodiy faoliyatda muhim rol o'ynaydi. Ularni ishlab chiqarish, energetika, qishloq xo'jaligi, sanoat va qurilish

sohalarida qo'llanilishi asosida ham tasniflash mumkin. Bu orqali resurslarning iqtisodiy qiymati va ularning ishlab chiqarish jarayonidagi o'rni aniqlanadi.

- Ekologik ta'sir va boshqaruv strategiyalari: Resurslardan foydalanish atrof-muhitga ta'sirini hisobga olgan holda, ularning ekologik xavfsizligi va barqaror ekspluatatsiyasi masalalari ham e'tiborga olinadi. Shu asosda, ekologik xavf-xatar darajasi yuqori bo'lgan resurslar va ularni boshqarish choralari ajratib ko'rsatiladi.

Tabiiy resurslar klassifikatsiyasi iqtisodiyot va atrof-muhitni boshqarishda muhim ahamiyatga ega. Ushbu tasniflash tizimi resurslarning turli xususiyatlari va imkoniyatlarini aniqlab berib, ularni samarali boshqarish va foydalanish uchun poydevor yaratadi. Klassifikatsiya orqali resurslar ularning qayta tiklanishi, ishlatilish sohasi, iqtisodiy qiymati va ekologik ahamiyatiga ko'ra ajratiladi. Bu yondashuv resurslardan oqilona foydalanish, ularni tejash va atrof-muhitga bo'lgan zararlarni kamaytirish strategiyalarini ishlab chiqishda muhim rol o'ynaydi. Masalan, qayta tiklanadigan resurslar bo'yicha ehtiyotkorlik bilan rejalashtirilgan siyosat, ularning kelajak avlodlar uchun saqlanishini ta'minlasa, qayta tiklanmaydigan resurslar uchun esa resurslarni tejash va alternativ energiya manbalariga o'tishni rag'batlantiradi.

Shuningdek, tabiiy resurslar klassifikatsiyasi davlatlar va hududlar o'rtasidagi iqtisodiy hamkorlikni kuchaytirish, savdo va investitsiya faoliyatini tartibga solish hamda ekologik xavfsizlikni ta'minlashda ham katta rol o'ynaydi. U orqali turli sektorlar – energetika, qishloq xo'jaligi, sanoat va boshqa sohalarda resurslardan oqilona foydalanish rejalashtiriladi.

Resurslar iqtisodiyotidagi tabiiy resurslar klassifikatsiyasi munosabatlarini quyidagicha yoritish mumkin:

❖ Optimal resurs taqsimoti va boshqaruv: Tabiiy resurslarni (yer, suv, havo, minerallar, o'simlik va hayvonot resurslari) qayta tiklanadigan va qayta tiklanmaydigan bo'limlarga ajratish ularning mavjud zaxiralarini aniq baholash imkonini beradi. Bu tasniflash yordamida har bir resurs turiga mos boshqaruv strategiyalari ishlab chiqiladi, resurslardan samarali foydalanish, ularni optimal taqsimlash va iqtisodiy foydani oshirishga zamin yaratiladi.

❖ Barqaror rivojlanish va ekologik xavfsizlik: Tabiiy resurslarning ekologik ta'siri va ularning qayta tiklanish xususiyatlari hisobga olinsa, resurslardan uzoq muddatli va barqaror foydalanish strategiyalarini ishlab chiqish osonlashadi. Qayta tiklanadigan resurslar (masalan, o'simliklar, hayvonot resurslari, suv) va qayta tiklanmaydigan resurslar (masalan, ko'mir, neft, gaz) o'rtasidagi farqni aniqlash iqtisodiy rejalashtirishda va ekologik xavfsizlikni ta'minlashda muhim ahamiyatga ega.

❖ Investitsiya va innovatsiyalarni yo'naltirish: Tabiiy resurslarning turli kategoriyalar bo'yicha aniqlanishi investitsiya qarorlarini qabul qilishda asos bo'ladi. Resurslarning iqtisodiy qiymatini, ularning ishlab chiqarish jarayonidagi o'rnini va bozor talabini aniqlash orqali, innovatsion texnologiyalar va ilg'or boshqaruv tizimlariga sarmoya kiritish rejalashtiriladi.

❖ Iqtisodiy samaradorlik va raqobatbardoshlik: Resurslar iqtisodiyotining asosiy ishlab chiqarish omillari sifatida, tabiiy resurslarning to'g'ri tasniflanishi ishlab chiqarish jarayonining samaradorligini oshiradi. Bu esa, resurslardan oqilona foydalanish orqali umumiy iqtisodiy o'sishga va milliy raqobatbardoshlikni ta'minlashga xizmat qiladi.

❖ **Siyosat va strategik rejalashtirish:** Tabiiy resurslar klassifikatsiyasi natijalari davlat siyosati va strategik rejalashtirish jarayonlarida asosiy rol o'ynaydi. Resurslar zaxiralari, ularning geografik taqsimoti va ekologik holati haqida aniq ma'lumotlar asosida iqtisodiy va ekologik muhofaza choralari ishlab chiqish, shuningdek, milliy darajada resurslardan samarali foydalanish bo'yicha siyosatlarni belgilash mumkin bo'ladi.

Takliflar:

1. Qayta tiklanish dinamikasini aniq hisobga olish:

Tabiiy resurslarning tiklanish tezligi va imkoniyatlarini aniqlovchi maxsus mezonlar joriy qilish zarur. Masalan, suv resurslari uchun mintaqaviy qurg'oqchilik ko'rsatkichlari, o'simlik va hayvonot dunyosi uchun biologik qayta tiklanish imkoniyatlari kiritilishi lozim.

2. Iqtisodiy qiymat va barqarorlik indikatorlarini joriy etish:

Har bir tabiiy resurs uchun uning iqtisodiy ahamiyati, energiya ishlab chiqarishdagi roli va texnologik talablarni aks ettiruvchi indikatorlarni tasniflashga qo'shish maqsadga muvofiqdir. Bu bozor sharoitlarida investitsiya uchun istiqbolli resurslarni belgilashga yordam beradi.

3. Raqamli texnologiyalar asosida monitoring tizimlarini rivojlantirish:

Dronlar, IoT (Internet of Things), sun'iy intellekt va geografik axborot tizimlari yordamida tabiiy resurslar zaxiralari va ularning holatini real vaqt rejimida kuzatish tizimlari joriy qilinishi zarur. Bu resurslardan samarali foydalanish va ularni saqlash choralari yaxshilashga xizmat qiladi.

4. Ekologik xavf darajasini tasniflash:

Har bir tabiiy resurs uchun ekologik xavf ko'rsatkichi kiritilishi lozim. Masalan, yer resurslari uchun eroziya xavfi, suv resurslari uchun ifloslanish darajasi kabi mezonlar tasnifga qo'shilishi kerak. Bu ekologik barqarorlik strategiyalarini ishlab chiqishga imkon beradi.

5. Hududiy tasnifni chuqurlashtirish:

Tabiiy resurslarning mintaqaviy o'ziga xosliklarini hisobga olgan holda klassifikatsiya qilish lozim. Masalan, tog'li hududlar, cho'l zonalar va qishloq xo'jaligi uchun qulay bo'lgan vodiy hududlar resurslari alohida tasniflanishi zarur.

6. Energiya samaradorligi mezonlarini kiritish:

Resurslardan energiya ishlab chiqarishda foydalanish samaradorligini aniqlovchi mezonlar ishlab chiqilishi lozim. Bu qayta tiklanadigan energiya manbalariga e'tiborni kuchaytirish va ekologik zararni kamaytirish uchun muhimdir.

7. Xalqaro standartlarga muvofiqlik:

Tabiiy resurslar klassifikatsiyasi xalqaro standartlar (masalan, BMT yoki Jahon Banki tavsiyalari) asosida takomillashtirilishi va global iqtisodiy jarayonlarga integratsiyalashuvi zarur.

Xulosa. Tabiiy resurslar iqtisodiyotning asosiy omillaridan biri bo'lib, ularning to'g'ri tasniflanishi va boshqaruvi milliy iqtisodiy barqarorlik, samaradorlik hamda ekologik xavfsizlikni ta'minlashda muhim ahamiyat kasb etadi. Resurslarning qayta tiklanishi, iqtisodiy qiymati, geografik joylashuvi va ekologik xavflari asosida chuqur tahlil qilinishi ularni oqilona boshqarish imkonini yaratadi. Takomillashgan tabiiy resurslar klassifikatsiyasi esa resurslarni samarali boshqarish, innovatsion texnologiyalarni joriy qilish va barqaror rivojlanishga erishish uchun mustahkam poydevor bo'lib xizmat qiladi. Shu bilan birga, ilmiy-tadqiqot ishlarini kengaytirish,

raqamli monitoring texnologiyalaridan foydalanish va xalqaro tajribani oʻrganish ushbu yoʻnalishda yanada katta yutuqlarni taʼminlashi mumkin.

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STRATEGIES FOR ECONOMIC GROWTH: INTENSIFYING LIVESTOCK FARMING IN PEASANT AND HOUSEHOLD FARMS

Xidirov Xurshidjon Toʻlqinjon oʻgʻli - PhD student, “TIAME” National Research University

Annotation. The growth of livestock farming is an important potential area for economic development related to peasant and family farms, which are the mainstay of the rural economies in many developing regions. This article attempts to find different ways to increase the efficiency and profitability of livestock farming by intensification. It examines the prospects for overcoming capital and knowledge deficits through technological change, better animal care, efficient feeding, and resource conservation. Additionally, it looks at the effect that the adoption of these strategies would have on income for the farms, rural areas, and the economy as a whole. The findings demonstrate that, with adequate support, small-scale farmers can greatly benefit from the economic advantages of intensification while also maintaining ecological balance.

Keywords: livestock farming, economic growth, peasant farms, household farms, intensification, sustainability, rural development

Аннотация. Рост животноводства является важной потенциальной областью экономического развития, связанной с крестьянскими и семейными фермами, которые являются основой сельской экономики во многих развивающихся регионах. В этой статье делается попытка найти различные способы повышения эффективности и прибыльности животноводства путем интенсификации. В ней рассматриваются перспективы преодоления дефицита капитала и знаний за счет технологических изменений, лучшего ухода за животными, эффективного кормления и сохранения ресурсов. Кроме того, в ней рассматривается влияние, которое принятие этих стратегий окажет на доход ферм, сельских районов и экономики в целом. Результаты показывают, что при адекватной поддержке мелкие фермеры могут получить значительную выгоду от экономических преимуществ интенсификации, одновременно поддерживая экологический баланс.

Ключевые слова: животноводство, экономический рост, крестьянские хозяйства, домашние хозяйства, интенсификация, устойчивость, сельское развитие

Annotatsiya. Chorvachilikning o'sishi ko'plab rivojlanayotgan hududlarda qishloq xo'jaligining asosiy tayanchi bo'lgan dehqon va oilaviy fermer xo'jaliklari bilan bog'liq iqtisodiy rivojlanishning muhim salohiyatli yo'nalishi hisoblanadi. Ushbu maqola chorvachilikni intensivlashtirish orqali uning samaradorligi va rentabelligini oshirishning turli usullarini topishga harakat qiladi. U texnologik o'zgarishlar, hayvonlarni yaxshilash, samarali oziqlantirish va resurslarni tejash orqali kapital va bilim taqchilligini bartaraf etish istiqbollari o'rganadi. Bundan tashqari, ushbu strategiyalarni qabul qilish fermer xo'jaliklari, qishloq joylari va umuman iqtisodiyot uchun daromadga ta'sirini ko'rib chiqadi. Natijalar shuni ko'rsatadiki, yetarlicha qo'llab-quvvatlansa, kichik fermerlar intensivikasiyaning iqtisodiy afzalliklaridan katta foyda olishi hamda ekologik muvozanatni saqlashi mumkin.

Kalit so'zlar: chorvachilik, iqtisodiy o'sish, dehqon xo'jaliklari, tomorqa xo'jaliklari, intensivlashtirish, barqarorlik, qishloq taraqqiyoti

Introduction. The peasant and household farms have a huge impact on the economies of most developing nations. These farms not only enhance local food production and food security but also provide income and employment opportunities for the people living in rural areas. Traditional livestock farming practices used by most of these farms, however, are often associated with low productivity and inefficiency. The need to raise output, increase profits, and facilitate rural economic development calls for the implementation of livestock farming intensification strategies.

This paper explores the possibility of realizing economic development on the account of intensification of livestock farming on peasant and household farms. It articulates strategies for boosting farm productivity along the intersection of economy, society, and ecology. By employing these strategies, the paper seeks to assist smallholders, public sector decision-makers, and agribusinesses that aim to improve livestock farming performance.

Theoretical Framework and Literature Review

Intensification in livestock farming refers to an increase in output per unit of input, achieved through new technologies, better husbandry, and more efficient use of resources. Some researchers have pointed out the existing links between the livestock intensification and the economic development. The Food and Agriculture Organization (FAO) reports suggest that, in particular, smallholder farms can benefit from proper use of resources that economic intensification brings such as improvement in profitability, production efficiency, and sustainable resource use.

Yet the literature, particularly in the social science tradition, reminds us that there is always the possibility of poorly managed environmental and social consequences of this process. One of the most important questions is how to make this process economically possible without harming the environment, especially for peasants and family farms which typically have little money and resources to work with.

Strategies for Intensification of Livestock Farming

3.1. Advancements in Technology and Mechanization

Innovation is key when it comes to agriculture and livestock farming. The use of fully automated feeding equipment, precision farming, and the latest veterinary services are ways in which efficiency and productivity can be increased. Additionally, technologies such as artificial insemination, genetic selection, and disease control systems can improve outputs while lowering mortality rates.

Of concern, though, is whether peasant and subsistence farms can afford these technologies. Therefore, governments and agricultural support agencies should give grants, subsidies, or training programs to encourage technology use to assist farmers in adopting these technologies.

3.2. Enhanced Practices of Animal Husbandry

The efficiency of economic returns out of farmed livestock greatly depends on how well a farmer manages a livestock farm. This includes implementing proper breeding programs, maintaining optimal health and nutrition, and managing animal welfare. Economic returns can be improved through intensive feeding programs which include the use of quality forage and balanced feed to improve growth and milk production.

3.3. Feed Optimization

Feed costs represent one of the largest expenses in livestock farming. Therefore, optimizing feed use is a crucial strategy for intensification. This can be achieved through the use of high-quality, nutrient-rich feeds that promote faster growth and increased milk production. Improved pasture management, crop rotation, and the integration of leguminous crops can also enhance feed quality and reduce the reliance on expensive commercial feed.

In many regions, the use of locally available feed resources can reduce costs while maintaining nutritional quality. Farmers can also implement feed conservation techniques, such as silage and haymaking, to ensure a consistent supply of feed throughout the year.

3.4. Sustainable Resource Management

Intensifying livestock farming must be done in a way that is environmentally sustainable. This requires efficient management of water, land, and energy resources. Sustainable practices, such as rotational grazing, manure management, and water recycling, can help mitigate the environmental impact of intensified farming operations.

Incorporating renewable energy sources, such as solar and biogas, into farm operations can further enhance sustainability while reducing operational costs. Governments and agricultural agencies can support the adoption of these practices by offering technical assistance and financial support to small-scale farmers.

3.5. Capacity Building and Knowledge Transfer

Many peasant and household farmers face knowledge gaps when it comes to implementing advanced livestock farming techniques. Therefore, capacity building and knowledge transfer are essential components of any intensification strategy. Agricultural extension services, farmer cooperatives, and NGOs can provide training and education on modern farming practices, animal health, and sustainable resource use.

In addition, promoting farmer-to-farmer learning and the use of demonstration farms can accelerate the adoption of best practices and innovations in livestock farming.

4. Economic Impact of Livestock Farming Intensification

4.1. Increased Productivity and Income

The intensification of livestock farming has a direct impact on farm productivity. By adopting modern technologies and optimized management practices, farmers can increase the output of meat, milk, and other livestock products. This, in turn, leads to higher incomes for farmers and improved economic stability for rural households.

In regions where peasant and household farms dominate the agricultural landscape, increased livestock productivity can contribute to rural economic growth by creating new market opportunities, stimulating demand for farm inputs, and generating employment.

4.2. Cost Efficiency and Profit Margins

While the initial costs of intensification can be high, the long-term benefits often outweigh these investments. Farms that implement intensification strategies experience lower per-unit production costs due to economies of scale and improved efficiency. For example, optimizing feed and reducing animal health-related losses can significantly enhance profit margins.

4.3. Contribution to National Economic Growth

The intensification of livestock farming in peasant and household farms has broader implications for national economic growth. Increased productivity and profitability in the livestock sector can lead to higher contributions to GDP, improved trade balances through livestock product exports, and greater food security at the national level.

Moreover, intensification can promote rural development by improving the livelihoods of small-scale farmers, reducing poverty, and creating employment opportunities in the agricultural sector.

5. Challenges and Solutions

5.1. Access to Capital

One of the primary barriers to livestock farming intensification is the lack of access to capital. Many small-scale farmers are unable to afford the necessary investments in technology, infrastructure, and inputs. To address this issue, governments, financial institutions, and NGOs should develop programs that provide low-interest loans, grants, and subsidies to support farmers in their efforts to intensify their operations.

5.2. Technical Knowledge and Training

The lack of technical knowledge is another significant challenge for small-scale farmers. Comprehensive training programs, agricultural extension services, and farmer cooperatives can provide the necessary education and support to help farmers implement intensification strategies successfully.

5.3. Environmental Sustainability

Ensuring that livestock farming intensification is environmentally sustainable requires careful planning and management. Governments should implement policies that promote sustainable farming practices and provide incentives for the adoption of renewable energy and waste management systems.

Conclusion. The intensification of livestock farming in peasant and household farms offers a viable pathway to economic growth, increased productivity, and improved livelihoods in rural communities. By adopting modern technologies, improving animal husbandry practices, optimizing feed, and managing resources

sustainably, small-scale farmers can significantly enhance the economic efficiency of their operations.

However, to realize the full potential of these strategies, there is a need for targeted support in the form of financial assistance, technical training, and policy frameworks that promote sustainability and inclusivity. With the right strategies in place, intensification can contribute to both rural development and national economic growth while ensuring long-term sustainability for the livestock farming sector.

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SUV XO'JALIGI TIZIMIDA EKOLOGIK MUAMMOLARNI OLDINI OLISH VA BARQARORLIKNI TA'MINLASH

Koshnazarova Maloxat Alimovna - "Toshkent irrigatsiya va qishloq xo'jaligini mexanizatsiyalashtirish muhandislari instituti" milliy tadqiqot universiteti "O'zbek tili va adabiyoti" kafedrası o'qituvchisi

Raxmatov Sadriddin Xusniddin o'g'li - "Toshkent irrigatsiya va qishloq xo'jaligini mexanizatsiyalashtirish muhandislari instituti" milliy tadqiqot universiteti "Ekologiya va huquq" fakulteti "Ekologiya va atrof-muhit muhofazasi" yo'nalishi 2-bosqich talabasi

Annotatsiya: Ushbu maqolada dunyo bo'ylab suv tanqisligining kelib chiqishi va ularning oqibatlari tahlil qilinib, suv resurslaridan oqilona foydalanish, uni samarali boshqarish, ekologik barqarorlikni ta'minlash, ekologik madaniyatni shakllantirish haqida bayon etilgan. Suv xo'jaligida esa ekologik muammolarni bartaraf etish yo'llari bo'yicha tavsiyalar keltirilgan.

Kalit so'zlar: ekologik barqarorlik, suv xo'jaligi, yashil iqtisodiyot, qishloq xo'jaligi, suv xo'jaligi, korxona, tadbirkor, daryo, suv ombori, kanali, suv resursi, ekologik muammo, suv tanqisligi, ocharchilik, suvni tejash, suv resurslarini boshqarish, oqilona foydalanish.

Аннотация: В статье анализируются истоки и последствия дефицита водных ресурсов во всем мире, рассматриваются вопросы рационального использования водных ресурсов, эффективного управления ими, обеспечения экологической устойчивости и формирования экологической культуры. Даны рекомендации по устранению экологических проблем в водном хозяйстве.

Ключевые слова: экологическая устойчивость, управление водными ресурсами, зеленая экономика, сельское хозяйство, управление водными ресурсами, предприятие, предприниматель, река, водохранилище, канал, водные ресурсы, экологическая проблема, нехватка воды, голод, водосбережение, управление водными ресурсами, рациональное использование.

Abstract: The article analyzes the origins and consequences of water shortages worldwide, considers the issues of rational use of water resources, their effective management, ensuring environmental sustainability and forming an environmental culture. Recommendations are given for eliminating environmental problems in water management.

Keywords: environmental sustainability, water resources management, green economy, agriculture, water resources management, enterprise, entrepreneur, river, reservoir, canal, water resources, environmental problem, water shortage, hunger, water conservation, water resources management, rational use.

Kirish. 30.01.2025-yildagi PF-16-sonli “O‘zbekiston-2030” strategiyasini “Atrof-muhitni asrash va “Yashil iqtisodiyot” yilida amalga oshirishga oid Davlat dasturi to‘g‘risida”gi O‘zbekiston Respublikasi Prezidentining Farmonida jamiyatda ekologik qiyofani yaxshilash, atrofda yashillik darajasini oshirish, ekologik jihatdan qulay va farovon yashash muhitini, ekologik turmush tarzini shakllantirish, tabiiy resurslardan oqilona foydalanish, shuningdek, oqova suvlardan samarali foydalanish, yuqori texnologiyalardan foydalangan holda sug‘orish tizimini joriy etish, yashillik darajasini ko‘tarish orqali ekologik barqarorlikni ta‘minlash borasidagi asosiy faoliyatga alohida urg‘u berib o‘tilgan. Atrof-muhit, tabiatning o‘zi mavjud holati va insoniyat sivilizatsiyasining rivojlanish shakli suv resurslarining miqdori, shuningdek, sifatiga ham bog‘liq. Qadimgi sivilizatsiyalarni olib qaraydigan bo‘lsak, eng yirik suv manbalari atrofida shakllangan. Shu o‘rinda Nil daryosidan tashqarida tasavvur qilib bo‘lmaydigan Qadimgi Misr, Dajla va Furot bilan bog‘liq bo‘lgan Mesopotamiya sivilizatsiyalariga nazar tashlasak.

Nil daryosi dunyodagi eng uzun daryo bo‘lib, uzunligi 6.650 km ni tashkil etadi va Afrikaning 11 davlatini kesib o‘tadi.

Nil - mintqa iqtisodiyoti va tarixi uchun juda muhim daryo, u Misr sivilizatsiyasining beshigi hisoblanadi. Nil daryosi qadimgi davrlardan beri Misr aholisining asosiy hayot manbalaridan biri bo‘lib kelgan. Misr sivilizatsiyasi Nil daryosi qirg‘og‘ida rivojlangan, bu yerda daryoning yillik toshqinlari yerni urug‘lantirib, dehqonchilikni keltirib chiqargan.

Suvning kamligidan qiynalayotgan insoniyat hayoti, yashash tarzi eng avvalo, uning cheklangan manbadan foydalanish qobiliyatiga aloqadordir.

Mamlakatimizda jamiyatning butun ijtimoiy tuzilishi va maxsus ekologik madaniyatning shakllanishida suvga qadriyat sifatida qaralishi eng muhim omil hisoblanadi. Shu bilan birga yerning suv resurslari ko‘p bo‘lgan qismlarida ularga nisbatan munosib munosabat shakllanmagan. Masalan, ortiqcha suv resurslari mavjud bo‘lgan joylarda yashovchi xalqlar madaniyatida suvning unchalik qadr-qimmatini bo‘lmagani kabi suvga ehtiyotkor munosabat deyarli yo‘q. Hatto vaqti-vaqti bilan sodir bo‘lgan qurg‘oqchilik ham ularda ko‘proq tabiiy ofat sifatida qabul qilingan va suv resurslariga bo‘lgan umumiy munosabatga katta qadriyat sifatida ta‘sir ko‘rsatmagan.

Muammo, maqsad va vazifalar. Sanoat inqilobi g‘alaba qozongan XX asrda vaziyat turli xil o‘g‘itlar va pestitsidlardan foydalangan holda qishloq xo‘jaligining intensiv usullariga o‘tish davrida o‘zgara boshlagan. Jumladan, tabiat endi yaqin atrofdagi daryo va ko‘llarni oqava suvlari bilan to‘sib qo‘ygan sanoat korxonalari chiqindilariga dosh bera olmaydi. Shuningdek, qishloq xo‘jaligi ishlab chiqarishida o‘g‘it va pestitsidlarning haddan tashqari ko‘p ishlatilishi yer osti suvlarining ifloslanishiga olib keladi.

XX asrning o‘rtalariga kelib, ular ilgari suvga befarq bo‘lgan hududlarda suv juda katta qadriyat ekanligini tushunishdi. Dunyo aholisining o‘sishi esa suv tanqisligi muammosining keskinlashishiga olib kelmoqda. Insoniyat bu qiyinchiliklarga javob berishi mushkul bo‘lmoqda.

Barcha dunyo bo‘ylab ishlab chiqarish chiqindilarini kamaytirish bo‘yicha qonunchilika oid talablar kiritilmoqda. Korxonalardan chiqayotgan chiqindilarni chiqarish ehtimolini butunlay yo‘q qiladigan yopiq sikl texnologiyalari ishlab

chiqilmoqda. Jamiyatda atrof-muhitni muhofaza qilish qonunchiligini buzganlarga nisbatan qattiq jazo choralari ko'rilmogda.

Qonun-qoidalarining bajarilishi ko'plab ekologik tashkilotlar tomonidan nazorat qilinib, ular bu faoliyatni yo'lga qo'yib, atrof-muhitni, jumladan, suv resurslarini muhofaza qilish bo'yicha yangi loyihalarni ishlab chiqishmogda. Shu nuqtayi nazardan Butun jahon ekologlari jiddiy siyosiy kuchga aylanmogda. Bundan tashqari yashil partiyalar ko'plab parlamentlarda munosib vakillikka ega bo'lmogda. Mamlakatda ekologik harajatlar ortib borayotganligiga qaramay, yirik korporatsiyalar ishlab chiqarish sanoatlarining rivojlanishida "iflos" chiqindilarning chiqishini ko'z bilan ilg'amaslik mumkin emas. Chunki sanoatlashtirish sohasida rivojlanish darajasi yuqori bo'lgan mamlakatlarda ko'pincha ekologik vaziyatning tangligi kuzatiladi.

Oxirgi o'n yilliklarda ishlab chiqarishning jadal rivojlanishi nafaqat ishchi kuchining arzonligi, balki ekologik talablarni bajarmaslik tufayli ham paydo bo'lgan. Asosan, bunga Xitoy mamlakati dalildir.

Jahon banki ma'lumotlariga ko'ra, Xitoy shaharlari yaqinida joylashgan daryolarning 90 foizi jiddiy ifloslangan. Umuman olganda, yer osti suvlarining ifloslanishi va kamayishi tufayli suv tanqisligi yiliga 147 milliard yuan (21,4 milliard dollar) yoki Xitoyning yillik ishlab chiqarishining qariyb 1 foizini tashkil qiladi. Bu nafaqat Xitoyning muammosi, balki allaqachon qo'shni mamlakatlardagi ekologik muammolarga aylangan.

Ayniqsa, so'nggi o'n yil ichida Rossiya Xitoy korxonalarida sodir bo'lgan bir qator avariylar tufayli mazkur mamlakatlarda jiddiy yo'qotishlarni sodir qilgan, balki boshqa davlatlar talofatiga olib kelgan. Chunki, bu hodisa jarayonidagi toksik moddalar daryolarga - Amur irmoqlariga quyilib, oqimdan keyin boshqa chegaradosh daryo suvlariga yetib borgan.

Sanoatlashtirish va qishloq xo'jaligining intensiv usullariga o'tish bosqichlarini bosib o'tgan mamlakatlarda suvga eng muhim qadriyat sifatida qara olmayotganligi sabab ekologik vaziyat tubdan o'zgarayotligini kuzatishimiz mumkin. Chunki bunday munosabat albatta o'z samarasini bermasdan qo'ymaydi. Shuningdek, O'zbekistonning o'zida ham suv resurslarini muhofaza qilish bilan bog'liq vaziyatlarni qoniqarli deb bo'lmaydi.

Ko'p hollarda texnologik jihatdan eskirgan ishlab chiqarish korxonalarining rahbarlari O'zbekiston qonunchiligida mustahkamlangan ekologik standartlarni ham e'tiborsiz qoldirib, ishlab chiqarish xarajatlarini kamaytirishmogda. Biroq atrof-muhitni muhofaza qilish xizmatlari har doim ham xavfli moddalarni yaqin atrofdagi suv havzasiga tashlagan huquqbuzarlarni aniqlay olmaydi. Ammo qoidabuzarlik qayd etilgan holatlarda ham, undirilgan jarima tabiatga, xususan, suv resurslariga yetkazilgan zararni qoplay olmaydi.

Tadqiqot metodi. nazariy-uslubiy manbalarni tahlil qilish, tarixiy, retrospektiv va olingan ma'lumotlarni jamlash, loyihalash, umumlashtirish va sharhlash, kuzatish, suhbat, anketa, kontent tahlil, kvalimetriya va ekspert baholash.

Tadqiqot natijalari. Hozirgi kunda kunda suv, ayniqsa, toza ichimlik suvi yetishmasligi dunyo miqyosidagi muammolardan biriga aylanmogda. Ko'pchilikning suvga qadriyat sifatida qarashi, suvni tejash vositalarini joriy etishi, shuningdek, zamonaviy suv tozalash vositalaridan foydalanishi va ularning yangi modellarini

ishlab chiqishda tejamkorlik bilan munosabatda bo'lishi har kimning odat tusiga kirishi zarur. Aks holda jamiyat kelajagida:

- ocharchilik;
- turli epidemiyalarning tarqalishi;
- hayot sifatining keskinlashishi natijasida siyosiy beqarorlik kabi vaziyatlar yuzaga kelishi muqarrardir.

Shu munosabat bilan yurtimizda avj olayotgan “axlatga qarshi” norozilik aksiyalari tasodifiy emasligi bejiz emas. Zero, ushbu soha bilan shug'ullanayotgan ishbilarmonlarning o'z biznesining “rentabelligini” oshirish maqsadida eskirgan texnologiyalardan foydalanishi natijasida bunday chiqindi “maydonlari”ni o'rab turgan butun tabiiy muhit – havo va suvning degradatsiyasiga olib keladi. Chunki yer osti suvlariga kirib boradigan millionlab tonna chiqindilarning parchalanish mahsulotlari bunday “korxonalar”dan o'nlab kilometr uzoqlikdagi barcha tirik mavjudotlarni zaharlashga qodir.

Mavjud tahdid va tahlikalarga adekvat javob choralari hozirda yaqqol ko'rinib turgan quyidagi omillarga asoslanib ishlab chiqish lozim:

- ✓ suv tanqisligining tobora ortib borayotgan tahdidi;
- ✓ Ko'plab turli miqyosdagi suv iste'molchilarining mavjudligi, ularning o'zaro aloqalari, cheklangan suv resurslarini ekotizim va iqtisodiyot tarmoqlarining raqobatdosh talablari o'rtasida taqsimlash dilemmasi muqarrarligini belgilaydigan shart va omillar;
- ✓ sifatli toza suv resurslarining yetishmasligi;
- ✓ suv tanqisligi muammolari bo'yicha ma'lumotlarning cheklanganligi yoki suvdan foydalanuvchilar o'rtasidagi tarmoqlararo o'zaro munosabatlarning turli masalalari bo'yicha ijtimoiy-iqtisodiy va ekologik-iqtisodiy ma'lumotlarning yetishmasligi;
- ✓ bugungi kunda qabul qilingan qarorlarning uzoq oqibatlarining yuqori darajada noaniqligi;
- ✓ kelajakda qo'shimcha suv resurslarini jalb qilish zarurati bilan bog'liq bo'lgan boshqa ko'plab muhim holatlarning paydo bo'lish ehtimoli.

Yuqoridagilarni inobatga olgan holda, ushbu konsepsiya asosida manfaatdor hukumat, ilmiy mutaxassislar va tadbirkorlik tuzilmalarining keng auditoriyasiga taqdim etish va ularning ekologik madaniyatini oshirish maqsadga muvofiqdir. Shuningdek, mazkur konsepsiya atrof-muhitni muhofaza qilishga ustuvor ahamiyat qaratgan holda manfaatdor tomonlardan maksimal iqtisodiy foyda olishga qaratilgan innovatsion tarmoqlararo suv faoliyati uchun asos ham bo'lishi mumkin.

Mavjud milliy suv ta'minoti va suv iste'molchi tashkilotlarining umumiy kamchiligi ularning mintaqaviy manfaatlarining tor doirasi bilan chegaralangan bir-biri bilan mahalliy o'zaro aloqalarining zaifligidadir. Biroq bu tashkilotlar bir xil suv havzalari - daryo, suv ombori va kanallaridan foydalanishlariga qaramasdan, ularning harakatlari bir-biridan uzviy va maqsadlari tor idoraviy tarmoqlidir. Bundan tashqari, bunday tashkilotlarda iqtisodiyotda suv resurslaridan xavfsiz foydalanish tajribasiga ega bo'lgan mutaxassislar juda kam. Iqtisodiyotning boshqa tarmoqlarining imkoniyati, raqobatbardosh ustunligi va manfaatlari ko'zga tashlanmaydi. Natijada bunday yondashuv manfaatlar to'qnashuviga olib keladi. Ya'ni, daryolar salohiyatidan oqilona foydalanishga muvofiqlashtirilgan yondashuv o'rniga har bir mamlakat yoki tarmoq suvdan foydalanish strategiyasini ishlab

chiqadi. Bu esa suv resurslari uchun raqobatning kuchayishiga va ko‘p hollarda suv tanqisligiga hamda atrof-muhitning zararlanishi olib keladi.

Umuman, suv resurslarini boshqarishning mavjud tashkiliy tuzilmasi ularning salohiyatidan teng va samarali foydalanishga, infratuzilmaviy investitsiya loyihalarini amalga oshirish uchun tashqi va ichki moliyaviy resurslarni jalb qilishga yetarlicha yordam bermayapti.

Suvni muhofaza qilish sohasini ifodalovchi mansabdor shaxslar “devonining vazni” odatda past bo‘lganligi sababli ular o‘larining “vaznli” iste‘molchilari bilan to‘qnashuvda suv resurslarini muhofaza qilish va undan yaxshiroq foydalanish manfaatlarini samarali himoya qilisha olmaydi.

Bundan tashqari, suv resurslarini boshqarishning tarmoqlar, hududlar va mamlakatlar o‘rtasida aniq milliy munosabatlarni o‘rnatish imkonini beradigan huquqiy-iqtisodiy mexanizm mavjud emas. Bularning barchasi ayni paytda “tabiat – inson – sanoat” munosabatlarini uyg‘unlashtirishga imkon bermayapti. Natijada bu suv resurslarining kamayib ketishiga qarshi kurashda asosiy to‘siqlardan biriga aylanib bormoqda.

Aynan shu sabablar tufayli iqtisodiyot tarmoqlari va aholi tomonidan daryolar havzalari ekotizimiga salbiy ta‘sir ko‘rsatmaydigan suvdan barqaror foydalanish tizimini yaratish masalasi ancha murakkab jarayondir. Mazkur muammoni hal qilishda tabiiy muhit o‘zining suv resurslaridan foydalanish tabiati va ko‘lamiga bo‘lgan reaksiyasini hamda ortib borayotgan antropogen omillarning atrof-muhit holatiga ta‘sirini hisobga olish kerak.

Belgilangan mavjud masalaning yechimi:

- ✓ suv manbalarining ifloslanishi;
- ✓ suv resurslari va suv iste‘molchilarining hududiy notekis taqsimlanishi;
- ✓ vaqt o‘tishi bilan oqimning tabiiy tebranishlari;
- ✓ suv iste‘molining uzluksiz ortib borishidadir.

Yana shuni ta‘kidlash joizki, hozir deyarli barcha mamlakatlarda daryolar oqimi to‘liq tartibga solingan va daryo havzalari asosan suv xo‘jaligi yoki suv resurslari tizimini ifodalaydi. Bu omil xalqaro hamkorlikda muhim ahamiyat kasb etadi. Chunki daryo havzasining quyi oqimida joylashgan mamlakatlarning suv bilan ta‘minlanishi iste‘mol xarakteriga va daryo oqimining yuqori qismida joylashgan mamlakatlar tomonidan ifloslanishiga bog‘liq.

Xulosalar. Bugungi kunda eng dolzarb muammo suvning sifatini muhofaza qilish va undan oqilona foydalanishdir, shuningdek, kam sarf qilishdir. Bu muammoning yechimi huquqiy, iqtisodiy va ma‘muriy chora-tadbirlar asosida erishiladi.

Xulosa qilib shuni aytish joizki, barcha mamlakatlarda suv va uni muhofaza qilish bo‘yicha qonun-qoidalar mavjuddir. Ammo ularni qayta ko‘rib chiqish hamda “Yashil iqtisodiyot” tamoyillariga moslashtirish zarurdir. Asosan, milliy havza va ma‘muriy-hududiy darajalarda suv resurslarini boshqarishning yagona huquqiy asoslar bilan faoliyat ko‘rsatishini ta‘minlash zarur.

Yana shuni ta‘kidlash lozimki, suv resurslari barcha tabiiy resurslarning organik qismi bo‘lganligi uchun suvni muhofaza qilish tizimini qonunchilik orqali tartibga solish va atrof-muhit qonunchiligining butun tizimi o‘rtasidagi bog‘lanishlilikni ta‘minlash zarurdir. Shu asosda daryo havzasi ijtimoiy, iqtisodiy va ekologik

omillarning butun majmuasi bilan yagona geografik hudud sifatida qaraladigan tizimli tarmoqlararo suv resurslarini boshqarishni yaratish mumkin.

Bugungi kunda mamlakatimizning barcha tarmoqlarida “Yashil iqtisodiyot” tamoyillarini joriy etish hamda barqaror rivojlanish bo'yicha o'z siyosatini olib bormoqda. Bunda samarali natijaga erishish uchun “Yashil iqtisodiyot”ning ahamiyatli jihatlarini ko'rib chiqishimiz va chora-tadbirlarni ishlab chiqish zarurdir. Buning uchun insonlar birlashishi, maqsadlar uyg'unlashishi, birdamlikda, hamjihatlikda harakat qilish lozim. Demak, yechim topadigan, foydali chora-tadbirlarni ishlab chiqilgandagina barqaror rivojlanishga erishish mumkin.

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THE IMPACT OF ENERGY RESOURCE MANAGEMENT ON THE PARAMETERS OF AGGREGATE PROCESSING MACHINES AND THEIR AGRO-TECHNICAL AND ENERGY PERFORMANCE INDICATORS

Azmuddin Sadriddinov - “TSTU” professor department of “Land Transport Systems”

Hursand Rakhimov - “TIAME” National Research University, basic doctoral student in the specialty, “Agricultural and land reclamation machinery. Mechanization of agricultural and land reclamation work”

Abstract. The article presents the results of theoretical studies conducted to justify the optimal values of the parameters of a combined aggregate leveler for tillage of the soil before sowing. According to the results obtained, in order to ensure the required level of work quality, that is, the amount of fractions smaller than 25 mm in the treated layer is at least 80 percent and the height of irregularities on the field surface is no more than ± 2 cm with minimal energy consumption, the following parameters: the height of the leveler and the specific mass of the aggregate leveler were theoretically and experimentally studied.

Key words: leveler, softener, aggregate, specific gravity, structure, soil, degree of crushing.

Abstract. Maqolada ekishdan oldin tuproqqa ishlov beruvchi kombinatsiyalashgan agregat tekislagichi parametrlarining maqbul qiymatlarini asoslash bo'yicha o'tkazilgan nazariy tadqiqotlarning natijalari keltirilgan. Olingan natijalar bo'yicha talab darajasidagi ish sifatini, ya'ni ishlov berilgan qatlamda o'lchami 25 mm. dan kichik fraksiyalar miqdori kamida 80 foiz va dala yuzasidagi notekisliklarning balandligi ko'pi bilan ± 2 sm bo'lishini kam energiya sarflagan holda ta'minlash uchun quydagi parametrlari tekislagichning balandligi hamda agregat tekislagichining solishtirma massasi nazariy va eksperimental tadqiq qilindi.

Key words: tekislagich, yumshatgich, agregat, solishtirma massa, qurlima, tuproq, uvalanish darajasi.

Аннотация. В статье представлены результаты теоретических исследований, проведенных с целью обоснования оптимальных значений параметров комбинированного агрегата-выравнивателя для обработки почвы перед посевом. Согласно полученным результатам, качество работы на требуемом уровне, то есть размер обработанного слоя составляет 25 мм. Для того чтобы обеспечить содержание фракций мельче не менее 80 процентов и высоту неровностей на поверхности поля не более ± 2 см при минимальных энергозатратах, теоретически и экспериментально исследовались следующие параметры: высота выравнивателя и удельная масса заполнителя выравнивателя.

Ключевые слова: выравниватель, пластификатор, заполнитель, удельный вес, структура, грунт, степень измельчения.

Introduction. Current on the day village farm effective and stable in development the most important from directions one calculated this to the field modern agro technology current to do and farmer farms high productive village farm techniques

with provide on account of done Village farm from crops plenty harvest in receiving planting before to the places good quality processing to give important importance has is considered. Because, planting before to the places good quality processing if not given, the village farm of crops seeds agricultural technology requirements at the level good quality planted will not be planted seeds sly sprout does not come out and every one per hectare necessary was seedling It is not available. This is your own in turn crops productivity to decrease take is coming.

In recent years, certain work has been carried out to reform the agricultural sector of our country, in particular, to improve the state administration system in the sector, to widely introduce market relations and strengthen their legal basis, to attract investments to the sector, and to introduce resource-saving technologies and technical means. Currently, not only in our country but also in the world, work is being carried out on the optimization of tillage machines and their parameters before sowing. In particular, Patkowska E, Błażewicz-Woźniak M, Konopiński M and D Wachlar are especially among the world's leading scientists [1-2]. In particular, from Uzbekistan A. Tukhtakuziyev, R. Tovashov, B. Shaimardanov, F.M. Mamatov, B. R. Kurambayev and many other researchers are working with tillage machines. What we can see in their scientific research work is to improve the quality of processing while reducing the energy consumption of the machine [3-7].

Materials and methods. This article presents the results of theoretical and experimental studies conducted to justify the optimal values of the leveling height and the specific mass of the aggregate leveling device in order to ensure that the soil is treated with soil fractions smaller than 25 mm in size at least 80 percent and the height of the soil surface irregularities is no more than ± 2 cm with minimal energy consumption. The capabilities of the MC Excel and Kompas 3D programs were fully used to analyze and statistically process the results.

According to the analysis of scientific, technical and patent literature, it was found that the factors of economy in soil cultivation are energy and resource efficiency. Economical technologies should be aimed at preserving the fertile soil layer and moisture, combating water and wind erosion. In such technologies, each operation can be carried out by turning the soil with working bodies with or without turning it over. In some technologies, it can be carried out on the basis of zero or minimal soil cultivation, while preserving plant stems and root residues on the field surface. Therefore, the use of precise (coordinated) agrotechnical or farming technologies that ensure high efficiency in soil cultivation should be one of the important directions.

Results and discussions. A special laboratory-field device was prepared to conduct the specified experimental studies (Fig. 1). The laboratory device consists of a frame 1 equipped with a clamping device 2, levelers 3, ballasts 4, a base 5 on which levelers are mounted, connected movably relative to each other, and special holes 6 that allow changing the opening angle of the levelers.

On the basis of the parameters of the aggregate leveler for energy-saving combination The work on the theoretical studies conducted is described in detail in the article [8-10].

Literature was used to analyze the results obtained and verify their compliance with agrotechnical requirements [11-13].

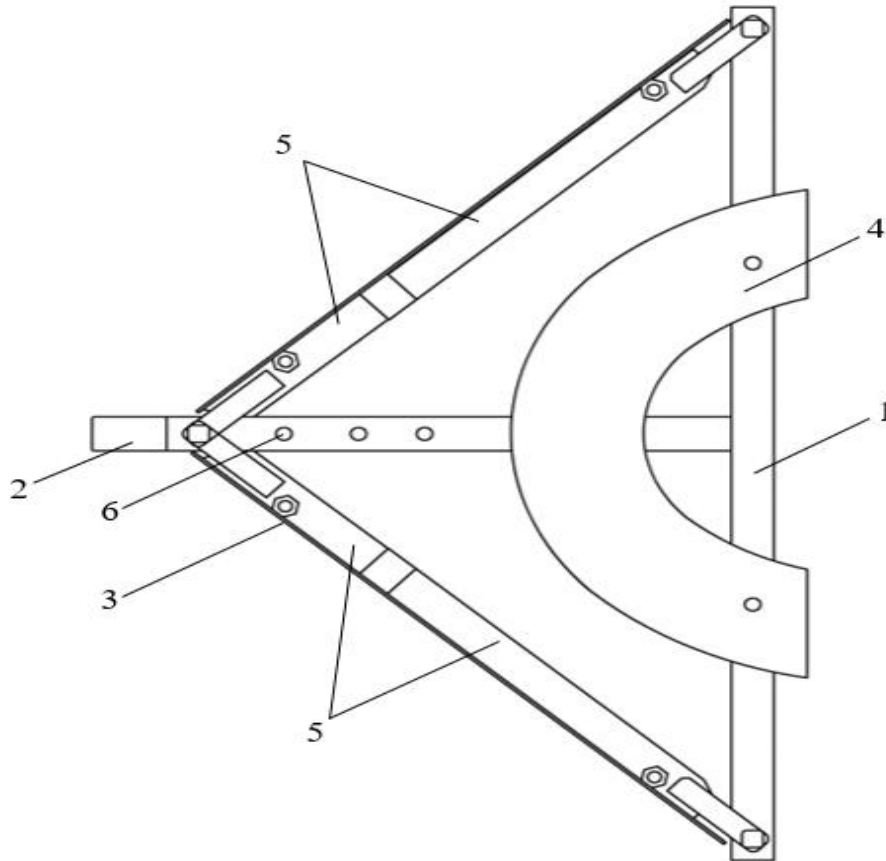


figure 1. *Structural diagram of the laboratory device*
 1-cross beam; 2-steering device; 3-levelers, 4-ballast; 5-base with levelers
 installed; 6-special holes

The height of the levelers on the performance of the laboratory device

Based on the results of theoretical studies, the height of the levelers was determined from 11 cm to 17 cm at intervals of 2 cm, and the speed of the aggregate was determined to be 8 and 10 km/h. The results obtained in the experiments are presented in Table 1 and Figure 2.

Their analysis shows that the mean square deviation of the height of the irregularities on the surface of the treated area by the laboratory device decreased with increasing screed heights. When the screed heights increased from 11 cm to 17 cm, the mean square deviation of the height of the irregularities on the treated area decreased from ± 2.36 cm to ± 1.78 cm at an aggregate speed of 8 km/h, and from ± 2.22 cm to ± 1.70 cm at 10 km/h. When the leveling heights were 13 cm or less, the soil piled up in front of the leveling device exceeded it, which is why the root mean square deviation of the heights of irregularities on the field surface at these values was greater than the permissible value. This situation was not observed when the leveling heights were 15 cm or more, and the root mean square deviation of the heights of irregularities on the field surface was less than the permissible value. An increase in the speed of movement of the aggregate led to a decrease in this indicator [13-15].

With increasing leveler heights, the degree of soil compaction, i.e. the amount of soil fractions smaller than 25 mm, first increased rapidly, and then this intensity decreased. When the leveler heights increased from 11 cm to 15 cm, the degree of soil

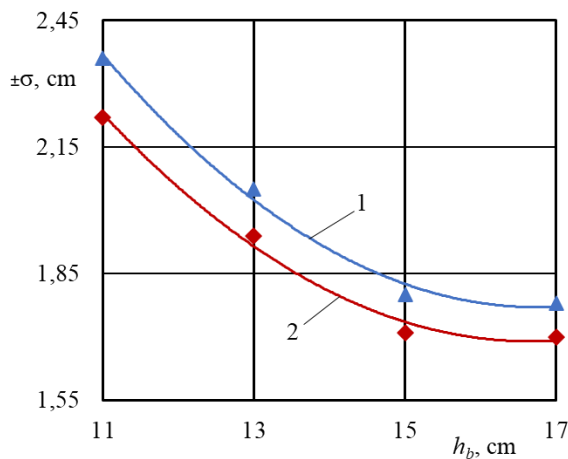
compaction increased from 81.1% to 85.3% at an aggregate speed of 8 km/h, and from 82.9% to 87.3% at a speed of 10 km/h.

table 1.

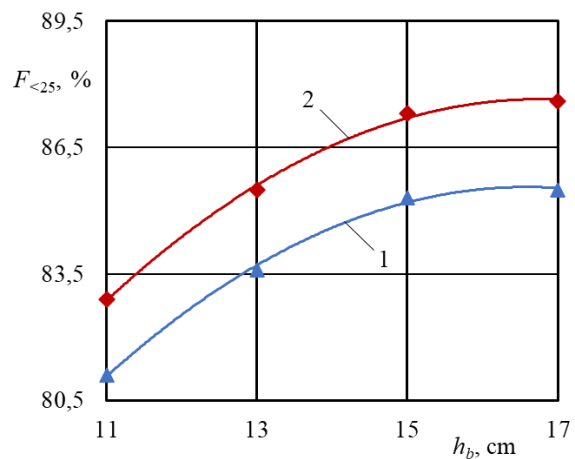
The effect of the height of the levelers on the performance of the laboratory device

Levelers height, cm	The mean square deviation of the heights of irregularities on the surface of the treated area , $\pm$ c m	Soil compaction level, i.e. the amount of soil fractions smaller than 25 mm, %	Tensile strength of the laboratory device, kN
<i>V= 8 km /h</i>			
11	2.36	81.1	1.85
13	2.05	83.6	2.03
15	1.80	85.3	2.11
17	1.78	85.5	2.14
<i>V= 10 km /h</i>			
11	2.22	82.9	1.93
13	1.94	85.5	2.12
15	1.71	87.3	2.20
17	1.70	87.6	2.23

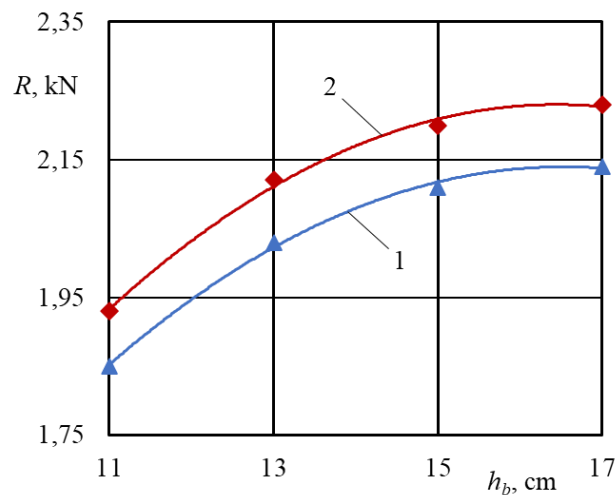
Increasing the leveling heights from 15 cm to 17 cm did not significantly affect the degree of soil compaction. However, increasing the speed of the aggregate movement led to an increase in the degree of soil compaction.



a)



b)



c)

1 and 2 suitable accordingly aggregate speed 8 and 10 km/ h

figure 2. The effect of screed heights on performance. a-the mean square deviation of the heights of the levelers from the heights of the irregularities on the field surface ($\pm\sigma$); b-the degree of soil compaction of the levelers ($F<25$); c-the effect of the levelers' heights on the tensile resistance (R)

The laboratory device increased with the increase in the height of the levelers. When the height of the levelers increased from 11 cm to 17 cm, the traction resistance of the laboratory device increased from 1.85 kN to 2.14 kN at an aggregate speed of 8 km/h, and from 1.93 kN to 2.23 kN at an aggregate speed of 10 km/h. However, the rate of increase in the traction resistance of the laboratory device decreased with the increase in the height of the levelers. However, an increase in the aggregate speed led to an increase in the traction resistance of the laboratory device.

So, from the above, it follows that the height of the levelers should be at least 15 cm.

The specific gravity of a laboratory device on its performance

During the experiments, based on the results of theoretical studies, the specific mass of the laboratory device was changed from 100 kg to 145 kg in 15 kg increments. This was achieved by placing an additional load on top of the laboratory device. The height and opening angle of the levelers were set to 15 cm and 100° , respectively, the angle of deviation of the traction force relative to the horizon was 5° , and the speed of the unit was set to 8 and 10 km/h.

The results obtained in the experiments are presented in Table 2 and Figure 3.

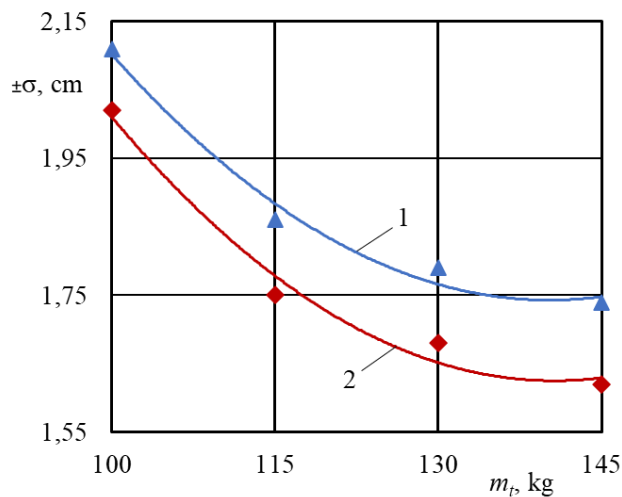
table 2.

The effect of the specific gravity of a laboratory device on its performance

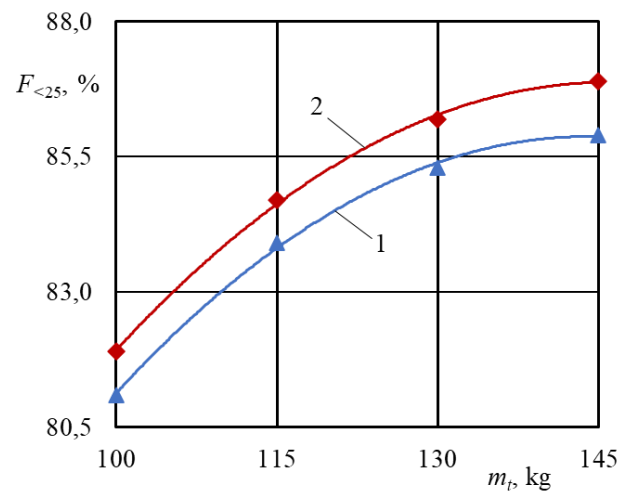
Specific mass of the laboratory device, kg/ m	The mean square deviation of the heights of irregularities on the surface of the treated area, $\pm$ c m	Soil compaction level, i.e. the amount of soil fractions smaller than 25 mm, %	Tensile resistance of the laboratory device, kN
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V= 8 km /h			
100	2.11	81.1	1.96
115	1.86	83.9	2.13
130	1.79	85.3	2.31
145	1.74	85.9	2.50
V= 10 km /h			
100	2.02	81.9	2.04
115	1.75	84.7	2.22
130	1.68	86.2	2.41
145	1.62	86.9	2.61

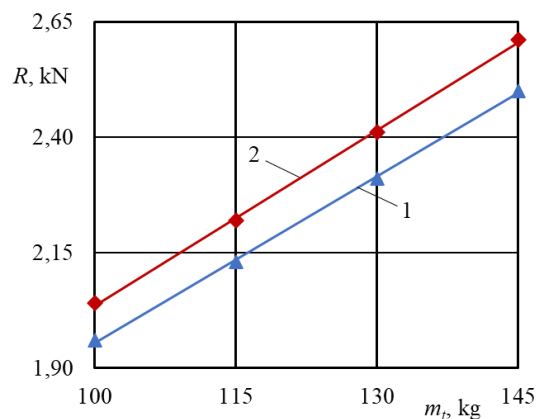
Their analysis shows that with an increase in the specific mass of the laboratory device, the root mean square deviation of the height of irregularities on the surface of the area treated by it decreased. When the specific mass increased from 100 kg/m to 145 kg/m, the root mean square deviation of the height of irregularities on the surface of the treated area decreased from ± 2.11 cm to ± 1.74 cm at an aggregate speed of 8 km/h, and from ± 2.02 cm to ± 1.72 cm at 10 km/h. An increase in the speed of the aggregate movement led to a decrease in this indicator [13-15].



a)



b)



c)

1 and 2 suitable accordingly aggregate speed 8 and at 10 km/ h

figure 3. The influence of the specific mass on its performance

a-the influence of the specific mass of the device on the mean square deviation ($\pm\sigma$) of the heights of irregularities on the surface of the cultivated field, b-the influence of the specific mass of the device on the degree of soil compaction ($F < 25$); c-the influence of the specific mass of the device on the drag resistance (R)

With the increase in the specific gravity of the laboratory device, the degree of soil compaction, that is, the amount of soil fractions smaller than 25 mm in size, increased. When the specific gravity increased from 100 kg/m to 145 kg/m, the degree of soil compaction increased from 81.1% to 85.9% at an aggregate speed of 8 km/h, and from 81.9% to 86.9 % at a speed of 10 km/h. An increase in the aggregate speed led to an increase in the degree of soil compaction.

The increase in the specific gravity of the laboratory device increased its resistance to traction. When the specific gravity increased from 100 kg/m to 145 kg/m, the aggregate movement speed increased from 1.96 kN to 2.50 kN at 8 km/h, and from 2.04 kN to 2.61 kN at 10 km/h. The increase in aggregate movement speed also led to an increase in this indicator.

The main reason for this is that as the specific gravity of the laboratory device increases, the force that pushes it into the soil increases.

So, from the above, it follows that the specific mass of the laboratory device should be at least 115 kg.

Conclusion. According to the results of experimental studies, the average square deviation of the height of irregularities on the surface of the area treated by the energy-saving combined aggregate leveler is less than ± 2 cm, the degree of soil compaction, that is, the amount of soil fractions smaller than 25 mm in size, is more than 80%, and the specific gravity of the aggregate is reduced when the levelers are at least 15 cm high and the specific gravity is at least 115 kg.

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THE IMPORTANCE OF ENGLISH IN CREATING A GREEN ECONOMY PLATFORM FOR AGRICULTURAL DEVELOPMENT

Yuldashova Nargiza Abdukholiq qizi - Teachers. English department.
“TIAME” National Research University

Khudayberganova Marguba Abdievna - Teachers. English department.
“TIAME” National Research University

Ziyadulloyeva Mokhidil Shovkat qizi - Teachers. English department.
“TIAME” National Research University

Annotation. This article highlights the critical importance of English language proficiency in fostering the development of a green economy within the agricultural sector. It explores how English enables access to global research, knowledge, and technology, supporting the implementation of sustainable agricultural practices. By examining the relationship between language skills and green economy practices, this paper emphasizes the role of English in bridging gaps in communication and promoting international collaboration for agricultural innovation and sustainability. Furthermore, it explores the challenges faced by non-English speakers in implementing green technologies and how English proficiency can unlock opportunities for growth and environmental conservation in agriculture.

Keywords: *Green economy, agricultural development, English proficiency, sustainability, innovation, international collaboration.*

Аннотация. *Статья подчеркивает критическую важность владения английским языком для содействия развитию зеленой экономики в сельскохозяйственном секторе. Рассматривается, как английский язык предоставляет доступ к глобальным исследованиям, знаниям и технологиям, поддерживая внедрение устойчивых сельскохозяйственных практик. Исследуя взаимосвязь между языковыми навыками и практиками зеленой экономики, данная работа подчеркивает роль английского языка в преодолении коммуникативных барьеров и стимулировании международного сотрудничества для сельскохозяйственных инноваций и устойчивости. Кроме того, статья анализирует проблемы, с которыми сталкиваются неанглоязычные специалисты при внедрении зеленых технологий, и как владение английским языком может открыть возможности для роста и охраны окружающей среды в сельском хозяйстве. Ключевые слова: Зеленая экономика, сельскохозяйственное развитие, владение английским языком, устойчивость, инновации, международное сотрудничество.*

Annotatsiya. *Ushbu maqola ingliz tilini bilishning qishloq xo'jaligi sohasida yashil iqtisodiyotning rivojlanishini ta'minlashdagi muhim ahamiyatini ta'kidlaydi. Ingliz tili global tadqiqotlar, bilimlar va texnologiyalarni olish imkoniyatini yaratib, barqaror qishloq xo'jaligi amaliyotlarini joriy etishni qo'llab-quvvatlashni ko'rib chiqadi. Til ko'nikmalari va yashil iqtisodiyot amaliyotlari o'rtasidagi munosabatni tahlil qilgan holda, ushbu maqola ingliz tilining muloqotdagi bo'shliqlarni to'ldirish va qishloq xo'jaligi innovatsiyalari va barqarorlik uchun xalqaro hamkorlikni rivojlantirishdagi rolini ta'kidlaydi. Bundan tashqari, maqola ingliz tilini bilmaydiganlar yashil texnologiyalarni joriy etishda duch keladigan qiyinchiliklarni va ingliz tili bilimi qishloq xo'jaligida o'sish va atrof-muhitni muhofaza qilish imkoniyatlarini qanday ochishi mumkinligini o'rganadi.*

Kalit so'zlar: Yashil iqtisodiyot, qishloq xo'jaligi rivojlanishi, ingliz tilini bilish, barqarorlik, innovatsiya, xalqaro hamkorlik.

Introduction. The global agricultural industry faces pressing challenges, including climate change, environmental degradation, and food security. In response, there is a growing recognition of the need to transition toward a green economy in agriculture. A green economy in agriculture emphasizes the adoption of sustainable practices, such as renewable energy use, waste management, and resource conservation. However, for agricultural professionals and stakeholders to effectively implement green technologies and sustainable methods, proficiency in English plays a vital role.

In a rapidly globalizing world, English has emerged as the universal language of research, international trade, and technological exchange. This article examines how knowledge of English can aid in the development of a green economy platform in agriculture by facilitating access to scientific research, fostering international collaborations, and improving communication between stakeholders in different regions of the world.

The Role of English in Green Technology Adoption and Agricultural Development

The adoption of green technologies in agriculture is heavily influenced by research and innovation, which is predominantly published and disseminated in English. Leading journals, conferences, and networks focused on sustainability and environmental practices often operate in English, making it the key language for accessing new knowledge, methodologies, and case studies from around the world.

Green technologies, such as renewable energy systems, precision farming techniques, and waste-to-resource solutions, often require specific technical knowledge that is best acquired through English-language resources. Farmers, researchers, and policymakers who are proficient in English can access the latest innovations and apply them effectively in their local contexts, thus fostering sustainable agricultural practices. Moreover, English proficiency allows agricultural stakeholders to engage in international discussions and collaborations, creating opportunities for the exchange of best practices and innovations that might not be accessible in native languages.

Global challenges, such as climate change and environmental degradation, require concerted efforts across borders. A green economy in agriculture is not just a local or national endeavor but a global mission. Collaboration between countries, research institutions, and multinational organizations is essential to drive forward innovations in sustainable agriculture. English is the common language of diplomacy and international cooperation. As agricultural development increasingly takes place on a global scale, English proficiency allows stakeholders from different parts of the world to engage in meaningful dialogue, share insights, and collaborate on projects that address the shared goals of environmental protection, economic growth, and social equity. Through such international collaborations, agricultural professionals can bring innovative green solutions to their home regions, thereby contributing to global sustainability.

In many regions, agricultural professionals may face communication barriers due to limited English proficiency. These barriers can hinder their ability to participate in global conversations about sustainable practices, access funding for green initiatives, or adopt new technologies. As agriculture moves toward more globalized, technology-driven methods, English becomes a crucial tool for closing communication gaps.

Training agricultural workers, policymakers, and researchers in English ensures they can communicate effectively with international experts, access high-quality learning materials, and stay informed about the latest trends in green technologies. This capacity for global communication is vital for the successful implementation of green economy strategies in agriculture.

English as a Tool for Capacity Building and Innovation

The role of English language proficiency in agricultural development and its influence on the creation of a green economy platform has been a subject of growing academic interest. Several studies emphasize the significant relationship between language knowledge, innovation in agriculture, and international collaboration, all of which are critical for advancing green economy initiatives in agriculture.

Escobar-Rodriguez et al. (2021) explored the importance of multilingualism in agriculture, particularly focusing on innovative approaches to language education.

They argue that understanding and integrating various linguistic terms in agricultural contexts is crucial for the dissemination and adoption of new agricultural technologies. Among the many languages spoken globally, English emerges as a key language in the dissemination of agricultural knowledge and technologies. Escobar-Rodriguez's work highlights how learning English provides access to a wealth of research and technical resources, creating opportunities for agricultural professionals to engage in the global green economy dialogue.

In a similar vein, Akerele, Arif, and Ahmed (2018) discuss the relationship between English proficiency and innovation in agriculture. Their research indicates that many technological advancements and innovations in the agricultural sector are disseminated primarily through English-language publications and platforms. The study stresses that proficiency in English not only facilitates access to cutting-edge agricultural innovations but also enables farmers, researchers, and policymakers to contribute to the global green economy by implementing sustainable practices.

Horton and Barker (2019) examine the role of English in diplomatic relations within international agricultural networks. They theorize that English serves as a common language that bridges cultural and linguistic gaps, allowing countries to engage in international agricultural agreements, share best practices, and collaborate on green initiatives. In the context of a green economy, where sustainable practices are often developed through international cooperation, English proficiency is crucial for fostering diplomatic dialogue and achieving mutual goals in agricultural development.

Johnson (2021) further explores the role of English proficiency through content-based analysis in the context of global agricultural networks. He argues that participation in these networks requires a certain level of English language proficiency, as much of the scientific literature, international forums, and research collaborations are conducted in English. Johnson emphasizes that English proficiency enables agricultural professionals to engage effectively in these networks, thus playing a crucial role in the transfer of green technologies and knowledge that promote sustainable agricultural practices worldwide.

Smith and Jones (2020) offer a comprehensive content analysis of how English language proficiency facilitates access to agricultural literature, particularly literature that focuses on sustainable farming techniques and green economy practices. They identify a direct correlation between English-language skills and the ability to access and comprehend agricultural research, thereby influencing the successful implementation of green technologies and practices. English proficiency, therefore, is a key factor in promoting the adoption of environmentally friendly practices in agriculture and in creating a green economy platform.

Finally, Zhang and Li (2021) focus on the role of intercultural communication in agricultural settings, emphasizing that language knowledge is central to the development of networks in international agricultural relations. Their research illustrates that English proficiency is fundamental for fostering cross-cultural interactions and building effective agricultural networks. In the context of agricultural development and the green economy, English acts as a bridge to connect agricultural professionals across the globe, facilitating knowledge exchange, collaboration, and the adoption of green technologies.

English language skills are also essential for building the capacity of agricultural professionals to innovate and adapt to new environmental challenges. Research and development (R&D) in green technologies are typically led by English-speaking countries and international research institutions. By ensuring agricultural workers and researchers have a strong command of English, they can access the vast pool of knowledge available, enabling them to adapt and apply innovative solutions in their own contexts.

Furthermore, English proficiency can enhance professional development opportunities through international training programs, conferences, and certifications that focus on sustainable agriculture. These opportunities empower individuals and communities to improve their agricultural practices, contribute to the global green economy, and become leaders in the field of sustainable agriculture.

Conclusion. In conclusion, English language proficiency is a key enabler in the creation of a green economy platform for agricultural development. It allows stakeholders to access critical global research, engage in international collaborations, and implement innovative green technologies. As agriculture transitions towards more sustainable practices, the role of English in facilitating knowledge exchange, fostering innovation, and enhancing communication cannot be underestimated. Governments, educational institutions, and organizations must prioritize English language training as part of their strategy to promote a green economy in agriculture.

By equipping agricultural professionals with the necessary language skills, we ensure that they can contribute to the global effort of sustainable agricultural development, thereby advancing the green economy agenda and fostering a more sustainable and resilient future for agriculture worldwide.

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THE MAGIC OF PRACTICE IN IMPROVING SPEAKING SKILLS

Nasiba Salikhova - The English language department of applied disciplines,
USWLU nasibasalikh

Annotation Speaking fluently and confidently is a skill that plays a vital role in both personal and professional life. Whether in daily conversations, public speaking, or language learning, effective communication can open doors to new opportunities. This article explores the significance of practice in enhancing speaking skills, the different methods of practice, and the scientific basis behind its effectiveness.

Key words: pronunciation, improve fluency, speaking exercises, performance, comprehension, real-life conversations, confidence, communication, discussions.

Anotatsiya. Ravon va ishonchli so'zlash shaxsiy va professional hayotingizda muhim rol o'ynaydigan mahoratdir. Kundalik suhbatlar, notiqlik nutqlari yoki til o'rganish bo'ladimi, samarali muloqot yangi imkoniyatlar eshiklarini ochib beradi. Ushbu maqolada nutq malakasini oshirishda amaliyotning ahamiyati, amaliyotning turli usullari va samaradorligining ilmiy asoslari ko'rib chiqiladi.

Kalit so'zlar: talaffuz, ravonlikni oshirish, nutq mashqlari, mahsuldorlik, tushunish, haqiqiy suhbatlar, ishonch, muloqot, muhokamalar.

Аннотация. Беглая и уверенная речь — это навык, который играет важную роль как в личной, так и в профессиональной жизни. Будь то повседневные разговоры, публичные выступления или изучение языка, эффективное общение может открыть двери новым возможностям. В этой статье рассматривается значение практики в улучшении навыков говорения, различные методы практики и научная основа ее эффективности.

Ключевые слова: произношение, улучшение беглости речи, разговорные упражнения, производительность, понимание, реальные разговоры, уверенность, общение, обсуждения.

Introduction. The magic of practice lies in its ability to refine pronunciation, improve fluency, expand vocabulary, and boost confidence. However, mastering speaking skills does not happen overnight. It requires consistent effort, dedication, and most importantly, practice. The concept of "practice makes perfect" is supported by scientific research on skill acquisition and memory retention. According to Ericsson, deliberate practice is essential for achieving expertise in any field. This type of practice involves goal-oriented, structured, and repetitive exercises that gradually improve performance.[3] When it comes to speaking skills, the brain forms new neural pathways through continuous speaking exercises, reinforcing fluency and accuracy over time.[2]

Neuroscientists explain that practice strengthens the brain's ability to process and produce language efficiently. The more we speak, the more we activate the brain regions responsible for articulation, comprehension, and auditory feedback.[4] This

process, known as neuroplasticity, allows the brain to adapt and enhance language skills through repeated exposure and use.

Speaking practice activity

Benefits of Regular Speaking Practice:

(1) Fluency refers to the ability to speak smoothly without excessive pauses or hesitation. Regular practice helps individuals overcome speech blocks by making their speech patterns more automatic. When learners engage in activities such as storytelling, reading aloud, or conversational practice, they develop a rhythm in their speech that enhances fluency.[6] Similarly, pronunciation improves through constant practice. Many learners struggle with certain sounds or intonation patterns that are not present in their native language. By practicing tongue twisters, shadowing native speakers, and using pronunciation apps, individuals can refine their pronunciation and sound more natural.

(2) Expansion of Vocabulary and Grammar Usage. Speaking frequently exposes learners to new words and grammatical structures in a practical context. Unlike passive learning methods, active speaking practice helps retain vocabulary better because words are used in meaningful conversations. Research suggests that actively recalling and using words in speech strengthens memory retention and reduces the risk of forgetting them.[8]

Additionally, grammar rules become more intuitive with practice. Instead of consciously analyzing sentence structures, speakers develop an automatic understanding of correct syntax and word order. Speaking naturally in various situations reinforces grammar knowledge and minimizes mistakes over time.

(3) Boosted Confidence and Reduced Anxiety. Many people experience anxiety when speaking in a foreign language or addressing an audience. However, practice significantly reduces this fear by building confidence. Studies show that repeated exposure to speaking situations lessens anxiety and increases self-assurance.[5] Confidence grows as speakers become more familiar with expressing their thoughts. Engaging in role-plays, debates, and impromptu speaking exercises can help individuals feel more comfortable and prepared for real-life conversations.

(4) Effective Methods to Practice Speaking. There are numerous ways to practice speaking skills, each catering to different learning styles and preferences. Here are some of the most effective methods:

❖ Speaking with a Partner or in a Group

Conversing with a friend, tutor, or language partner allows for interactive learning. Discussions on various topics help improve articulation, listening skills, and the ability to respond naturally. Group discussions and public speaking clubs, such as Toastmasters, provide a supportive environment to practice structured speaking.

❖ Recording and Self-Assessment

Recording oneself while speaking is a valuable self-assessment tool. By listening to recordings, individuals can identify areas that need improvement, such as pronunciation errors, hesitations, or grammatical mistakes. Over time, this method helps track progress and refine speaking skills.

❖ Shadowing Technique

The shadowing technique involves listening to a native speaker and repeating their speech simultaneously. This method improves pronunciation, intonation, and

rhythm by mimicking natural speech patterns.[1] It is particularly effective for learners aiming to develop a native-like accent.

❖ Using Language Learning Apps and Online Platforms

Technology has made language learning more accessible. Apps like Duolingo, Speechling, and Elsa Speak offer pronunciation feedback and speaking exercises. Online platforms like iTalki and Cambly connect learners with native speakers for real-time conversation practice.

❖ Public Speaking and Storytelling

Public speaking exercises, such as giving presentations or telling stories, enhance clarity, coherence, and expression. Storytelling, in particular, helps organize thoughts and maintain audience engagement while improving fluency.

Conclusion. Summarizing the article, we would like to emphasize that magic of practice in improving speaking skills cannot be overstated. Consistent speaking practice enhances fluency, pronunciation, vocabulary, and confidence while reducing anxiety. Supported by scientific research, deliberate practice strengthens neural connections, making speech production more natural and effortless. By using effective methods such as conversations, self-recording, shadowing, and public speaking, learners can significantly improve their speaking abilities. Ultimately, the key to mastering speaking skills is persistence—every conversation, mistake, and attempt contributes to progress. With dedication and practice, anyone can become a confident and articulate speaker.

It can also be argued that the use of new information technologies in teaching does not exclude traditional technologies, however, it is new information technologies that become the main means of access to various sources of information, which is one of the most important aspects of the modern educational process. [7]

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THE ROLE OF TAXES IN DEVELOPING A GREEN ECONOMY

Numonov Fayzullokhon - 1st year master's student in economics, Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIAME)-National Research University

Abstract. *Through a Comparative Policy Analysis this article explores how taxation influences the development of a green economy by examining cases from Finland, the United States, and Uzbekistan. The study analyzes government reports, academic studies, and policy reviews to assess how taxation affects carbon emissions along with renewable energy investment and economic sustainability. Finland's €80 per ton carbon tax has achieved significant emission reductions while the United States depends on state-level mechanisms and tax incentives instead of a national carbon tax. While Uzbekistan remains dependent on fossil fuel subsidies it is slowly implementing incentives for renewable energy. Carbon pricing paired with subsidy removal and tax incentives constitute essential tools for realizing both environmental protection and economic sustainability.*

Keywords: *Carbon tax, green taxation, sustainable economy, renewable energy policy, carbon pricing, comparative policy analysis, emissions reduction strategies, environmental fiscal policies, climate finance, economic impact of green taxes, clean energy transition, government incentives for sustainability, Finland, USA and Uzbekistan.*

Introduction. The global community's escalating battle against climate change positions taxation as a vital instrument for speeding up the shift toward a green economy. Through renewable energy support incentives fossil fuel dependency discouragement and environmental project funding taxes have the ability to redirect economic actions toward sustainable practices. Green taxation policies have become an increasingly popular strategy for governments worldwide and have produced demonstrable outcomes during the last five years.

As the global economy faces the urgent task of moving towards sustainability, taxation has emerged as a powerful tool in shaping environmental policies. Worldwide, governments are using environmental taxes to encourage cleaner energy consumption, reduce greenhouse gas (GHG) emissions, and promote sustainable economic growth. Over the last five years, carbon pricing mechanisms, including carbon taxes and emissions trading systems, have grown rapidly. By 2023, more than 75 carbon pricing mechanisms were in place globally, covering almost 25% of GHG emissions. However, experts warn that current tax rates are insufficient to meet the global climate targets set by the Paris Agreement.

Carbon pricing methods now capture close to 25% of worldwide greenhouse gas emissions while generating more than \$100 billion in revenue during the year 2022. Power plants and industrial facilities have experienced a 35% decrease in emissions since 2005 because of the European Union's Emissions Trading System (EU ETS). The U.S. Inflation Reduction Act of 2022 designated \$369 billion toward clean energy incentives which aims to achieve a 40% emissions reduction by 2030.

Even with the progress we've made, there are still hurdles to overcome, particularly in ensuring that tax policies are both fair and effective. This article takes a closer look at the role of taxes in promoting a green economy, analyzing global trends, economic impacts, and offering policy recommendations for a sustainable future. The primary focus of this piece is to investigate how taxation can drive the transition to a greener economy. By reviewing recent policy implementations, economic effects, and global trends, the article aims to demonstrate how tax instruments can motivate sustainable practices and help reduce carbon emissions.

Objectives:

1. Assess the Effectiveness of Green Taxes – Take a closer look at how carbon taxes, emissions trading systems, and incentives for renewable energy are performing based on the latest statistical data.

2. Examine Global Policy Trends – Look at tax-based environmental policies from various countries to pinpoint the best practices and the challenges they face.

3. Analyze Economic and Social Implications – Explore how green taxation impacts businesses, consumers, and government revenues, while also considering fairness and economic competitiveness.

4. Provide Policy Recommendations – Share insights on how policymakers can fine-tune tax strategies to promote environmental sustainability without placing an unfair economic burden on anyone.

Methodology. In this study, we apply Comparative Policy Analysis (CPA) to assess the impact of tax policies on fostering a green economy in Finland, the United States, and Uzbekistan. By using the CPA method, we can systematically compare and contrast various tax strategies and regulatory frameworks, as well as their influence on reducing carbon emissions, increasing renewable energy adoption, and facilitating economic transformation.

Selection of Countries

- **Finland:** A leader in green taxation and carbon pricing, Finland has adopted extensive policies to reduce fossil fuel dependence and transition to a circular economy.

- **United States:** The U.S. employs a mixed approach, with federal and state-level carbon pricing mechanisms, such as California's cap-and-trade system and proposed national carbon taxes.

- **Uzbekistan:** A rapidly transitioning economy, Uzbekistan has recently introduced green energy initiatives but faces challenges in implementing effective environmental taxation policies.

Data Collection and Sources

The study relies on secondary data from government reports, academic studies, and policy reviews from institutions such as the **World Bank, OECD, IMF, Harvard Davis Center, Columbia University's Center on Global Energy Policy**, and other academic and governmental sources.

Key data points include:

- Carbon taxation rates and revenue allocation
- Emissions reduction outcomes
- Renewable energy investment trends

Analytical Framework

1. **Policy Design & Implementation:** Examines how carbon taxes and green incentives are structured and enforced.
2. **Economic and Environmental Impact:** Assesses changes in carbon emissions, energy prices, and economic growth.
3. **Political and Social Acceptability:** Evaluates public and industry responses to taxation policies.

The findings from this comparative approach will highlight the effectiveness of green tax policies in different economic contexts and provide insights into best practices for developing nations like Uzbekistan.

Results. The analysis of green tax policies in Finland, the USA, and Uzbekistan reveals significant differences in their approaches to carbon taxation, subsidies, and incentives for a green economy. These variations reflect their economic structures, energy dependencies, and policy priorities.

Finland: A Model for Carbon Taxation

Finland was one of the pioneers in implementing a carbon tax back in 1990. Since then, the country has gradually raised the tax rate to promote a reduction in emissions. As of 2023, Finland’s carbon tax stands among the highest in the world, at around €80 per ton of CO₂. This initiative has led to a remarkable 23% decrease in emissions since 1990, all while keeping the economy stable. The revenue generated from this tax is funneled back into renewable energy projects, green technologies, and subsidies for businesses that focus on energy efficiency. Additionally, Finland has strict environmental regulations and offers incentives for electric vehicles (EVs), positioning the country as a leader in sustainable energy transitions.

United States: Fragmented Carbon Pricing Policies

The USA doesn't have a federal carbon tax in place, but several states have taken the initiative to implement their own carbon pricing strategies. For instance, California's Cap-and-Trade Program and the Regional Greenhouse Gas Initiative (RGGI) in the Northeast are great examples of subnational efforts aimed at cutting emissions. Still, national policies are a hot topic and often spark political debate. The Biden administration has focused more on tax credits and subsidies rather than a direct carbon tax, as seen in initiatives like the Inflation Reduction Act of 2022, which set aside \$369 billion for climate-related investments. Research indicates that a federal carbon tax of \$50 per ton, with annual increases, could lead to a 63% reduction in emissions by 2050 while still supporting economic growth. Despite all these efforts, fossil fuel subsidies are still a big deal. In fact, the US government allocated less than 15% of federal energy subsidies to oil, gas, and coal between 2016 and 2022.

Uzbekistan: Transitioning from Fossil Fuel Dependence

Uzbekistan is quite dependent on fossil fuel subsidies, which makes its shift to a greener economy a bit slower compared to Finland or the USA. The government continues to back fossil fuels, with subsidies that promote the use of coal and gas. On a positive note, the country has started to roll out some green taxation measures, like incentives for solar energy projects and new environmental levies on industrial emissions. Back in 2021, Uzbekistan pledged to boost renewable energy production to 25% of its total energy by 2030, offering tax exemptions for solar and wind investments. Unlike Finland and the USA, Uzbekistan doesn’t have a robust carbon

pricing mechanism yet, but international cooperation and investments in renewables are helping to steer its economic path in a more sustainable direction.

Comparison and Key Findings

- **Carbon Tax Implementation:** Finland boasts the most organized carbon taxation system, while the US depends on policies set at the state level. Uzbekistan is just starting to explore green tax incentives.

- **Subsidy Reallocation:** Both the US and Finland utilize subsidies to encourage renewable energy, but Uzbekistan continues to heavily support fossil fuels with its subsidies.

- **Economic Impact:** In Finland, carbon pricing hasn't hindered economic growth. Research indicates that a similar strategy in the US could result in significant emissions reductions without any adverse economic effects. Meanwhile, Uzbekistan is grappling with economic challenges as it tries to reduce its reliance on fossil fuels.

Conclusion. This comparative policy analysis of Finland, the United States, and Uzbekistan highlights the essential role of taxation in shaping a green economy. Each country has taken its own unique approach, influenced by its economic structure, political landscape, and environmental priorities. From this analysis, several important insights come to light.

Finland's carbon tax model is a great example of how a well-thought-out environmental tax can cut emissions without stifling economic growth. The country's €80 per ton carbon tax has led to a notable drop in emissions while also encouraging investments in renewable energy. On the other hand, the United States, which doesn't have a federal carbon tax, depends on state-level policies and tax incentives, like those introduced through the Inflation Reduction Act, which allocated a whopping \$369 billion for clean energy initiatives. Despite all the efforts being made, ongoing fossil fuel subsidies are really holding back the complete transition to a sustainable economy. On the flip side, Uzbekistan is still just starting out with its green tax implementation, and fossil fuel subsidies are still a big part of its energy sector. That said, recent incentives for renewable energy show that there's a move towards more sustainable policies.

The results show that carbon pricing mechanisms, the reallocation of subsidies, and targeted tax incentives are crucial for reaching environmental and economic sustainability. Nations that want to transition to a green economy must find a way to balance taxation with public support and economic competitiveness. As we move forward, global collaboration and policy innovation will be key to making sure that taxation continues to push climate action forward.

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USE OF THE GREEN ECONOMY PLATFORM IN AGRICULTURE AND WATER MANAGEMENT: INNOVATIVE APPROACHES AND PROSPECTS

Mirzaeva Malika Baxadirovna - Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, National Research University¹, Tashkent International University², DSc researcher, candidate of technical sciences

Suleymanov Anvar Askarovich - Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, National Research University, professor

Abstract. This article provides a comprehensive analysis of the possibilities of using the green economy platform in the agricultural and water management sectors. Particular attention is paid to the issues of efficient use of natural resources, ensuring environmental sustainability and optimizing agricultural production processes through the implementation of green economy principles. The possibilities of efficient use of water and land resources, automation of agrotechnical activities and increasing productivity on farms using remote monitoring systems and smart technologies are studied. The economic efficiency and environmental benefits of drip irrigation, sprinkler irrigation and other innovative irrigation technologies are also considered.

Keywords: agriculture, water resources, irrigation, green economy, remote monitoring, smart technologies, environmental sustainability, digital innovation.

Аннотация. В данной статье подробно анализируются возможности использования платформы зеленой экономики в сферах сельского и водного хозяйства. Применяя принципы зеленой экономики, особое внимание

уделяется вопросам эффективного использования природных ресурсов, обеспечения экологической стабильности и оптимизации процессов сельскохозяйственного производства. С помощью систем дистанционного мониторинга и умных технологий в хозяйствах изучаются возможности эффективного использования водных и земельных ресурсов, автоматизации агротехнических мероприятий и повышения производительности. Также рассмотрены экономическая эффективность и экологическая польза капельного орошения, дождевального орошения и других инновационных технологий орошения.

Ключевые слова: сельское хозяйство, водные ресурсы, ирригация, зеленая экономика, дистанционный мониторинг, умные технологии, экологическая устойчивость, цифровые инновации.

Annotatsiya. Mazkur maqolada qishloq va suv xo'jaligi sohalarida yashil iqtisodiyot platformasidan foydalanish imkoniyatlari atroflicha tahlil qilinadi. Yashil iqtisodiyot tamoyillarini tatbiq etish orqali tabiiy resurslardan samarali foydalanish, ekologik barqarorlikni ta'minlash va qishloq xo'jalik mahsulotlarini ishlab chiqarish jarayonlarini optimallashtirish masalalariga alohida e'tibor qaratiladi. Fermer xo'jaliklarida masofaviy monitoring tizimlari va aqlli texnologiyalar yordamida suv va yer resurslaridan unumli foydalanish, agroteknik tadbirlarni avtomatlashtirish va hosildorlikni oshirish imkoniyatlari o'rganiladi. Shuningdek, tomchilatib sug'orish, yomg'irlatib sug'orish hamda boshqa innovatsion sug'orish texnologiyalarining iqtisodiy samaradorligi va ekologik foydalari ko'rib chiqiladi.

Kalit so'zlar: qishloq xo'jaligi, suv resurslari, irrigatsiya, yashil iqtisodiyot, masofaviy monitoring, aqlli texnologiyalar, ekologik barqarorlik, raqamli innovatsiyalar.

Kirish. So'nggi yillarda qishloq xo'jaligida yer va suv munosabatlarini tartibga solish, qishloq xo'jaligi ekin yer maydonlaridan samarali foydalanish, sohaga innovatsion texnologiyalarni joriy qilish, past hosilli paxta va g'alla maydonlarini qisqartirish hisobiga yuqori daromadli, eksportbop mahsulotlar yetishtirish, davlat ehtiyojlari uchun qishloq xo'jaligi mahsulotlari xarid narxini oshirib borish hisobiga qishloq xo'jaligi korxonalarining moliyaviy barqarorligi ta'minlanmoqda. Bugungi kunda, jamiyat va davlat hayotining barcha sohaları shiddat bilan rivojlanayotgani islohotlarni mamlakatimizning jahon sivilizatsiyasi yetakchilari qatoriga kirish yo'lida tez va sifatli rivojlanishini ta'minlaydigan zamonaviy innovatsion g'oyalar, ishlanmalar va texnologiyalarga asoslangan holda amalga oshirishni taqozo etadi. Shu boisdan, mamlakatimizda iqtisodiyotimizning barcha jabxalarida bo'lgani kabi qishloq xo'jaligini ham tubdan isloh qilish, sohaga bozor mexanizmlarini joriy etish, mahsulotlarni qayta ishlash tizimi va qo'shimcha qiymatni shakllantirishni yanada takomillashtirishda sezilarli natijalarga erishilmoqda. Qishloq va suv xo'jaligi har qanday mamlakat iqtisodiy rivojlanishining muhim tarkibiy qismlaridan biri hisoblanadi. Aholi sonining ortishi va global iqlim o'zgarishlari natijasida qishloq xo'jaligi resurslaridan samarali foydalanish muhim ahamiyat kasb etmoqda. O'zbekiston qishloq xo'jaligida yer va suv resurslarini tejash, mahsulot yetishtirish jarayonlarini innovatsion texnologiyalar yordamida optimallashtirish, yashil iqtisodiyot platformasidan keng foydalanish borasida muhim qadamlarni

qo‘ymoqda. Sohani rivojlantirish bo‘yicha uzoq istiqbolli yangi vazifalar belgilab olinmoqda.

Prezident farmonlari va davlat dasturlarida qishloq xo‘jaligini modernizatsiya qilish, hosildorlikni oshirish va suv tejovchi texnologiyalarni keng joriy etish bo‘yicha strategiyalar ishlab chiqilgan. Xususan, O‘zbekiston Respublikasi Prezidentining 2022-yil 28-yanvardagi PF-60-son farmonida 2022–2026 yillarga mo‘ljallangan yangi O‘zbekistonning taraqqiyot strategiyasi doirasida inson qadrini yuksaltirish, fuqarolik jamiyatini rivojlantirish hamda qishloq xo‘jaligida barqaror o‘sinh sur‘atlarini ta‘minlashga qaratilgan chora-tadbirlar belgilangan. Bu islohotlar, asosan, qishloq xo‘jaligi mahsulotlarining raqobatbardoshligini oshirish, ishlab chiqarishni diversifikatsiya qilish va innovatsion texnologiyalarni keng tatbiq etishga qaratilgan [1]. Bugungi kunda davlat va jamiyat hayotining barcha sohalarida shiddat bilan o‘shib borayotganni hisobga olsak, mamlakatimizni jahon iqtisodiy bozori maydonida raqobatbardosh bo‘lishi uchun zamonaviy innovatsion g‘oyalar va ilg‘or texnologiyalarni joriy etish muhim masala hisoblanadi. Shu sababli jahon bozor mexanizmlarini o‘rganib chiqqan holatda mahsulotlari qayta ishlash tizimlarini takomillashtirish va boshqarish platformasidan samarali foydalanish imkoniyatlarini oshirishga qaratilgan bo‘lib, iqtisodiy va ekologik barqarorlikni ta‘minlash borasida muhim ahamiyatga ega [2]. Ushbu maqolada fermer xo‘jaliklarida masofaviy monitoring tizimlari va aqlli texnologiyalar yordamida suv va yer resurslaridan samarali foydalanish yo‘llari tahlil qilinadi.

Mazkur maqolaning asosiy maqsadi – qishloq xo‘jaligi va irrigatsiya tizimlarini rivojlantirishda yashil iqtisodiyot platformasidan foydalanish samaradorligini o‘rganish, masofaviy monitoring tizimlari va aqlli texnologiyalar yordamida qishloq xo‘jaligi resurslarini optimallashtirish imkoniyatlarini aniqlashdir.

Ushbu maqsadga erishish uchun quyidagi vazifalar belgilangan:

- Qishloq xo‘jaligida suv va yer resurslaridan foydalanish samaradorligini oshirishga qaratilgan innovatsion texnologiyalarni tahlil qilish.
- Masofaviy monitoring tizimlarining agroteknik tadbirlarda qo‘llanishi va samaradorligini o‘rganish.
- Aqlli sensorlar va avtomatlashtirilgan boshqaruv tizimlari orqali ekologik barqarorlikni ta‘minlash imkoniyatlarini tahlil qilish.
- Yashil iqtisodiyot konsepsiyasini qishloq xo‘jaligiga integratsiya qilish orqali hosildorlik va mahsulot sifatini oshirish yo‘llarini ishlab chiqish.

Metodologiya. Masofaviy nazorat tizimini qishloq xo‘jalik mahsulotlarini nazorat qilish va ularni boshqaruvchi dasturiy ta‘minotini yaratish jarayonlarda fermer xo‘jaliklarining yopiq yoki ochiq yer maydonidagi uchastkalarini masofaviy nazorat qilish dasturiy mahsulotni yaratishda amaldagi sensor datchiklardan olinayotgan ma‘lumotlarga mosligini aniqlash zarur bo‘ladi. Real vaqtda (on-layn) ham, oflayn rejimda ham ishlash uchun aniq dehqonchilik texnologiyasining muhim elementi turli sensorlar (datchiklar) dan foydalanish hisoblanadi. Qishloq xo‘jaligi mahsulotlarini nazorat qilish uchun mo‘ljallangan datchiklar uzoq vaqtdan beri zamonaviy qishloq xo‘jaligi texnologiyasi standartlariga tegishli bo‘lsa-da, texnologik parametrlarni nazorat qilish uchun sensorlar amalda juda kam qo‘llaniladi. Sensorlar tuproq, o‘simliklar xususiyatlarini elektr va elektromagnit, optik, optoelektrik, radiometrik, mexanik, lazer, akustik, pnevmatik va termal parametrlar bo‘yicha o‘lchash uchun mo‘ljallangan [3].

Mexanik datchiklar tuproq va o'simliklarning penetratsion qarshilik, chidamlilik va turar joy qarshiligi kabi xususiyatlarini o'lchash uchun ishlatiladi. Ko'pgina datchiklar real vaqtda ham, ikki bosqichli ishda ham qo'llanilishi mumkin. Haqiqiy vaqt rejimida ishlaydigan tizimlar uchun mo'ljallangan sensorlar tuproq va o'simliklarning xususiyatlarini o'lchash, diagnostika qilish va tan olish, ularni sharhlash va natijalarni texnologik jarayonlarga bir ish o'tishida amalga oshirish uchun ishlatiladi [4].

Tizimning ikki bosqichli ish rejimida sensorlarning o'lchov ma'lumotlari qayta ishlash, to'plash va echimlarni chiqarish uchun tashqi kompyuterlarga, buyruqlar esa vazifa kartalari (chip kartalari) yordamida ijrochi qurilmalarga uzatiladi.

Mazkur maqoladatta qishloq xo'jaligi va irrigatsiya tizimlarini rivojlantirishda yashil iqtisodiyot platformasidan foydalanish samaradorligini aniqlash, masofaviy monitoring tizimlari hamda aqlli texnologiyalar yordamida qishloq xo'jaligi resurslarini optimallashtirish imkoniyatlarini o'rganish maqsadida quyidagi beshta tahliliy usullari qo'llanilishini birma-bir ko'rib chiqamiz:

Birinchisi bu nazariy tahlil O'zbekiston Respublikasi Prezidentining 2022–2026 yillarga mo'ljallangan Taraqqiyot strategiyasi hamda qishloq xo'jaligi sohasidagi davlat dasturlari o'rganish hamda O'zbekiston Respublikasi Qishloq xo'jaligi vazirligi va Suv xo'jaligi vazirligi tomonidan e'lon qilingan statistik ma'lumotlar, hisobotlar va qonunchilik hujjatlari tahlil qilishdan boshlaymiz.

Albattaki raqobat bardoshlikni oshirish uchun jahon banki va boshqa xalqaro tashkilotlarning O'zbekistonda qishloq xo'jaligida yashil iqtisodiyot tamoyillarini joriy qilishga doir tadqiqot va tavsiyalari o'rganildi. Suv tejovchi texnologiyalarning qishloq xo'jaligidagi ahamiyati va samaradorligi haqidagi ilmiy maqolalar tahlil qilindi.

Ikkinchisi eksperimental tadqiqotlar. Bunda fermer xo'jaliklarining yopiq yoki ochiq yer maydonidagi uchastkalarini masofaviy nazorat qilish dasturiy mahsulotini yaratishda amaldagi sensor datchiklardan olinayotgan ma'lumotlarning mosligi aniqlanib, ularning ishlash samaradorligi baholandi. Aqlli texnologiyalar va datchiklar, infraqizil hamda lazer sensorlari va orqali agrotexnik nazorat bilan o'simlik yoki tuproq tomonidan quyosh nurlarining aks ettirilishi va singdirilishi orqali hosildorlikni prognoz qilish, o'simlik xususiyatlarini real vaqt rejimida monitoring qilish usullari tadqiq etilishiga imkoniyatlari beradi.

Uchinchisi empirik tadqiqotlar usuli bo'lib, 2023 yilda O'zbekiston Respublikasi Qishloq xo'jaligi vazirligi tomonidan 500 dan ortiq fermer xo'jaliklari ishtirokida o'tkazilgan so'rov natijalari tahlil qilindi [5]. Bu esa O'zbekistonning turli hududlarida yashil iqtisodiyot platformalarining qishloq xo'jaligida qo'llanilish darajasi tahlil qilishda yordam beradi. Holbuki yashil iqtisodiyot konsepsiyasining qishloq xo'jaligiga integratsiya qilinishi natijasida hosildorlik va mahsulot sifatiga ta'siri amaliyotda empirik tadqiqot usuli otqali suv resurslarini tejashga qaratilgan hukumat dasturlarining fermer xo'jaliklariga ta'siri baholash mumkin.

Ohirgisi **tatistik usul** olingan natijalar asosida qishloq xo'jaligida innovatsion texnologiyalarni qo'llash samaradorligi baholandi. Tadqiqot davomida to'plangan ma'lumotlar O'zbekiston Davlat statistika qo'mitasi ma'lumotlari bilan solishtirilib, ishonchligi tekshirildi. Olingan natijalar statistik tahlil vositalari yordamida qayta ishlanib, qishloq xo'jaligidagi innovatsion texnologiyalarning samaradorligi tasdiqlandi va tuproq xususiyatlarini o'lchash uchun turli sensorlardan olingan

natijalar statistik tahlil qilindi. Fermer xo‘jaliklarida aqlli texnologiyalar yordamida olingan ma‘lumotlar asosida mahsulot yetishtirish samaradorligi baholandi.

Texnologik jarayonlarni yuqori darajada avtomatlashtirish va mexanizatsiyalash zarur. Boshqaruv tizimini bir nechta boshqaruv jarayonlari va ob‘ektlari munosabati sifatida ko‘rish mumkin. Boshqarishni avtomatlashtirishning umumlashirilgan maqsadi boshqaruv ob‘ektining potentsial imkoniyatlaridan foydalanish samaradorligini oshirishdan iborat. Quyidagi uch turdagi mikroiklimni nazorat qilish tizimlari mavjud [6].

1. Qo‘lda boshqariladigan. Bularga o‘simliklarning o‘shini vizual nazorat qilish, o‘simliklarni qo‘lda sug‘orish, haroratni sozlashni yoqish va o‘chirish, o‘g‘itlash va pestitsidlarni qo‘lda purkash kiradi.

2. Qisman avtomatlashtirilgan. Ushbu birliklar qo‘lda boshqarish va qisman avtomatlashtirishning kombinatsiyasi bo‘lib, ko‘p jihatdan qo‘lda boshqariladigan qurilmalarga o‘xshaydi, lekin sug‘orish va parametrlarni nazorat qilishda mehnatni kamaytiradi.

3. To‘liq avtomatlashtirilgan. Bu issiqxona ichida sodir bo‘ladigan iqlim o‘zgarishlarining aksariyatiga javob berish uchun yaxshi jihozlangan murakkab o‘simliklardir. Bu tizimlar teskari ogohlantirishlarga samarali javob berishga yordam beradigan teskari aloqa printsipli asosida qurilgan. Ushbu birliklar ko‘p sonli parametrlarni tartibga solishga va yuzaga kelishi mumkin bo‘lgan muammolarni omil bilan hal qilishga qodir bo‘lsa-da, ular ancha qimmat.

Natijalar. Issiqxonani avtomatlashtirish turli ko‘rsatkichlarni kuzatish va o‘simliklarning o‘shini uchun mikroiklimni boshqarishni o‘z ichiga oladi. Aqlli issiqxona quyidagilarni boshqarishga qodir: issiqlik - o‘simliklarning haddan tashqari qizishi yoki muzlashining oldini olish; suv – yog‘ingarchilik issiqxonaga tushmasligi sababli o‘simliklarni sug‘orishni nazorat qilish kerak; yorug‘lik - o‘simliklarning qo‘shimcha yoritilishi yoki ularning xiralashishi; havo oqimi va namlik - mahkam yopiq issiqxona kunning vaqtiga qarab namlikning oshishiga va o‘simliklar uchun kislorod va karbonat angidrid etishmasligiga olib keladi; hasharotlar - zararli hasharotlarning issiqxonaga kirib kelishini oldini olishingiz yoki foydali bo‘lganlarning yashashi uchun qulay sharoitlarni ta‘minlashingiz mumkin. O‘simliklarning yaxshi o‘shini uchun bir vaqtning o‘zida ushbu parametrlarning ko‘proq sonini nazorat qilish kerak. Buni quyidagi tizimlar bilan ta‘minlash mumkin: Sug‘orish - ma‘lum jadval bo‘yicha muntazam suv ta‘minoti; ventilyatsiya - fanatlarni yoqish yoki o‘chirish yoki oynalarni ochish va yopish; ozuqaviy moddalarni dozlash – tuproq tahlilidan ozuqa moddalarini sug‘orish tizimi bo‘ylab taqsimlash uchun foydalanish mumkin; zararkunandalarga qarshi kurash - o‘simliklarni avtomatik ximoyalash. Kattaroq avtomatlashtirish va iqlim nazorati uchun ushbu tizimlarning barchasi bir vaqtning o‘zida boshqarilishi va ularning ishini optimallashtirishi mumkin bo‘lgan bitta katta tizimni tashkil qilishi kerak. Belgilangan iqlim parametrlarini saqlash mikroiklim tizimining normal ishlashining ajralmas qismi hisoblanadi. Bu ishda o‘simliklar uchun optimal, idealga yaqin o‘shish sharoitlarini tanlash muhim qismdir, chunki mikroiklim ularga asoslanadi.



1- rasm. Aqlli issiqxonaning imkoniyatlari

Avtomatik boshqaruv tizimining asosiy vazifalari: havo haroratini nazorat qilish; sug'orish tizimini boshqarish; yoritish moslamalarini nazorat qilish (1-rasm). Ilgari issiqxona ishini avtomatlashtirish qimmat va ba'zan imkonsiz protsedura bo'lgan, ammo hozirgi vaqtda bu muammoni hal qilish unchalik qimmat emas va to'liq o'zini oqlaydi va kelajakda bundan ham katta foyda keltiradi. Avtomatlashtirilgan issiqxonada uskunaning ishlashining barcha natijalari, kompyuterda vizual tarzda kuzatilishi mumkin. Web-interfeys nafaqat harorat, namlik va yorug'lik sensorlarining ko'rsatkichlarini kuzatish, balki ushbu ko'rsatkichlarni boshqarish imkonini beradi. Web-kamera orqali issiqxonani kuzatish uchun ham amalga oshirilishi mumkin. Issiqxonani boshqarish tizimi markaziy plata tomonidan boshqariladi va quyidagicha ishlaydi: olingan atrof-muhit ma'lumotlari, havo harorati, namlik yoki yorug'lik sensori markaziy boshqaruvchiga uzatiladi, u joriy qiymatlarni o'rnatilgan qiymatlar bilan taqqoslaydi. . Agar qiymatlardan birortasi mos kelmasa, optimal holatni tiklash uchun aktuator ishga tushiriladi. Keyinchalik NodeMCU Internet orqali monitoring qilish uchun ma'lumotlarni uzoq serverga yuboradi. Havo haroratini nazorat qilish ikki chegara chegarasi bilan belgilanadi: yuqori chegara va pastki chegara. Yuqori chegaradan oshib ketganda, shamollatish teshiklari ochiladi, rele issiqxona muhitini sovutish uchun ishga tushiriladi, pardalar issiqlikni ushlash uchun ishlatilishi mumkin va harorat pastki chegaradan pastga tushganda, rele o'chadi, isitgichni isitish uchun yoqadi. Namlikni nazorat qilish foydalanuvchi tomonidan belgilangan chegara bilan belgilanadi. issiqxonadagi namlik belgilangan chegaradan pastga tushganda, avtomatik sug'orish tizimi yoqiladi va optimal holat tiklanganda o'chadi. Yoritish holati ikkita oldindan o'rnatilgan nuqta bilan nazorat qilinadi: yuqori chegara va pastki chegara. Yuqori chegara yorug'lik qachon yoqilganligini, pastki chegara esa qachon o'chirilganligini aniqlaydi. Ushbu strategiya asosan kunduzgi yorug'likni oshirish yoki foydalanuvchining xohishiga ko'ra tabiiy yorug'likning etishmasligini qoplash uchun ishlatiladi. Quyida natijalar keltirildi:

Fermer xo‘jaliklarining yopiq maydonlarida datchiklar yordamida masofaviy monitoring tizimining joriy etilishi tuproq va suv resurslarini yanada samarali boshqarishga yordam beradi.

Aqlli texnologiyalar asosida ishlab chiqilgan boshqaruv tizimlari orqali tuproq unumdorligini oshirish va hosildorlikni 30% gacha ko‘paytirish mumkin.

Tomchilatib sug‘orish va yomg‘irnatib sug‘orish tizimlarining keng joriy etilishi orqali suv iste‘molini 40% gacha kamaytirish imkonini mavjud.

Sensor datchiklar va mobil ilovalar yordamida fermerlarga real vaqt rejimida ekin maydonlarining holati haqida ma‘lumot yetkazish natijasida agrotexnik tadbirlarni yanada aniq va samarali amalga oshirish imkoniyati yaratildi.

Yashil iqtisodiyot platformasi asosida biologik o‘g‘itlardan foydalanish va raqamli boshqaruv tizimlari yordamida qishloq xo‘jalik mahsulotlarining ekologik tozaligini ta‘minlash mumkinligi isbotlandi.

Xulosa. Qishloq va suv xo‘jaligi sohalarida yashil iqtisodiyot platformasidan foydalanish innovatsion yondashuvlarni talab etadi. Tadqiqot natijalari shuni ko‘rsatdiki, qishloq xo‘jaligining raqamli transformatsiyasining samarasini olishlari mumkin, xususan: - raqamli qishloq xo‘jaligi platformasiga ulangan qishloq xo‘jaligi ishlab chiqaruvchisi, inson ishtirokini minimal darajaga tushirgan holda, avtomatik ravishda oladi [7]: ekinlar haqida ma‘lumot, resurslar, ob-havo sharoiti; o‘simliklarni rivojlanishini hisobga olgan holda to‘liq nazorat qiladi; barcha qishloq xo‘jaligi texnikasini raqamli boshqaruv tizimlariga ulash; - davlat qishloq xo‘jaligi ishlab chiqaruvchilari to‘g‘risidagi ob‘ektiv ma‘lumotlarni oladi, bu esa davlat tomonidan qo‘llab-quvvatlanadigan chora-tadbirlar samarasini oshirish imkonini beradi. Suv resurslarini tejash, tuproq unumdorligini yaxshilash va qishloq xo‘jaligi mahsulotlari sifatini oshirish bo‘yicha zamonaviy innovatsion texnologiyalardan foydalanish istiqbollari muhim ahamiyatga ega. O‘zbekiston qishloq xo‘jaligida yashil iqtisodiyot konsepsiyasini keng joriy qilish orqali barqaror rivojlanish maqsadlariga erishish imkoniyati mavjud.

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USING INTERACTIVE METHODS IN TEACHING ENGLISH TO STUDENTS OF HYDROTECNICAL CONSTRUCTION

Madaliyeva D.B. - Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, National Research University.

Parpiyeva U.X. - Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, National Research University.

Israilova D.A. - Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, National Research University.

Boqiyeva M.O. - Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, National Research University.

Abstract: The teaching of English to students in the field of hydrotechnical construction presents unique challenges and opportunities, given the technical nature of the subject matter. This study explores the efficacy of interactive methods in enhancing language acquisition and technical comprehension among these students. By incorporating techniques such as collaborative learning, role-playing, simulations, and problem-based learning, this research aims to create an engaging educational environment that fosters both linguistic skills and professional competencies.

Keywords: Interactive learning, collaborative learning, hands-on activities, peer teaching, digital tools, and simulation exercises.

Аннотация: Преподавание английского языка студентам в области гидротехнического строительства сопряжено с уникальными проблемами и возможностями, учитывая технический характер предмета. В данном исследовании рассматривается эффективность интерактивных методов в улучшении усвоения языка и понимания технических вопросов этими студентами. Используя такие методы, как совместное обучение, ролевые игры, симуляции и проблемно-ориентированное обучение, это исследование направлено на создание привлекательной образовательной среды, способствующей развитию как лингвистических навыков, так и профессиональных компетенций.

Ключевые слова: интерактивное обучение, совместное обучение, практические занятия, взаимное обучение, цифровые инструменты и имитационные упражнения.

Annotatsiya: Gidrotexnik qurilish bo'yicha talabalarga ingliz tilini o'rgatish, mavzuning texnik xususiyatini hisobga olgan holda noyob qiyinchiliklar va imkoniyatlarga ega. Ushbu tadqiqot talabalar tomonidan tilni o'zlashtirish va texnik masalalarni tushunishni yaxshilashda interaktiv usullarning samaradorligini ko'rib chiqadi. Birgalikda o'rganish, rol o'ynash, simulyatsiya va muammoga yo'naltirilgan ta'lim kabi usullardan foydalangan holda, ushbu tadqiqot lingvistik ko'nikmalar va

kasbiy kompetentsiyalarni rivojlantirishga yordam beradigan jozibali ta'lim muhitini yaratishga qaratilgan.

Kalit so'zlar: interaktiv o'rganish, hamkorlikda o'rganish, amaliy mashg'ulotlar, o'zaro o'rganish, raqamli vositalar va simulyatsiya mashqlari.

Introduction. Hydrotechnical construction is a specialized field of civil engineering that focuses on the design, construction, and maintenance of structures and systems related to water management. These structures are essential for controlling water resources, preventing floods, generating hydroelectric power, and ensuring the sustainable use of water for agriculture, industry, and domestic purposes. From dams and canals to levees and water treatment plants, hydrotechnical construction plays a critical role in shaping the relationship between human societies and water.

Key Areas of Hydrotechnical Construction

1. Dams and Reservoirs

Dams are among the most iconic structures in hydrotechnical construction. They serve multiple purposes, including water storage, flood control, irrigation, and hydroelectric power generation. Reservoirs created by dams provide a reliable water supply for communities and agriculture, especially in regions prone to drought. The construction of dams requires careful planning, geological surveys, and advanced engineering techniques to ensure stability and longevity.

2. Canals and Irrigation Systems

Canals are artificial waterways designed to transport water from one location to another. They are crucial for irrigation, enabling agriculture in arid regions, and for navigation, facilitating the movement of goods and people.

Integrating Interactive Methods in Teaching English for Hydrotechnical Construction Students

Materials and Methods

This section outlines the interactive methods employed in teaching English to students specializing in hydrotechnical construction. The goal is to enhance language skills while providing relevant context related to their field of study.

Materials

- Textbooks and Reference Books: Specialized textbooks on hydrotechnical construction and engineering terminology.
- Multimedia Resources: Videos, presentations, and online platforms that focus on the practical application of English in the field.
- Interactive Tools: Software and applications that promote language learning through games, quizzes, and simulations relevant to hydrotechnical scenarios.

Methods

- Collaborative Learning: Students work in groups on projects related to hydrotechnical construction, facilitating peer interaction and language practice.
- Role Play: Simulating real-life scenarios where students must use English for communication (e.g., project meetings, site visits).
- Problem-Based Learning (PBL): Presenting students with real-world problems in hydrotechnical construction that require research, discussion, and presentation in English.

- **Interactive Workshops:** Engaging sessions where students participate in hands-on activities while practicing their language skills.

Implementation: - **Classroom Activities:** Incorporating games and discussions that require the use of specific vocabulary related to hydrotechnical construction.

- **Field Trips:** Visiting construction sites or engineering firms where students can practice their language skills in a professional environment.

- **Guest Speakers:** Inviting professionals from the field to speak about their experiences, allowing students to engage with industry-specific language.

Assessment: - Evaluation of student progress through:

- Participation in interactive activities.

- Performance during role plays and presentations.

- Written assignments that demonstrate an understanding of both technical content and language use.

Interactive methods enhance engagement, practical application, and retention. Below is a structured strategy to implement these methods effectively:

1. Scenario-Based Role-Plays

- **Objective:** Develop speaking and listening skills in professional contexts.

- **Activities:**

- Simulate project meetings where students discuss dam design challenges.

- Role-play negotiations with international contractors or environmental agencies.

- Practice presenting technical reports to stakeholders in English.

- **Tools:** Scripts with key vocabulary (e.g., "sedimentation control," "hydraulic load"), mock project briefs.

2. Project-Based Learning (PBL)

- **Objective:** Foster teamwork and technical writing/presentation skills.

- **Activities:**

- Design a hypothetical hydrotechnical project (e.g., a flood-resistant levee system) and present it in English.

- Collaborative creation of a bilingual manual for a hydroelectric turbine.

- **Outcome:** Final presentations, written reports, and peer evaluations.

3. Gamification

- **Objective:** Reinforce technical terminology through engagement.

- **Activities:**

- Jeopardy!-Style Quiz: Categories like "Flood Control," "Materials Science," and "Environmental Impact."

- Crossword Puzzles/Flashcards: Focus on terms like "spillway," "aqueduct," or "geotechnical survey."

- **Platforms:** Online tools like Kahoot! or Quizlet for interactive quizzes.

4. Technology Integration

- **Objective:** Merge digital literacy with language practice.

- **Activities:**

- Virtual reality (VR) tours of hydrotechnical sites with English-guided commentary.

- Simulations using software like AutoCAD, requiring students to explain design choices in English.

- Tools: VR headsets, engineering software, language apps (e.g., Duolingo for technical vocabulary).

5. Peer Teaching and Workshops

- Objective: Deepen understanding through teaching.

- Activities:

- Students prepare mini-lessons on topics like "Canal Lining Techniques" or "Erosion Control."

- Peer feedback sessions on technical documents (e.g., feasibility studies).

Conclusion. Using interactive methods in teaching English to students of hydrotechnical construction is highly beneficial for several reasons. First, these methods actively engage students, making the learning process more dynamic and enjoyable. This engagement fosters better retention of vocabulary and concepts related to both English language skills and technical knowledge.

Interactive methods, such as group discussions, role-playing, simulations, and project-based learning, create opportunities for students to practice their language skills in real-world contexts relevant to their field. For instance, working on group projects that simulate real hydrotechnical challenges can enhance not only their English proficiency but also their technical competencies.

Additionally, these methods promote collaboration among students, encouraging them to communicate effectively in English while developing teamwork skills essential in the engineering field. This collaborative learning environment helps build confidence as students practice speaking and writing in English.

Furthermore, interactive techniques can cater to diverse learning styles and needs within the classroom. By incorporating multimedia resources, hands-on activities, and peer-to-peer teaching opportunities, instructors can create a more inclusive environment that accommodates various preferences.

In conclusion, integrating interactive methods into English language instruction for hydrotechnical construction students leads to improved language acquisition and prepares them for professional communication in their field. Such approaches not only enhance technical understanding but also equip students with essential soft skills needed for success in a collaborative work environment. Therefore, it is vital for educators to adopt these strategies to foster both linguistic competence and professional readiness among their students.

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USING INTERACTIVE METHODS IN TEACHING ENGLISH TO STUDENTS OF LAND MANAGEMENT AND LAND CADASTRE

Umarova Feruza Nigmatovna - Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, National Research University

Azizova Makhsuda Ahmadaliyevna - Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, National Research University

Kholmurodova Ezoza Xasanovna - Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, National Research University

Teshaeva Dildora O‘tkir qizi - Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, National Research University

Abstract. The article discusses the technology of using interactive methods in teaching students of the Land Management and Land Cadastre. It explores the integration of empathy, social intelligence, and interactive methodologies to enhance a teacher's ability to engage students meaningfully in language learning. The article outlines active teaching methods and training programs designed to foster empathy, communication skills, and reflection, thereby increasing a teacher's effectiveness in the classroom.

Keywords: interactive methods, engage students, critical thinking, communicative skills, abilities, educational process

Аннотация. В статье рассматривается технология использования интерактивных методов в обучении студентов землеустройству и земельному кадастру. В статье исследуется интеграция эмпатии, социального интеллекта и интерактивных методик для повышения способности преподавателя эффективно вовлекать студентов в изучение языка. В статье описываются активные методы обучения и обучающие программы, направленные на развитие эмпатии, коммуникативных навыков и рефлексии, тем самым повышая эффективность работы учителя в классе.

Ключевые слова: интерактивные методы, вовлечение студентов, критическое мышление, коммуникативные навыки, умственные способности, образовательный процесс.

Annotatsiya: Maqolada talabalarga yer tuzish va yer kadastrini o'qitishda interaktiv usullardan foydalanish texnologiyasi ko'rib chiqiladi. Maqolada

o'qituvchining talabalarni til o'rganishga samarali jalb qilish qobiliyatini oshirish uchun empatiya, ijtimoiy intellekt va interaktiv texnikaning integratsiyasi ko'rib chiqiladi. Maqolada empatiya, muloqot qobiliyatlari va aks ettirishni rivojlantirishga qaratilgan faol o'qitish usullari va o'quv dasturlari tasvirlangan va shu bilan o'qituvchining sinfda samaradorligini oshiradi.

Kalit so'zlar: interaktiv usullar, talabalarni jalb qilish, tanqidiy fikrlash, muloqot qobiliyatlari, aqliy qobiliyatlar, ta'lim jarayoni

Introduction. The period of rapid development in our country is leading to an increasing demand for improving the quality and effectiveness of education in the continuous education system, which ultimately results in the need for training highly qualified specialists who meet global standards. This, in turn, sets the task for the leaders and educators working in every educational system to develop the skills and qualifications necessary to effectively apply information and communication technologies, advanced methods, and techniques in the educational process, while keeping pace with the times. The organization of joint activities between the teacher and the student, transforming the student into an active participant in the educational process, encouraging independent thinking, and developing the skills and qualifications to apply acquired knowledge in practice are key characteristics.

Purposes. To achieve this, the first priority is to define the educational objectives of the lessons based on levels of mastery, ensure guaranteed achievement of the desired educational outcomes within the set time and available conditions, select the most suitable methods and tools, and be able to effectively use them. Additionally, it is necessary to use educational technology regarding the forms and types of learning activities, the teaching model of the lesson, the technological map of the lesson, and its supplements, as well as the elements of educational technology and the use of project-based teaching methods and case technologies. A teacher's development of these competencies is critical not only for personal growth but also for ensuring that students are receiving an education that is responsive to their needs and promotes holistic development. Active teaching methods play a vital role in the development of communicative competence. These methods encourage students to actively participate in the learning process, promote critical thinking, and allow them to practice real-world communication skills. Active learning engages students in solving problems, discussing ideas, and applying knowledge in practical settings, all of which contribute to the development of communication skills. Several key active methods include:

Materials And Methods. To increase the effectiveness of education, it is essential for the individual to be at the center of education and to ensure that young people can acquire knowledge independently. For this, educational institutions need well-prepared teachers who, in addition to mastering their field of knowledge, have adopted modern innovative methods and can effectively use them in organizing educational and developmental activities.

Innovative and pedagogical technologies are not new. These technologies are those that have been continuously developing over centuries. Today, in modern lessons, the following basic requirements need to be considered:

- The methods used in the lesson should be implemented based on an approach tailored to

- the students' personal abilities;
- The lesson should be student-centered, ensuring active interaction between the teacher and the student;
- The lesson should focus on stimulating the students' high level of interest, intellectual activity, and success;
- Various pedagogical methods and techniques should be used depending on the content of the lesson;
- Lessons should be organized in a way that connects theory and practice;
- Effective and purposeful use of time during the lesson, ensuring quality and efficiency, and utilizing appropriate forms of control.

The main essence of interactive teaching is that all students become participants in the learning process. They understand the issues being discussed, the development of events and phenomena, identify problematic situations, search for ways to solve them, and suggest the most optimal solutions. When interactive methods are applied, students develop critical thinking, analyze information sources, solve complex problematic situations, draw reasoned conclusions by analyzing their peers' opinions, participate in debates, engage in communication with others, and acquire skills in understanding each other, working collaboratively, and harmoniously. [4] (pp. 63-71). In educational practice, there are many interactive methods such as "Wheel of Fortune," "Insert," "Contrasting Relations," "Bling Game," and others. However, there has been little work done on using these methods in land planning and cadastral education, particularly in English language lessons. Yet, these methods offer significant potential in developing sector-specific examples and in their application in lessons.

Considering the increasing demand for land in our country year by year, the growing demand for land planners who can ensure effective land use and protection directly ties to the quality and competitiveness of the workforce. Shaping the professional communicative (communication methods) skills of these specialists, along with their knowledge of information technologies and proficiency in English, is an important social issue, and its implementation will determine the future development of the land planning sector. This situation leads to the integration of the results of both sides' activities, contributing to the development of professional communicative skills.

The organization and implementation of land planning lessons using interactive methods varies, and the effective and successful use of these methods in the educational process depends on the pedagogical skills and the breadth of thinking of both the land planning teacher and the English language teacher. When explaining the issues in the field to students in English, we will focus on the characteristics of the "Wheel of Fortune" method. The "Wheel of Fortune" method, like other methods, is one of the technologies commonly used today, and it helps students deeply master a particular topic. The meaning of the term "Wheel of Fortune" is "two-way interaction." Through this method, all students in a group are simultaneously engaged in a specific activity to solve a particular task or problem. It also allows for identifying the abilities of each group member and understanding their viewpoints. The purpose of the method is to help learners analyze, evaluate, and develop independent creative skills based on the information they have mastered on the topic.

The methodology for using the "Wheel of Fortune" method is as follows:

- Based on the number of students in the group, they are divided into subgroups, and the teacher distributes pre-prepared tasks related to homework or the new topic to them in advance;

- During the designated time, students work with their groups. The teacher activates and monitors the students. From the list of actions provided, students are tasked with marking the actions they find correct in the specified boxes with special symbols ("+", "-", "x", "y");

- The teacher rotates the tasks among the groups in a clockwise direction, meaning Group 1 gives their task to Group 2, Group 2 gives their task to Group 3, and so on. Depending on the number of groups, this process is repeated several times until each group's task returns to them.

This is exactly why the technology is called "Wheel of Fortune." After the distributed materials return to their original owners, the teacher reads and announces the correct answers;

- Students check the correct answers to the tasks they completed based on the initial symbols and assign "1" point for each correct answer.

- At the end of the training, the evaluation criteria are read aloud to the students, and each student self-assesses. If there are 10 actions, 9-10 correct answers are rated as "excellent," 7-8 correct answers as "good," and 5-6 correct answers as "satisfactory."

Bling Game: This game is appropriate to use in practical exercises. If there are 15 students in a group, each student is given three bling questions on the topic. The total number of points a student needs to accumulate in one lesson is 3 points, and the questions rotate three times. Each correct answer earns 1 point. Thus, in one lesson, 45 questions are covered.

Results And Discussion. The main goal of the method is to engage students: through goal-oriented and skillfully formulated questions, learners are encouraged to recall and express their knowledge on the given topic. Under the guidance of the teacher, the sequence of questions is followed. Students, together with the teacher, independently think, conclude, summarize, and generalize, thereby understanding and mastering new knowledge. Games and group activities are powerful tools for enhancing communicative competence in both teachers and students. These activities break down barriers, encourage interaction, and create opportunities for feedback and reflection. For example, team-based language games can help students develop their speaking, listening, and problem-solving skills in a fun, low-pressure environment. Additionally, group work fosters a sense of community and allows participants to learn from one another. In-group settings, teachers and students can:

1. Experiment with different communication styles.
2. Gain feedback on their approaches to interaction.
3. Explore new ways of thinking and behaving.

The shared experience of working together also enhances the social bonds between participants, creating a supportive learning atmosphere.

Conclusion. In general, all interactive teaching methods encourage students to think quickly, activate their knowledge, foster curiosity, develop broad and systematic thinking, use time efficiently, accumulate points, self-assess, and increase interest in the subject. The teacher, in turn, provides a large amount of information in a short time and evaluates the student through feedback. The effectiveness of

teaching foreign languages depends not only on the teacher’s linguistic abilities but also on their communicative competence. Using active methods, empathy development, and reflection, teachers can cultivate an environment where communication thrives. As educators continue to improve their communicative competence, they enhance their ability to engage students, promote active learning, and ultimately contribute to the overall success of language education.

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“YASHIL IQTISODIYOT” TEXNOLOGIYALARINI QO‘LLASH ORQALI ATROF-MUHITNI MUHOFAZA QILISH

Kazakxanova Latofatxon Shuxratxanovna - *Geologiya fanlari universiteti magistranti*

Annotatsiya. Bugungi globalashuv va urbanizatsiyalashuv sharoitida mamlakat iqtisodiyotini rivojlantirish bilan bir qatorda rivojlanishning atrof-muhitga salbiy ta’sir doirasini kamaytirishimiz kerak. Buning uchun qayta tiklanuvchan energiyalar foydalanishni joriy qilishimiz kerak. Ushbu ilmiy ishda “yashil iqtisodiyot” texnologiyalarni qo‘llash orqali atmosferaga chiqarilayotgan zararli moddalarni kamaytirish mumkinligi ko‘rib chiqilgan.

Kalit so‘zlar: Energiya samaradorligi, “yashil iqtisodiyot” texnologiyalari, “yashil iqtisod”, quyosh paneli, bioxilma-xillik, ekologiya, zararli moddalar.

Аннотация. В современных условиях глобализации и урбанизации нам необходимо развивать экономику страны, одновременно снижая негативное воздействие развития на окружающую среду. Для этого нам необходимо внедрить использование возобновляемых источников энергии. В данной научной работе рассматривается возможность снижения выбросов вредных веществ в атмосферу за счет использования технологий «зеленой экономики».

Ключевые слова: Энергоэффективность, технологии «зеленой экономики», «зеленая экономика», солнечная панель, биоразнообразие, экология, вредные вещества.

Abstract. In today's conditions of globalization and urbanization, along with the development of the country's economy, we need to reduce the negative impact of development on the environment. For this, we need to introduce the use of renewable energies. This scientific work examines the possibility of reducing harmful substances emitted into the atmosphere through the use of "green economy" technologies.

Keywords: Energy efficiency, "green economy" technologies, "green economy", solar panels, biodiversity, ecology, harmful substances.

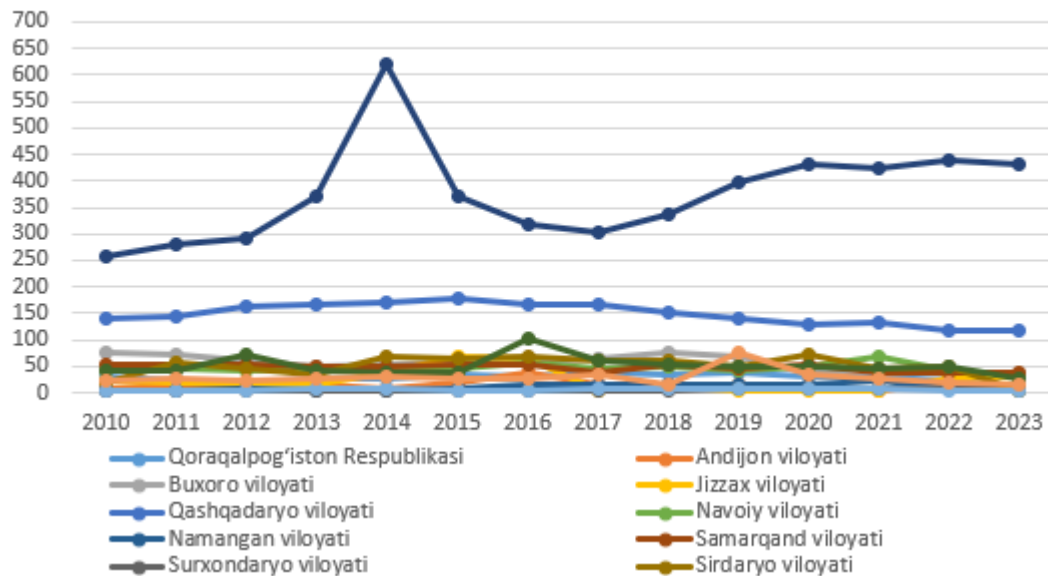
Kirish. Bugungi kunda iqtisodiyot shiddat bilan rivojlanayotgan bir vaqtda ishlab chiqarish ko‘lami hamda, kapitalga bo‘lgan talab ham oshib bormoqda. Bu esa o‘z navbatida mamlakatlarda korxona va firmalar sonining ortishiga sabab bo‘lmoqda. Buning natijasida ularning tashqi muhitga salbiy ta‘siri ham oshmoqda. Bu esa kapital resurslarining kamayishiga olib kelmoqdi. Bugungi kunda har bir mamlakat muqobil energiyaga muhtoj va buning ustida butun jahon olimlari ilmiy izlanishlar olib borishmoqda.

O‘zbekiston Respublikasi Prezidenti Shavkat Mirziyoyev mamlakatimizning yashil iqtisodga o‘tish g‘oyasini ilgari surmoqda. Shuning uchun barcha sohalarda yashil iqtisodiyot texnologiyalarini qo‘llashni joriy etmoqda. O‘z navbatida bu g‘oya O‘zbekistonning Taraqqiyot strategiyasida maqsad qilib olingan. Ko‘zlangan maqsadda mamlakat aholisini uzluksiz elektr energiyasi bilan ta‘minlash va iqtisodiyotning energiya samaradorligini 20% ga oshirish vazifasi nazarda tutilgan.

“Yashil iqtisodiyot” texnologiyalari deyilganda bioxilma-xillikka salbiy ta‘sir ko‘rsatmasdan turib, iqtisodiy jarayonda xizmat ko‘rsatadigan texnologiyalar tushuniladi. Bunga misol qilib quyosh hamda shamoldan energiya oladigan texnologiyalarni aytishimiz mumkin.

Bugungi kunda butun jahon mamlakatlari atmosferaga ko‘plab zaharli gazlar chiqarishmoqda va buning oqibatida atmosfera yemiriloqda. Bunga sabab “yashil iqtisodiyot” texnologiyalaridan foydalanish ko‘rsatkichi kamligidir. Shuningdek O‘zbekistondagi korxonalar ham ko‘plab zaharli gazlar chiqarmoqda. Bu o‘z navbatida ko‘plab salbiy oqibatlarga olib kelmoqda.

Atmosferaga chiqarilgan ifloslantiruvchi moddalar



1-rasm. O‘zbekiston Respublikasi viloyatlari kesimi bo‘yicha atmosferaga chiqarilgan ifloslantiruvchi moddalar hajmi(ming tonna)

Mamlakatimizda atmosferaga chiqarilayotgan zararli gazlar hajmi yuqori. Ushbu ko‘rsatgich bo‘yicha mamlakatimizda yetakchi o‘rinlarda Toshkent hamda Qashqadaryo viloyatlari turibdi (1-rasm). Bunga sabab ushbu viloyatlarda ishlab chiqarish yaxshi rivojlanganligi hamda bu viloyatlarda atmosferaga zarar yetkazuvchi korxonalarning ko‘pligidir.

O‘zbekiston Respublikasi qayta tiklanuvchi manbalardan energiya ishlab chiqarish bo‘yicha yuqori texnik salohiyatga ega bo‘lib, uning 97 foizi quyosh energiyasining ulushiga to‘g‘ri keladi. Jumladan, Respublikadagi quyosh nuridan energiya ishlab chiqarish salohiyati yiliga 525-760 mlrd. kVt.s.ni tashkil etadi. Buning sababi, mamlakatimizda quyoshli kunlar yiliga o‘rtacha 320 kunni va faol quyosh nurlari 3000 soatni tashkil etadi.

Mamlakatimiz iqlim jihatidan yaxshi joylashganini hisobga olgan holda mamlakatimizda quyosh elektr stansiyalarini va quyosh panellarini ko‘paytirishimiz kerak. Quyosh energiyasidan foydalanish ekologik toza, xavfsiz va tejamkordir. Davlat dasturiga kiritilgan aynan shu soha bo‘yicha ko‘plab rejalar bor. Misol uchun 2030-yilga borib mamlakatimizda elektr energiyasini ishlab chiqarish 120 mlrd kVt/soat ko‘rsatkichga erishish kutilmoqda. 2025-yil yakuniga qadar qayta tiklanadigan energiya hajmi umumiy energiya iste‘moli majmuasida 19,7 % gacha oshirish rejalashtirilgan.

1-jadval

O‘zbekiston Respublikasi hududida atmosferaga chiqarilgan ifloslantiruvchi moddalarning yillik hajmi(ming tonna)

O‘zbekiston Respublikasi	
2011	788,2
2012	817,6
2013	855,2
2014	1162,1
2015	975,1
2016	1008,2
2017	853,5
2018	883,7
2019	952,8
2020	924,4
2021	908,7
2022	873,6
2023	763,2

Yuqoridagi jadvaldan ko‘rib turibdiki, “yashil iqtisodiyot” texnologiyalari amalda qo‘llanilgan yillardan boshlab mamlakatimiz hududida atmosferaga chiqarilgan ifloslantiruvchi modddalarning yillik hajmi kamaymoqda.

Nafaqat quyosh energiyasi qayta tiklanadigan energiyalar orasida ekalogik xavfsiz va tejamkordir, bundan tashqari shamol energiyasi ham ekalogik xavfsiz bo‘lib, jahonda keng miqyosda qo‘llanilmoqda. Bu qayta tiklanadigan va ifloslanmaydigan tarzda elektr energiyasini olish yo‘li hisoblanadi.

Shamol energiyasi bo‘yicha dunyoda birinchi o‘rinda AQSh, ikkinchi o‘rinda Germaniya, Xitoy, Hindiston va Ispaniya turadi. Lotin Amerikasida eng yirik ishlab chiqaruvchi Braziliya hisoblanadi. Ispaniyada, shamol energiyasi 12 million uy ekvivalentini ta‘minlaydi va mamlakat talabining 18 foizini tashkil qiladi. Demak, mamlakat energetika kompaniyalari tomonidan taqdim etiladigan yashil energiyaning katta qismi shamol stansiyalaridan olinadi va qayta tiklanadigan energiya hisoblanadi.

Xulosa: Mamlakatimizda ko‘p qavatli inshootlar ko‘payib bormoqda, shundan kelib chiqib aytish mumkinki, mamlakatimizdagi inshootlarning tomlariga quyosh panellarini o‘rnatish va buning natijasida har bir bino o‘z o‘zini elektr energiyasi bilan ta‘minlashi zarur. Mamlakatimizning “yashil iqtisodiyot”ga jalb etuvchi iqtisodiy siyosatni keng ko‘lamda amalga oshirish talab etiladi. Nafaqat quyosh panellarini davlat binolariga qolaversa, fuqarolarning yashash joylariga ham o‘rnatish amaliyotini tadbiq etish hamda mavjud quyosh panelaridan oqilona foydalanishni oshirish kerak. Bu esa o‘z navbatida fuqarolar uchun ko‘plab foyda keltiradi. Quyosh panellarini faqatgina bino va inshootlarga o‘rnatmasdan mamlakatimiz hududidagi

lalmi va hosil olib bo'lmaydigan yerlarga ham o'rnatish va ushbu yo'l orqali mamlakatimizning elektr energiyasiga bo'lgan talabini to'liq qoplash hamda ortganini eksportga yo'naltirish kerak.

Bugungi kunda energiya olishning ko'plab usullari ekalogiyaga salbiy ta'sir o'tkazadi. Neft-gaz va ko'mir kabi ifloslantiruvchi manbalardan foydalanyotgan issiqlik elektr stansiyalar mavjud bo'lib, ular atrof muhitga katta zarar yetkazmoqda. Quyosh va shamol stansiyalari bundan mustasno. Mamlakatimizda tog'li va tog'oldi hududlar ko'p bo'lganligi uchun ushbu hududlarda shamol elektr stansiyalarni qurish va bunda keng ko'lamda foydalanishni jahon amaliyoti talab qilmoqda. Bu yuqorida aytib o'tilganidek, ham ekalogik toza ham hamyonbobdir. Ushbu yo'llardan foydalanishni jahon tajribasiga asoslangan holda amalga oshirish zarur.

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АКТУАЛЬНЫЕ ПРОБЛЕМЫ ВОДНОГО ХОЗЯЙСТВА И МЕЛИОРАЦИИ В УСЛОВИЯХ ГЛОБАЛЬНОГО ИЗМЕНЕНИЯ КЛИМАТА И ДЕФИЦИТА ВОДНЫХ РЕСУРСОВ

Ташева Умида Темуровна - старший преподаватель кафедры «Узбек тили ва адабиёти», Национальный исследовательский университет «Ташкентский институт инженеров ирригации и механизации сельского хозяйства»

Аннотация. Глобальное изменение климата и дефицит водных ресурсов ставят перед мировым сообществом серьёзные вызовы в области водного хозяйства и мелиорации. В статье рассматриваются ключевые проблемы, связанные с изменением режима осадков, повышением температур, засухами и деградацией почв. Анализируются современные методы управления водными ресурсами, включая интеллектуальные системы ирригации, повторное использование воды и адаптивные стратегии мелиорации. Представлены рекомендации по внедрению устойчивых технологий и международному сотрудничеству для минимизации последствий водного дефицита.

Ключевые слова: антропогенная нагрузка, адаптивные стратегии, деградация почв, модернизация.

Abstract. Global climate change and water scarcity pose significant challenges to the global community in the fields of water management and land reclamation. The article discusses key issues related to changes in precipitation patterns, rising temperatures, droughts, and soil degradation. It analyzes modern methods of water resource management, including intelligent irrigation systems, water reuse, and adaptive land reclamation strategies. Recommendations for the

implementation of sustainable technologies and international cooperation to mitigate the consequences of water shortages are also presented.

Keywords: *anthropogenic load, adaptive strategies, soil degradation, modernization.*

Anotatsiya. *Global iqlim o'zgarishi va suv resurslarining kamligi dunyo jamoatchiligiga suv xo'jaligi va melioratsiya sohalarida jiddiy chaqiriqlarni qo'yadi. Maqolada yomg'irlar rejimi, haroratlarning ko'tarilishi, qurg'oqchilik va tuproqning yomonlashishi bilan bog'liq asosiy muammolar ko'rib chiqiladi. Suv resurslarini boshqarishning zamonaviy usullari, jumladan aqlli sug'orish tizimlari, suvni qayta ishlatish va moslashuvchan melioratsiya strategiyalari tahlil qilinadi. Suv tanqisligini kamaytirish uchun barqaror texnologiyalarni joriy etish va xalqaro hamkorlik bo'yicha tavsiyalar taqdim etiladi.*

Kalit so'zlar: *antropogen yuklama, moslashuvchan strategiyalar, tuproqning yomonlashishi, modernizatsiya.*

Введение. Водные ресурсы являются одним из важнейших факторов устойчивого развития сельского хозяйства, энергетики и экосистем. Однако глобальное изменение климата приводит к росту температур, изменению гидрологического режима и учащению экстремальных погодных явлений, таких как засухи и наводнения. Одновременно с этим увеличивается антропогенная нагрузка на водные системы, что усугубляет проблему дефицита воды.

Основные проблемы водного хозяйства и мелиорации в современных условиях и адаптационные стратегии их решения:

- влияние глобального изменения климата на водные ресурсы;
- изменение режима осадков и температуры;

Глобальное потепление способствует перераспределению осадков, что приводит к сокращению запасов пресной воды в засушливых регионах и увеличению риска наводнений в других районах. Исследования показывают, что количество доступной воды на душу населения сокращается, особенно в странах с жарким климатом.

- рост частоты засух и их последствия;

В последние десятилетия наблюдается рост частоты и интенсивности засух, что негативно сказывается на сельском хозяйстве и экосистемах. В засушливых районах происходит опустынивание, деградация почв и снижение урожайности сельскохозяйственных культур.

- современные проблемы водного хозяйства и мелиорации;
- низкая эффективность использования водных ресурсов;

Во многих странах более 60% воды, используемой в сельском хозяйстве, теряется из-за неэффективных систем орошения и утечек. Отсутствие модернизации водной инфраструктуры приводит к значительным потерям водных ресурсов.

- загрязнение водных источников;

Антропогенная деятельность, включая промышленное загрязнение и неправильное использование удобрений, приводит к ухудшению качества воды. Загрязнение водоёмов снижает доступность пресной воды для потребления и орошения.

- деградация ирригационных систем;

Старые и неэффективные системы мелиорации способствуют засолению и заболачиванию почв, что снижает их продуктивность. Недостаток инвестиций в модернизацию ирригационных технологий усугубляет проблему.

Адаптационные стратегии и современные решения:

- инновационные технологии в управлении водными ресурсами;
- умные системы орошения позволяют оптимизировать расход воды;
- использование опреснительной технологии и очистки сточных вод помогает восполнять дефицит водных ресурсов;
- методы капельного и подземного орошения позволяют значительно сократить потери воды;
- повторное использование воды;

Во многих странах внедряются технологии повторного использования очищенных сточных вод для сельского хозяйства и промышленных нужд;

- эко системный подход к управлению водными ресурсами;

Применение ориентированных решений, таких как восстановление водно болотных угодий и создание искусственных водохранилищ, помогает регулировать водный баланс в регионах с дефицитом воды;

Водные ресурсы являются стратегическим фактором экономического развития Республики Узбекистан. В условиях засушливого климата и высокой зависимости от трансграничных рек Амударья и Сырдарья вопрос рационального водопользования приобретает особую значимость. Основными потребителями воды в стране являются сельское хозяйство, промышленность. С учётом изменения климата, роста населения и потребностей экономики необходимо внедрение эффективных технологий управления водными ресурсами.

Основные отрасли потребления воды и их проблемы

Сельское хозяйство потребляет около 90% всех водных ресурсов страны. Однако из-за устаревших методов орошения значительная часть воды теряется. Основные проблемы:

- низкая эффективность традиционных методов полива (например, поверхностное орошение);
- высокие потери воды при транспортировке из-за изношенности ирригационной инфраструктуры;
- вторичное засоление почв вследствие нерационального использования воды;

Пути повышения эффективности водопользования:

- внедрение современных технологий орошения;
- капельное и дождевальное орошение позволяют сократить потребление воды в сельском хозяйстве на 30–50%;
- оптимизация графика поливов и применение цифровых технологий для мониторинга влажности почвы;
- развитие агротехнологий, позволяющих снизить испарение и повысить удержание влаги в почве;
- улучшение системы управления водными ресурсами;
- разработка эффективных механизмов водного регулирования, включая автоматизированные системы мониторинга;

- развитие международного сотрудничества с соседними странами для эффективного распределения трансграничных водных ресурсов;
- усиление государственного контроля за рациональным использованием воды в различных отраслях;

Заключение. Международное сотрудничество и политика в области водных ресурсов:

Для решения глобальных водных проблем требуется межгосударственное сотрудничество, создание международных фондов по управлению водными ресурсами и разработка единых стандартов водопользования.

Глобальное изменение климата и дефицит водных ресурсов требуют срочных мер по адаптации систем водного хозяйства и мелиорации. Внедрение инновационных технологий, рациональное использование воды и международное сотрудничество позволят снизить негативные последствия и обеспечить устойчивое развитие водных экосистем.

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**ИССЛЕДОВАНИЕ НЕЛИНЕЙНОЙ ВЯЗКОУПРУГОЙ
ВИБРОЗАЩИТНОЙ СИСТЕМЫ**

Рахманкулова Барна Октамхановна, к.э.н., доцент, НИУ «ТИИИМСХ»,

Мирзаев Сайибджан Сабитович, к.т.н., доцент, НИУ «ТИИИМСХ»,

Юсупов Мажид - к.ф.-м.н., доцент, Ташкентский государственный аграрный университет

Аннотация.

Рассматривается нелинейная вязкоупругая виброзащитная система, которая состоит из объекта виброзащиты, установленного на платформе, которая, в свою очередь, установлена на другую платформу, нижняя платформа поставлена на вибрирующее основание. Предполагается, что характеристики вязкоупругих элементов системы имеют нелинейную кубическую характеристику. Построена математическая модель в виде систем нелинейных интегро-

дифференциальных уравнений. Реологические свойства подвески учитываются интегральной моделью Больцмана-Вольтерры с ядром релаксации Колтунова-Ржаницына. Для решения задач, предложен численный метод, основанный на использовании квадратурных формул, устраняющий особенности в ядре релаксации. Исследовано влияние реологических свойств подвески и вибрирующего основания на формы колебания по отношению к положению равновесия системы.

Ключевые слова: вязкоупругость, интегральный оператор, ядро релаксации, интегро-дифференциальные уравнения, формула трапеции, квадратурная формула, принцип Больцмана-Вольтерры, виброзащитная система.

Annotatsiya. Boshqa platformaga o'rnatilgan, pastki platforma tebranuvchi asosga o'rnatilgan, platformaga o'rnatilgan tebranish himoyasi ob'ektidan iborat chiziqli bo'lmagan yopishqoq elastik tebranish himoya tizimi ko'rib chiqilgan. Tizimning yopishqoq elastik elementlari xususiyatlari chiziqli bo'lmagan kubik xarakteristikaga ega deb faraz qilingan. Chiziqli bo'lmagan integro-differensial tenglamalar tizimi ko'rinishidagi matematik model yaratilgan. O'sma reologik xususiyatlari Boltsman-Volterra integral modeli bilan Koltunov-Rjanitsinning relaksatsiya yadrosi bilan hisobga olinadi. Qo'yilgan masalani yechish uchun relaksatsiya yadrosidagi xususiyatlarni bartaraf etuvchi kvadratura formulalaridan foydalanishga asoslangan sonli usul taklif etilgan. O'sma va tebranuvchi asoslarning tizimning muvozanat holatiga nisbatan tebranish shakllariga ta'siri o'rganilgan.

Kalit so'zlar: yopishqoq elastiklik, integral operator, relaksatsiya yadrosi, integro-differensial tenglamalar, trapetsiya formulasi, kvadratura formulasi, Boltsman-Volterra prinsipi, vibro himoya tizimi.

Abstract. A nonlinear viscoelastic vibration protection system is considered, which consists of a vibration protection object installed on a platform, which, in turn, is installed on another platform, the lower platform is installed on a vibrating base. It is assumed that the characteristics of viscoelastic elements of the system have a nonlinear cubic characteristic. A mathematical model was built in the form of systems of nonlinear integro-differential equations. The rheological properties of the suspension are taken into account by the Boltzmann-Volterra integral model with the Koltunov-Rzhanitsyn relaxation core. To solve problems, a numerical method is proposed based on the use of quadrature formulas, eliminating features in the relaxation core. Influence of rheological properties of suspension and vibrating base on oscillation forms with respect to system equilibrium position is investigated.

Key words: viscoelasticity, integral operator, relaxation core, integro-differential equations, trapezoid formula, quadrature formula, Boltzmann-Volterra principle, vibration protection system.

Введение. Создание эффективных средств защиты от вибраций и ударов является одной из важнейших проблем современной техники. Применение упругих амортизаторов является одним из наиболее распространенных способов виброзащиты. В настоящее время существует большое число конструктивных разновидностей виброзащитных устройств, предназначенных

как для защиты приборов и оборудования, устанавливаемых на вибрирующих основаниях, так и для защиты оснований и фундаментов от динамических воздействий. Создание амортизирующих устройств, способных защитить объекты от вибраций и ударов и, вместе с тем, обладающих ограниченными размерами, является сложной технической проблемой. В связи с этим первостепенное значение приобретают вопросы теории и расчета адаптивных виброзащитных систем [1].

Математической моделью многих механических систем является система динамических уравнений полиномиальной структуры с периодическими или постоянными параметрами. Такие механические системы широко применяют в динамике виброзащиты приборов и устройств [2].

В [3] рассматриваются вопросы построения математических моделей для механических систем, в которых могут быть сформированы сочленения. Предлагается метод, основанный на выборе систем обобщенных координат относительного движения, соответствующих возможностям появления сочленения звеньев. При этом число степеней свободы системы уменьшается.

В [4] рассмотрены методы и средства виброзащиты технологических и транспортных машин. Особое внимание уделяется уравниванию и балансировке валов и роторов, виброизоляции, вибродемпфированию, динамическому виброгашению и другим методам, приводятся основы акустической динамики.

При решении задач виброзащиты широко применяются линейные системы, хотя линейность функций не достаточно точно аппроксимирует характеристики системы, внося погрешности при анализе [5].

Рассматривается расчетная схема технических объектов, имеющих так называемую подвеску для защиты от внешних воздействий. Такого рода задачи характерны для транспортных средств различного назначения, в частности для защиты тяговых двигателей локомотивов различного назначения. [6].

Применим представленный метод к нелинейной динамической системе с тремя степенями свободы. Рассмотрим виброзащитную систему (рис. 1), состоящую из объекта виброзащиты массой m_1 , установленного на платформы массой m_2 и m_3 нижняя из которых закреплена на вибрирующем основании [7].

Предполагается, что вязкоупругие элементы имеют нелинейную кубическую характеристику $c(1 - R^*)(z + \gamma z^3)$, где c – жесткость подвески; γ – коэффициент нелинейности, зависящий от физических свойств материала подвески; $R^*y(t) = \int_0^t R(t - \tau)y(\tau)d\tau$ – интегральные операторы с ядрами релаксаций $R(t) = \varepsilon t^{\alpha-1}e^{-\beta t}$.

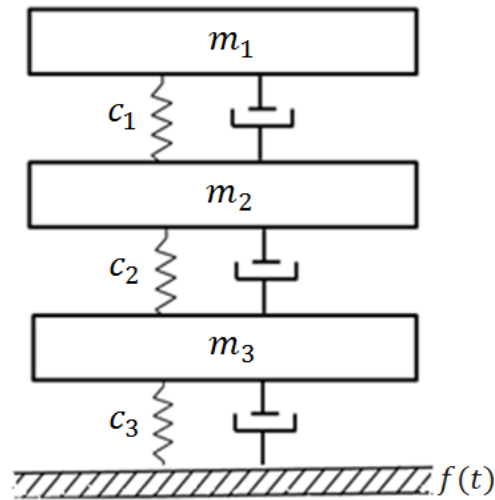


Рис. 1. Схема нелинейной виброзащитной системы.

Математическая модель рассматриваемой системы представима в виде системы нелинейных интегро-дифференциальных уравнений:

$$\begin{cases} m_1 \ddot{x}_1 + c_1(1 - R_1^*)[(x_1 - x_2) + d_1(x_1 - x_2)^3] = 0, \\ m_2 \ddot{x}_2 + c_1(1 - R_1^*)[(x_2 - x_1) + d_1(x_2 - x_1)^3] + c_2(1 - R_2^*)[(x_2 - x_3) + d_2(x_2 - x_3)^3] = 0, \\ m_3 \ddot{x}_3 + c_2(1 - R_2^*)[(x_3 - x_2) + d_2(x_3 - x_2)^3] + c_3(1 - R_3^*)[(x_3 - f) + d_3(x_3 - f)^3] = 0. \end{cases}$$

где

x_1, x_2, x_3 – абсолютные перемещения по отношению к положению равновесия системы.

На основание действуют вибрации $f(t) = asin\omega t$.

Методы решения. Введя безразмерные параметры $\frac{t}{\tau}; \frac{R_i}{\tau}; \frac{\omega}{\tau}; \frac{x_1}{l}; \frac{x_2}{l}; \frac{x_3}{l}; \frac{f}{l}$ и сохраняя при этом прежние обозначения, имеем:

$$\begin{cases} \ddot{x}_1 + k_{11}(1 - R_1^*)[(x_1 - x_2) + \gamma_{11}(x_1 - x_2)^3] = 0, \\ \ddot{x}_2 + k_{12}(1 - R_1^*)[(x_2 - x_1) + \gamma_{12}(x_2 - x_1)^3] + k_{21}(1 - R_2^*)[(x_2 - x_3) + \gamma_{21}(x_2 - x_3)^3] = 0, \\ \ddot{x}_3 + k_{22}(1 - R_2^*)[(x_3 - x_2) + \gamma_{22}(x_3 - x_2)^3] + k_3(1 - R_3^*)[(x_3 - f) + \gamma_3(x_3 - f)^3] = 0. \end{cases} \quad (1)$$

где

$$\begin{aligned} k_{11} &= \frac{c_1 \tau^2}{m_1}; & k_{12} &= \frac{c_1 \tau^2}{m_2}; & k_{21} &= \frac{c_2 \tau^2}{m_2}; & k_{22} &= \frac{c_2 \tau^2}{m_3}; & k_3 &= \frac{c_3 \tau^2}{m_3}; \\ \gamma_{11} &= \frac{d_1 \tau^2 l^2}{m_1}; & \gamma_{12} &= \frac{d_1 \tau^2 l^2}{m_2}; & \gamma_{21} &= \frac{d_2 \tau^2 l^2}{m_2}; & \gamma_{22} &= \frac{d_2 \tau^2 l^2}{m_3}; & \gamma_3 &= \frac{d_3 \tau^2 l^2}{m_3}. \end{aligned}$$

Принимаем, что

$$x_1(0) = \dot{x}_1(0) = x_2(0) = \dot{x}_2(0) = x_3(0) = \dot{x}_3(0) = 0. \quad (2)$$

На систему действует внешнее возмущение: $f(t) = 2,5sin6\pi t$.

Система интегро-дифференциальных уравнений (1) с начальными условиями (2) решается методом, основанным на использовании квадратурной формулы [8-17]. Два раза интегрируя по t систему (1) в интервале $[0; t]$ и полагая $t = t_n = n \cdot \Delta t, n = 0, 1, 2, 3, \dots$ (Δt – шаг по времени) имеем:

$$\left\{ \begin{array}{l} x_{1n} + k_{11} \int_0^{t_n} G_1(t_n - s) \{x_1(s) - x_2(s) + \gamma_{11}[x_1(s) - x_2(s)]^3\} ds = 0, \\ x_{2n} + k_{12} \int_0^{t_n} G_1(t_n - s) \{x_2(s) - x_1(s) + \gamma_{12}[x_2(s) - x_1(s)]^3\} ds + \\ + k_{21} \int_0^{t_n} G_2(t_n - s) \{x_2(s) - x_3(s) + \gamma_{21}[x_2(s) - x_3(s)]^3\} ds = 0, \\ x_{3n} + k_{22} \int_0^{t_n} G_2(t_n - s) \{x_3(s) - x_2(s) + \gamma_{22}[x_3(s) - x_2(s)]^3\} ds + \\ + k_3 \int_0^{t_n} G_3(t_n - s) \{x_3(s) - f(s) + \gamma_3[x_3(s) - f(s)]^3\} ds = 0. \end{array} \right. \quad (3)$$

где

$$G_j(t_n - s) = t_n - s - \int_0^{t_n - s} (t_n - s - \tau) R_j(\tau) d\tau; \quad j = \overline{1,3}.$$

Заменяя интегралы квадратурными формулами трапеции в системе (3), имеем следующие рекуррентные соотношения для определения абсолютных перемещений по отношению к положению равновесия системы:

$$x_{1n} = x_1(t_n); x_{2n} = x_2(t_n); x_{3n} = x_3(t_n).$$

$$\left\{ \begin{array}{l} x_{1n} = k_{11} \sum_{i=0}^{n-1} A_i G_1(t_n - t_i) [x_{2i} - x_{1i} + \gamma_{11}(x_{2i} - x_{1i})^3]; \\ x_{2n} = k_{12} \sum_{i=0}^{n-1} A_i G_1(t_n - t_i) [x_{1i} - x_{2i} + \gamma_{12}(x_{1i} - x_{2i})^3] + \\ + k_{21} \sum_{i=0}^{n-1} A_i G_2(t_n - t_i) [x_{3i} - x_{2i} + \gamma_{21}(x_{3i} - x_{2i})^3]; \\ x_{3n} = k_{22} \sum_{i=0}^{n-1} A_i G_2(t_n - t_i) [x_{2i} - x_{3i} + \gamma_{22}(x_{2i} - x_{3i})^3] + \\ + k_3 \sum_{i=0}^{n-1} A_i G_3(t_n - t_i) [f_i - x_{3i} + \gamma_3(f_i - x_{3i})^3]. \end{array} \right. \quad (4)$$

$$\text{где } A_0 = \frac{\Delta t}{2}; \quad A_j = \Delta t, j = \overline{1, n-1}.$$

Результаты и выводы. Для проведения вычислительного эксперимента составлена компьютерная программа, численные результаты которой представлены в виде графиков. Проведены численные расчеты. При этом использованы следующие исходные данные: $k_{11} = 0,6106$; $k_{12} = 0,5897$; $k_{21} = 1,5641$; $k_{22} = 1,0702$; $k_3 = 3,0351$; $\gamma_{11} = 0,8850$; $\gamma_{12} = 0,5848$; $\gamma_{21} = 2,5641$; $\gamma_{22} =$

$1,7544; \gamma_3 = 0,0409; \alpha_1 = \alpha_2 = \alpha_3 = 0,25; \beta_1 = \beta_2 = \beta_3 = 0,05; \varepsilon_1 = \varepsilon_2 = \varepsilon_3 = 0,02.$

На рис. 2,3,4 соответственно показано абсолютное перемещение платформы с массой m_1 , m_2 и m_3 . Здесь сплошной линией обозначен для упругой ($\varepsilon_i = 0$) и пунктирной линией для вязкоупругой ($\varepsilon_i = 0,02$) подвески. Колебания системы происходят с частотами, кратными частоте внешней силы, воздействующей на основание. Представленный график показывает, что вынужденные колебания в начале установления являются квазипериодическими с частотами, кратными внешней силе. Форма колебаний платформы массой m_2 и m_1 расположенной в верхней части платформы m_3 имеет периодический характер. Учет реологических свойств материала подвески приводит к уменьшению амплитуды вертикальных колебаний платформы. Уменьшение частоты колебаний приводит к сдвигу фаз направо. С течением времени вязкоупругие свойства подвески существенно снизят амплитуды вертикальных колебаний платформы.

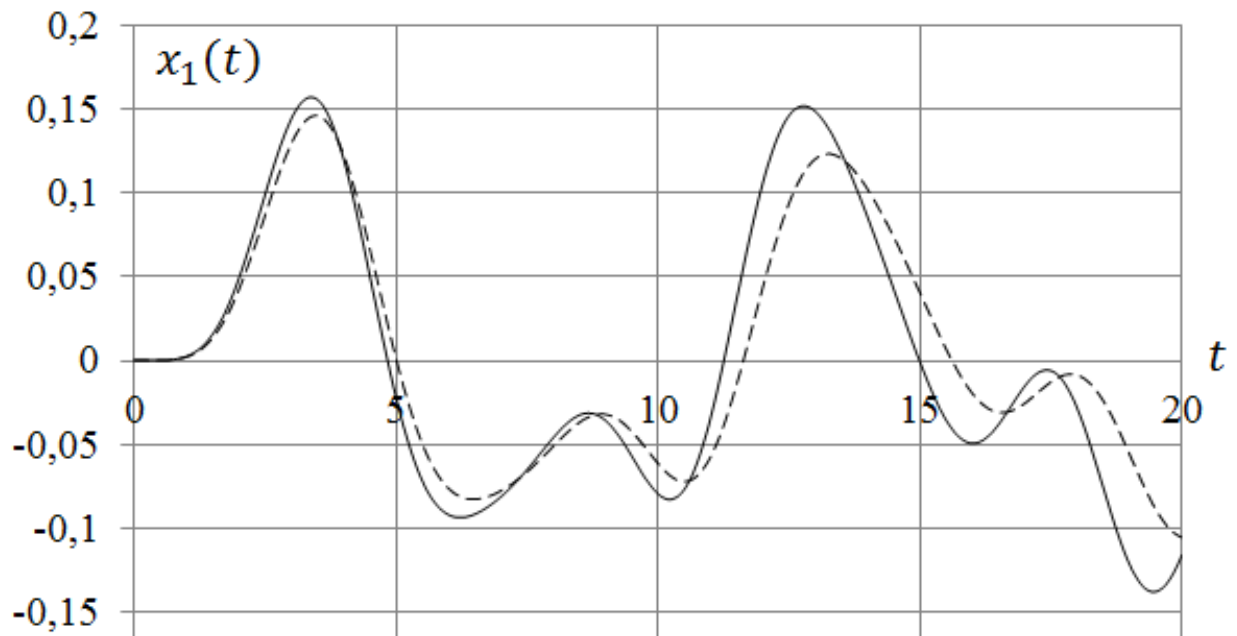


Рис.2. Абсолютное перемещение платформы с массой m_1 .

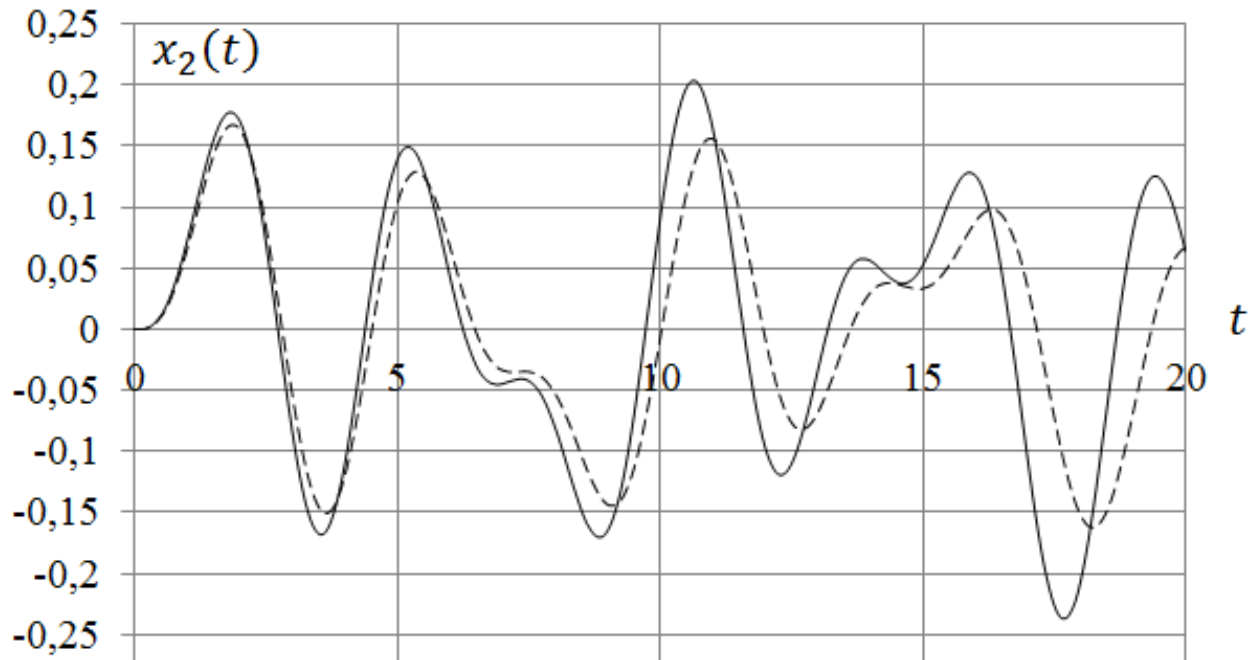


Рис.3. Абсолютное перемещение платформы с массой m_2 .

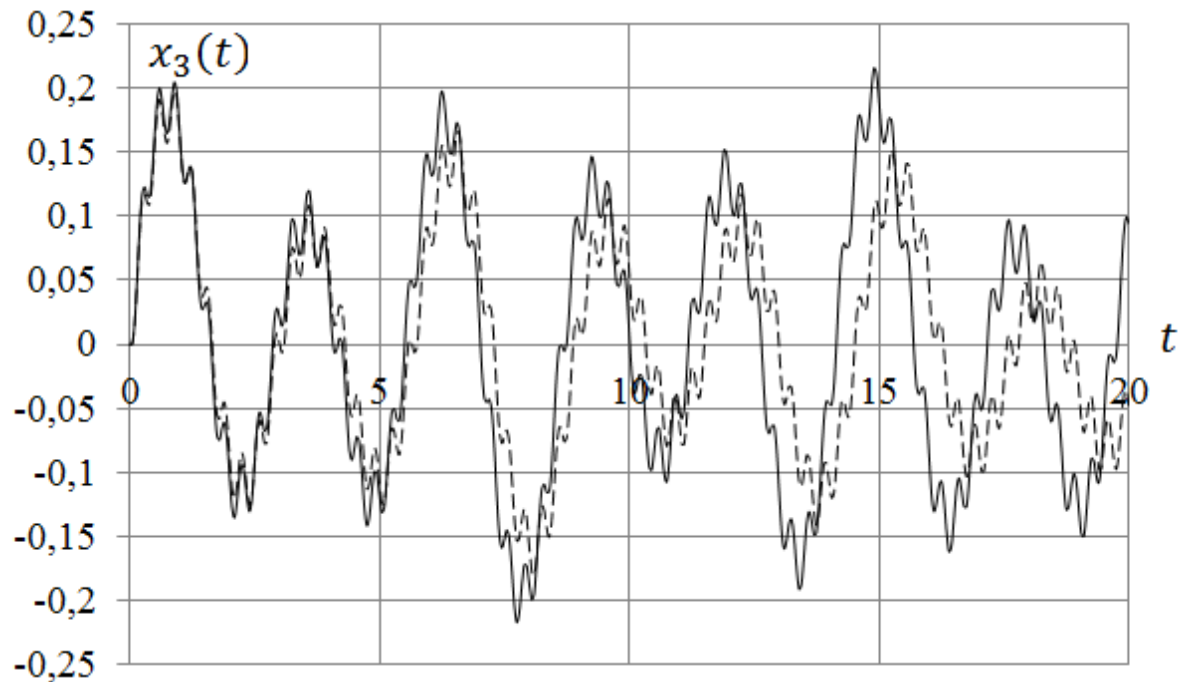


Рис.4. Абсолютное перемещение платформы с массой m_3 .

Исследовано влияние типа вибрации основания на форму колебаний платформы с массой m_1 , m_2 и m_3 . На основание действуют вибрации по законам:

$$f(t) = \begin{cases} 2,5\sin 6\pi t & \text{при } t < 5 \\ 0 & \text{при } t \geq 5 \end{cases}$$

На рис. 5,6,7 показано абсолютное перемещение платформы с массой m_1 , m_2 и m_3 соответственно. Здесь сплошной линией обозначен для упругой ($\varepsilon_i = 0$) и пунктирной линией для вязкоупругой ($\varepsilon_i = 0,02$) подвески.

Из графика видно, что после прекращения вибрации ($t \geq 5$) форма колебаний становится периодической.

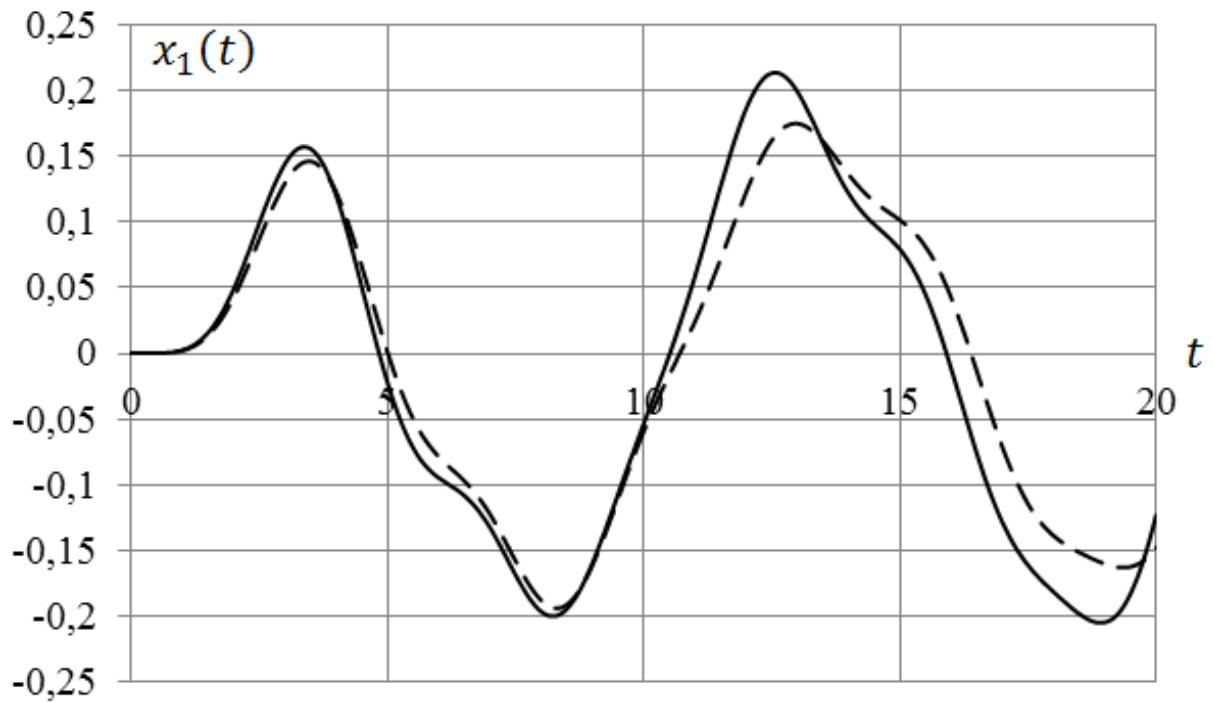


Рис.5. Абсолютное перемещение платформы с массой m_1 .

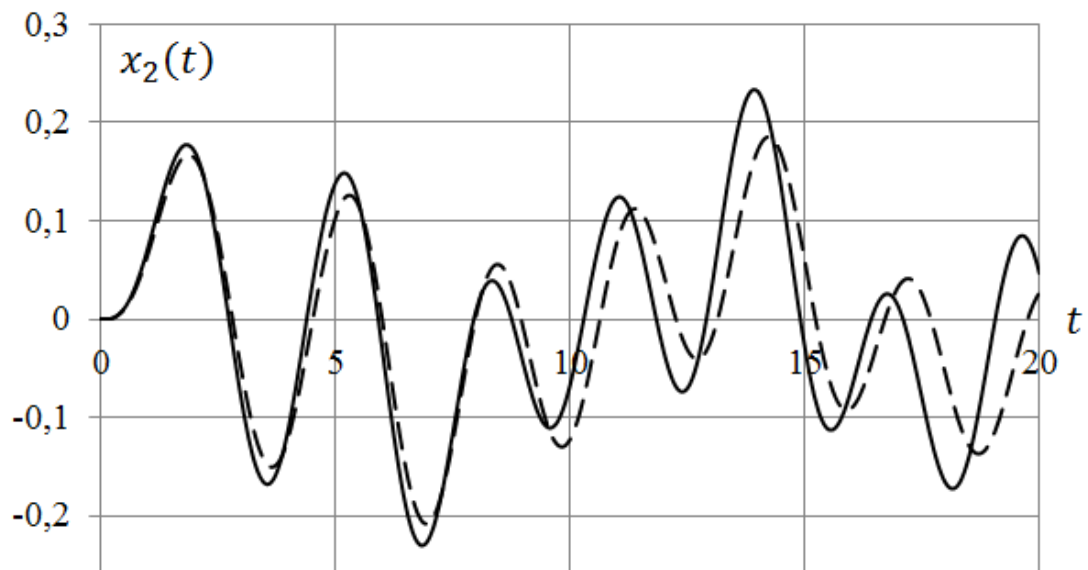


Рис.6. Абсолютное перемещение платформы с массой m_2 .

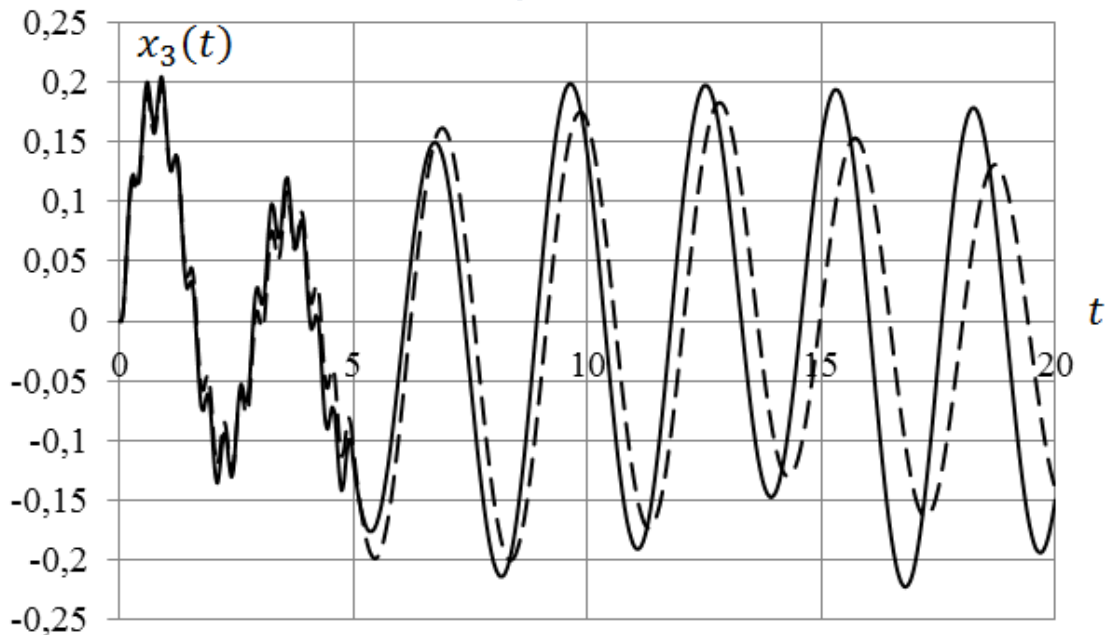


Рис.7. Абсолютное перемещение платформы с массой m_3 .

Заключение. Виброзащита, под которой понимается комплекс мероприятий при проектировании, изготовлении, монтаже и эксплуатации оборудования, направленных на уменьшение его вибрации, является одной из актуальных проблем различных отраслей машиностроения. Решение этой проблемы повысит эффективность работы оборудования.

Построенные адекватные математические модели и разработка эффективного метода их решения позволяет получить достаточно подробные качественные и количественные характеристики изучаемых движений, исследовать установившиеся режимы колебаний для нелинейных вязкоупругих систем, находящихся в условиях периодического внешнего воздействия, а также изучать переходные процессы.

Использование схем, допускающих получение решения в замкнутом виде или с помощью алгоритмов типа (4), представляет собой весьма большой интерес.

Полученные результаты позволяют сделать вывод о целесообразности учета нелинейности и наследственно-деформируемых свойств подвески для уменьшения амплитуды колебаний систем с несколькими степенями свободы при переходных процессах.

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МЕЖПРЕДМЕТНАЯ СВЯЗЬ ПРИ ОБУЧЕНИИ РУССКОМУ ЯЗЫКУ СТУДЕНТОВ ТЕХНИЧЕСКИХ ВУЗОВ

И.В. Алленова - Старший преподаватель кафедры "Узбекский язык и литература", НИУ "Ташкентский институт инженеров ирригации и механизации сельского хозяйства"

Аннотация. В данной статье рассматривается вопрос учета профессиональной направленности при изучении русского языка студентами. Применение языка специальности в процессе обучения является важным фактором мотивации изучения языка. Статья предназначена для преподавателей русского языка в вузе.

Ключевые слова: мотивация, потребность, коммуникативная компетенция, проблемное обучение.

Введение. В неязыковых вузах нашей республики для учащихся русский язык служит базой освоения профилирующих дисциплин и средством профессиональной подготовки учащихся. Этот факт обуславливает необходимость целенаправленной подготовки учащихся к реальному общению на русском языке в условиях современного производства.

Цель. Традиционно сложившаяся к настоящему моменту система обучения русскому языку не отвечает требованиям сегодняшнего дня. Совершенно очевидно, что необходимо существенно изменить эту систему, переориентировать весь учебный процесс на сознательно-коммуникативное обучение русскому языку как неродному. Прежде всего должны быть уточнены конечные цели обучения с учетом профессиональной ориентированности учебного процесса и максимальной приближенности к реальному общению в условиях современного производства. Должны быть существенно изменены содержание обучения, материал, на котором проводится обучение, организационные формы учебного процесса с использованием интерактива.

Результаты. Признание в практике преподавания русского языка как иностранного приоритета коммуникативно-деятельностного подхода к процессу обучения позволило уточнить факторы, влияющие на усиление учебно-познавательной активности учащихся, и тем самым выявить резервы оптимизации процесса обучения. Одним из таких факторов является *мотивация*. Проблема мотивации процесса обучения может быть рассмотрена с позиций психологии, педагогики и методики преподавания. Учитывается, что мотивация является и средством обучения, и объектом воспитания.

Ведущим компонентом мотивации признаются потребности, представляющие собой внутреннее условие, стимул деятельности. Овладение литературой по специальности на иностранном (русском) языке может быть продиктовано следующими потребностями: а) получение информации в конкретной области науки и техники; б) глубокое познание действительности на основе научных данных;

в) коммуникативная *потребность*, которая для специалистов в различных областях знаний означает общение со своими коллегами посредством письменных видов речи, а для овладевающих основами наук – общение с целью приобретения общеизвестных знаний в данной науке и способы их приобретения при чтении учебной литературы.

Для учащихся, у которых еще не сложилась стойкая система потребностей в чтении литературы по специальности (например, у школьников, студентов), важно создавать в ходе обучения ситуации, заставляющие их постоянно обращаться к соответствующей литературе при решении других учебных задач, не связанных с изучением русского языка.

Наличие определенных *потребностей* приводит к возникновению деятельности, при котором нужен *мотив*.

Мотивы учебной деятельности подразделяются: на познавательные, мотивы достижения и социальные. *Познавательные* мотивы характеризуются направленностью учащегося на работу с изучаемым объектом.

Среди познавательных мотивов широко выделяются мотивы (стремление овладеть новыми знаниями), учебно-познавательные (стремление овладеть способами получения знаний) и самообразование (самостоятельное совершенствование способов приобретения знаний).

Для методики преподавания является немаловажным, что *познавательные* мотивы можно сформировать за короткий срок, мотивы самообразования совершенствуются в ходе профессиональной деятельности в течение всей жизни. В формировании познавательных мотивов большую роль играют учебные тексты, чтение специальной литературы, связанной с профессиональной деятельностью учащихся, наличие в текстах научной, страноведческой информации.

Для этого важно показать учащемуся существующие способы получения знаний и организовать способность применения этих способов при выполнении заданий, которые требуют использование приемов анализа, сравнения, сопоставления, обобщения информации, извлеченной из нескольких текстов.

Среди мотивов достижения выделяются мотивы творческого и нетворческого достижения. Стремление добиться творческого успеха в науке, профессии характерны для взрослых учащихся, студентов, специалистов. Нетворческая деятельность характерна для всех категории учащихся: стремление к высокой успеваемости, к своевременной и успешной сдаче экзаменов, зачетов, тщательном выполнении домашних заданий.

К творческим заданиям относятся задания, направленные на выработку умения пользоваться приемами осмысления научного текста: приемы логической обработки текста (деление на смысловые части, определение логических отношений между ними; определение логической последовательности информации, порядка детализации мысли; осмысление связей описываемых явлений, взаимосвязь фактов).

При обучении чтению литературы по специальности такими ориентирами выступают лексические и лексикограмматические смысловые единицы научного текста. В жанрах научной литературы имеют наиболее

распространенные единицы: что называется, чем; чем называется, что; что называется каким; что-это что; что есть что; что-что; под чем понимают.

Преодолевать трудности учения помогают социальные мотивы. Они делятся на *широкие социальные* (например, мотив долга, ответственности, стремление хорошо подготовиться к избранной профессии) и *узкие социальные* (например, стремление занять определенное место в обществе заслужить авторитет, овладеть престижной профессией, самоутвердиться).

Для эффективного протекания учебной деятельности необязательно, чтобы действенными были все перечисленные мотивы. Иногда достаточно одного сильнодействующего мотива.

Важную роль в процессе формирования коммуникативной компетенции приобретают групповые и коллективные формы работы. Например, можно провести подготовку совместного доклада к научной конференции или к деловой игре, используя при этом изученную литературу по определенной специальности.

Умение преподавателя благоприятно воздействовать на эмоции учащихся способствует правильной самооценке учащихся. Важно учитывать методические приемы, которые формируют самооценку учащихся: *сравнение результатов работы* учащихся по различным показателям (скорость чтения извлечения информации и выработка коммуникативных задач, полнота и глубина понимания текста. Прием «аргументированного поощрения» должен владеть каждый преподаватель. Основную значимость среди этих приемов имеют такие, которые отвечают требованиям проблемного обучения на основе групповых коллективных форм работы.

Заключение. Успешное изучение русского языка в вузе требует обязательной интеграции профилирующих дисциплин с изучаемым языком. Что в свою очередь служит мотивацией в его изучении для учащихся и их качественной подготовки к профессиональной деятельности.

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НАЦИОНАЛЬНЫЙ ВОПРОС В УЗБЕКИСТАНЕ В НАЧАЛЕ XX ВЕКА

Хайдаров М. - Док.истор.наук, профессор Университет геологических наук Узбекистана

Миракбаров М. - Учитель Университет геологических наук Узбекистана, almaz721@yandex.ru

Аннотация. В данной статье освещается, что партийное единовластие в Туркестане сопровождалось отсутствием согласия с политическими партиями и узким пониманием толерантности в национальном вопросе. Также, несмотря на то, что большевистская партия теоретически одобряла политику "национального самоуправления" и "равноправия наций," на практике в период советской власти в СССР национальный вопрос решался односторонне, а права различных национальностей, в частности, тюркских народов, проживающих в Средней Азии, ущемлялись. Хотя официальная политика провозглашает "равноправие наций и самостоятельное определение своей судьбы," архивные данные показывают, что на самом деле в жизни было наоборот. Хотя официальная политика провозглашает "равноправие наций и самостоятельное определение своей судьбы," архивные данные показывают, что на самом деле в жизни было наоборот. Несмотря на то, что в декларативных законах содержались соответствующие статьи о том, что каждый народ в советском обществе имеет право жить свободно и независимо, создавать свое независимое государство, те, кто выдвигал такие взгляды, осуждались как "националисты" и подвергались репрессиям. Эти права имеют статус де-юре, и приводятся примеры того, как де-факто указывает на обратное.

Ключевые слова: национальная политика, декларация, право нации, национальные меньшинства, военный комиссар, Турк наркомпрос.

Abstract: This article highlights that party monopoly in Turkestan was accompanied by a lack of agreement with political parties and a narrow understanding of tolerance in the national question. Also, despite the fact that the Bolshevik party theoretically approved the policy of "national self-government" and "equality of nations," in practice, during the Soviet period in the USSR, the national question was resolved unilaterally, and the rights of various nationalities, in particular, the Turkic peoples living in Central Asia, were violated. Although official policy proclaims "the equality of nations and independent determination of their own destiny," archival data shows that in reality, the opposite was true in life. Although official policy proclaims "the equality of nations and independent determination of their own destiny," archival data shows that in reality, the opposite was true in life. Despite the fact that the declarative laws contained relevant articles stating that every nation in Soviet society has the right to live.

Keywords: national policy, declaration, national law, national minorities, military commissar, Turk Commissariat of Education.

Введение. В условиях независимого национально-государственного развития многонационального Узбекистана формирование новых общественных отношений, постепенная интеграция республики в мировое сообщество и включение ее народов в глобальный цивилизационный процесс объективно предопределяют необходимость обобщения и учета всего исторически значимого в накопленном опыте жизнедеятельности как коренных наций и народностей, так и пришлого населения, а также наиболее существенных факторов, стимулировавших или сдерживающих, деформировавших межнациональные отношения.

В любой многонациональной стране, обратившей политическую независимость, среди важнейших проблем, требующих правового, социально-экономического и гуманитарного разрешения, наиболее сложной и неотложной оказывается проблема обеспечения цивилизованного, прежде всего равноправного, развития наций и межнациональных отношений.

В этом смысле довольно много и позитивного, и негативного содержит в себе опыт развития и сосуществования наций Центральной Азии, в частности составлявших население Узбекистана в советский период.

Рассмотрим, как решался национальный вопрос в Узбекистане в 20-30-е годы XX столетия, каковы были тенденции и противоречия.

Октябрьский переворот 1917 года в Петрограде положил начало новому этапу развития. Принятые советским правительством: «Декларация прав народов России», обращение «Ко всем трудящимся мусульманам России и Востока» объявляли право каждого народа на выбор своего пути. Провозглашенные лозунги, память о царском колониальном режиме делали советскую власть привлекательной для населения. Однако, действительность оказалась иной. В Туркестане этот переворот имел своеобразный характер. Он был совершён в основном европейскими рабочими и солдатами. Г. Сафаров, автор книги «Колониальная революция: Опыт Туркестана», отмечает, что с первых дней революции советская власть утвердилась в Туркестане как власть тонкого слоя русских рабочих по линии железной дороги. С октябрьского переворота местным жителям казалась неразумной политика советского строя. Местное население было равнодушным к перевороту, потому что для Туркестана понятия «коммунизм», «социализм» и «интернационализм» пролетариев были чужими (незнакомыми). Здесь среди местных жителей почти не было рабочего класса. Октябрьский переворот был осуществлён европейским населением, на которое опиралось царское правительство.

Негативная политика колонизаторов влияла не только на европейских чиновников и служащих, но и на рабочий класс. Поэтому со времени переворота политику советского строя вели только представители русского населения. Из местного населения в ней могли участвовать только люди, связанные с местной властью. Остальным были чужды и непонятны её идеи[1].

О том, что октябрьские идеи силой насаждались в жизнь местного народа, было широко известно деятелям государства. Например, Т. Рыскулов пишет: «и в Туркестане октябрьская революция ограничилась свержением временного правительства и передачей государства в руки рабочего класса. Находившееся на периферии, вдали от железной дороги многомиллионное местное население осталось в стороне от революционного движения[2]. Доказательством этой

мысли служат и слова С.Ходжанова: «Основная часть трудового населения была в неопределённой позиции к октябрьскому перевороту» [3.С.22].

К тому же политика игнорирования национального вопроса, национально-освободительного движения стала одним из важных факторов общественной жизни края. В первом правительстве Туркестана, сформированным только из представителей левых социалистических партий не было ни одного представителя коренного населения: «Привлечение в настоящее время мусульман в органы высшей краевой революционной власти является неприемлемым указывала декларация III краевого съезда Советов как ввиду полной неопределённости отношения туземного населения к власти солдатских, рабочих и крестьянских депутатов, так и ввиду того, что среди туземного населения нет пролетарских классовых организаций» [4.С.95]. Вопрос об автономии края также не был решён. Это предопределило жесткую конфронтацию сил на политической арене, привело к обострению национального противостояния в крае.

Ситуация усугублялась также невысоким общеобразовательным уровнем действовавшего партийно-политического руководства. Председатель СНК Туркестанского края – Ф.И.Колесов в прошлом был чертежником; председатель ТуркЦИК – И.О.Тоболин – юристом средней квалификации; военный комиссар – Е.Л.Перфильев – кучером. Многих отличали некомпетентность, незнание и неуважение к историческому прошлому края, игнорирование обычаев местного населения, политическая ограниченность и экономическая безграмотность.

В апреле 1918 г. была создана Туркестанская автономная советская социалистическая республика в составе РСФСР. Депутаты съезда по поручениям Ленина и Сталина 30 апреля, приняли «Устав Российской Федерации о Туркестанской Республики. Этот устав объявил о том, что в Туркестане образовалась автономная республика [5.С.29]. В органах власти всех уровней появились представители коренного населения. Подверглась осуждению в сентябре 1919 года линия ряда Туркестанских руководителей (председателя ТуркЦИКа А.Казакова, председателя СНК Туркестана К.Сорокина), препятствовавших привлечению местного населения в Советы, считавших единственной опорой новой власти в крае русских рабочих, недоверчиво относившихся к дехканству. Однако отметим, что решающую роль в управлении краем играли созданные центром региональные органы Турккомиссии и Туркбюро ЦК РКП(б), преобразованные позднее в Среднеазиатские (Средазбюро ЦК ВКП(б) и т.д.).

Однако, когда в октябре 1918 г. на VI чрезвычайном съезде Советов принимается Конституция «Туркестанской республики Российской Социалистической Федерации», опять не учитываются интересы местных народов, текст для обсуждения не переводится на языки местных национальностей, а выходит только на русском языке, хотя уже 23 августа 1918 г. вышел декрет Совнаркома Туркестанской республики «О введении в Республике тюркского и русского языков в качестве государственных».

Вскоре создается специальный комиссариат по делам национальностей, в 1919 г. при нем действовали 10 отделов, в том числе Узбекский, Киргизский, Туркменский, Украинский и т.д.

Стало уделяться внимание и работе среди национальных меньшинств. Так, в составе Народного комиссариата по делам национальностей Туркестанской АССР действовал специальный отдел национальных меньшинств. В его задачи входило урегулирование их взаимоотношений с властями, организация жизни, защита прав и специфических интересов[6.]. В 1919 году был создан Отдел по просвещению национальных меньшинств при Туркнаркомпросе, переименованный позднее в Совет. В его составе действовал ряд Центральных бюро (украинское, армянское, немецкое, таджикское и другие), которые занимались вопросами образования, культурно-просветительной работой. С их участием открывались школы, где преподавание велось на языке родном для каждой нации или народности, дошкольные учреждения, библиотеки, различные кружки, курсы. Не все из этих бюро действовали одинаково эффективно, но ими была проделана достаточно серьезная работа, направленная на удовлетворение лицами различных национальностей своих культурных потребностей. Например, Украинским центральным бюро было открыто 40 школ с преподаванием украинского языка и литературы, 5 рабочих домов и клубов, 2 библиотеки, курсы для подготовки учителей. Туземно-еврейское бюро открыло 10 школ, 4 дошкольных учреждения, 6 рабочих домов, Институт просвещения, 3 библиотеки, 7 вечерних курсов, 3 интерната, 2 школы труда[7.С.97]. Проблемы этих групп населения, их жизнь освещались на страницах газеты «Жизнь национальностей».

Наряду с системой школьного образования закладывались основы советского варианта системы средних специальных и высших учебных заведений. Они строились на строго классовой основе. В результате значительная часть коренного, так называемого «нетрудового» населения оказалась искусственно отчуждена от возможностей получения соответствующего образования. Например, в 1921 г. В Туркестанском Госуниверситете (ныне НУУ) из двухтысячного состава студентов лишь 14 являлись выходцами из коренного населения.

В 1923г. Туркестанский Государственный университет переименовывается в 1-й Средне-Азиатский Государственный Университет, и в связи с этим на университет возлагается обслуживание как союзных республик (Киргизской, Бухарской и Хорезма), так и сопредельных государств, поэтому контингент студентов из местных коренных национальностей увеличивается. В 1923 г. обучалось киргиз 22 чел., узбеков -21, татар- 19[8.].

Состоявшиеся в сентябре 1920 г. V съезд КПТ и IX съезд Советов Туркестана принял решение о привлечение в органы Советской власти возможно большого количества работников из коренного населения и подготовки к переходу в советской работе на местные языки. Доля депутатов местных национальностей в ТуркЦИК увеличилась с 1/3 до 2/3[9.С.235]. В 1920 г. к руководству республикой пришли лица, представляющие народы Туркестана – Т.Рыскулов, А.Рахимбаев, Н.Т.Тюракулов, К.С.Атабаев.

В 20-е годы, после образования УзССР, органы, занимавшиеся национальными меньшинствами, претерпевали неоднократные реорганизации. Так, вопросами образования и культпросвет работой занимался Совет по просвещению национальных меньшинств, а с 1927 года — инспектура при окружных и уездных отделах народного образования. В связи

с районированием 1926 года создавались отдельные районы, сельсоветы по национальному признаку. Только в Самаркандском округе было создано 7 сельсоветов для национальных меньшинств. В 3-х из них насчитывалось в числе жителей от 90 до 100% представителей нацменьшинства, а в 4-х от 60 до 90% [10.]

Тенденции единения тюркских районов, стремление к самоопределению проявилось и в среде Туркестанских коммунистов. Т.Рыскулов, председатель ТуркЦИК, и его сторонники в 1920 г. провели на V краевой конференции Компартии Туркестана решение о создании Компартии Тюркских народов и переименовании Туркестана в Тюркскую советскую республику. Это крайне обеспокоило центр, отклонивший этот проект и стремившийся регламентировать процессы, идущие в регионе. Осуждению была подвергнута в 1921 г. линия Г. Сафарова, члена Туркбюро и Турккомиссии, возрождавшего лозунг национально-культурного самоопределения.

В 1922 года национальный состав аппарата управления ЦИК и СНК Туркестана были следующие:

Узбеки 132 (3,3 %)

Казакы 34 (0,8 %)

Туркмены 4 (0,1 %)

Другие народы Центральной Азии 87 (2,2%) представители европейского населения 3783 (93,6%)[11.С.156].

30 декабря 1922 г. был образован СССР. Уже в процессе его становления проявились признаки недемократического подхода к решению национального вопроса. По союзному договору 1922 г. армия, железные дороги, финансы, крупная промышленность были приданы «центру», а республики были наделены формальным распространением власти СНК, СТО и ВЦИК РСФСР на СНК, ЦИК и экономсоветы республик, т.е. произошла замена фиктивной независимости внутренней автономией республик в области языка, культуры, юстиции, земледелия и т.д. В дальнейшем права республик все более ущемлялись, а «центр» все более концентрировал власть, централизовав всю собственность под видом «общенародной». Осуществление в 1924 году национально-государственного размежевания региона и создание Узбекской ССР фактически проходило с подачи и под контролем центра. Это не было инициативой узбекского национального движения, пытавшегося создать самостоятельное государство. Определенная часть представителей этого движения стояла за идею воссоединения с другими тюркскими народами и с мусульманами других стран, поэтому их не привлекала идея создания национальной республики в составе СССР. Вхождение Узбекистана в Союз, по сути дела, ставило его в зависимость от центра, а организационное оформление в 1925 году Коммунистической партии Узбекистана, как составной и неотъемлемой части Российской компартии большевиков еще более усилило этот процесс. Национальные республики рассматривались руководством бывшего СССР как объекты политики центра, а не как субъекты, способные принимать решения. Это вело к унификации экономической политики, культурной нивелировке, игнорированию специфики регионов.

Общепризнанный принцип демократии право наций на самоопределение, как подчеркивает А.Авторханов, использованный большевиками в

стратегических целях достижения власти был в советский период отброшен. Основной идеей стала перспектива слияния наций в рамках одного государства.

Чтобы разделить Туркестан подготовка длилась 7 лет, в 1924 году перешли к последней стадии. Проблема национально территориального разделение Средней Азии нашло своё отражения и в зарубежной печати. Например, в брошюре «Третий мир» Даниел Пайпс говорит о местных народах которые были подверженные насилию как во время царского так и советского колонизаторства.

По убеждению Пайпса, советская национальная политика, претворение которой в жизнь началось в 1924 г., не освободила нерусские народы от Советской власти, а напротив, ввела их в состав Советского Союза уже в качестве национальных республик. «Создание среднеазиатских республик предвещало новый политический курс: неожиданно по приказу Москвы среднеазиаты превратились в пять отдельных народов» .

Что касается идеологии, развивает свою мысль автор, народы «советских колоний» из угнетенных масс превратились в «младших братьев», поскольку марксизм-ленинизм по своей сути учение антиимпериалистическое, и Советский Союз, теоретически, не может иметь колоний» (с.187). но как это уже неоднократно подтверждалось, заявляет Д.Пайпс, доктрина марксизма-ленинизма оказалась достаточно гибкой, чтобы противостоять любому аргументу делал вывод[12.С.186].

Территория нынешнего Узбекистана в 20-е годы входила в состав самостоятельных республик: ТАССР, Бухарской и Хорезмской. Еще в начале 1920 г. Центром был поставлен вопрос о расчленении Туркестанской АССР и образовании автономных республик по национально-языковому признаку. Однако, «перекройка» административно-территориальной карты Туркестана отодвигалась по целому ряду причин: нарастание недовольства в крае политикой и преобразованиями большевиков; усиливающийся размах движения за независимость; резонанс борьбы вокруг национального вопроса в Закавказье и др.

Инициаторы этой идеи обосновывали необходимость преобразования национальных республик существовавшим неравенством в развитии коренных народов, нарастанием национальных конфликтов. Они провозглашали выходом из этой ситуации разъединение народов региона на основе образования государственности туркмен, киргизов и др. Акцентируя внимание на языковых, национальных различиях, сторонники перекройки территорий и размежевания в меньшей мере учитывали культурные, экономические факторы, наличие общих водных ресурсов, ирригационных систем. В целом, приоритетными считались политические моменты. Национальный вопрос был искусственно раздут и использован как решающий аргумент за радикальные государственно-территориальные преобразования. Принцип «разделяй и властвуй» воплощался в жизнь.

12 мая 1924 г. в центре был рассмотрен вопрос о размежевании Средней Азии и принято решение о его проведении. Началась практическая работа. Комиссии разрабатывали вопросы о территориях и границах будущих

образований, создавался аппарат управления, решались вопросы экономики, бюджета, организации просвещения, здравоохранения и др.

В феврале 1925 г. В Бухаре 1 Всеузбекский съезд советов, принял «Декларацию об образовании Узбекской Советской Социалистической Республики» и сформировал высшие органы власти. Председателем Центрального исполнительного комитета республики был избран дехканин из Ферганской долины, деятель союза «Кошчи» Юлдаш Ахунбабаев. Правительство Узбекистана возглавил Файзулла Ходжаев. Столицей был назван Самарканд. Узбекская ССР была включена в состав бывшего СССР (создан в 1922 г.).

Национально-государственное размежевание было проведено без должного учета исторических особенностей развития края. В итоге карта региона изменилась. Созданные «суверенные союзные» Туркменская и Узбекская республики и автономные области стали, по сути дела, частями унитарного государства[13.С.122].. Все главные вопросы, определяющие судьбу Узбекистана, решались в Центре. Многие годы Узбекистан обеспечивая центр сырьем и предоставив им управление, выполнял все задания.

Казалось бы, коль была создана в 1924г. Узбекская национальная республика, то она должна делать максимально возможное для сплочения и численной концентрации узбекского народа. На деле же псевдо национально-государственное образование использовалось Центром для наращивания многонациональности республики. В Узбекистане, например, в пределах его нынешних границ было отмечено проживание представителей в 1926 г.- 91 национальностей, в 1959 г. -113, а в 1989 г.- более 130.

Миграция в республику осуществлялась в различных формах, но в основном преобладала принудительная и добровольно-стихийная.

Крупной волной принудительного переселения в 20-30-х гг. стала так называемая "кулацкая ссылка", связанная с массовой коллективизацией. Она формировалась из двух основных источников: выселение из Узбекистана коренных жителей по признаку "кулацко-байской" принадлежности и депортации в наш край изгнанных по тем же критериям крестьян из других регионов Союза.

Со второй половины 30-х гг. начала предприниматься депортация целых народов. Первоначально ей подверглись немцы Поволжья, поляки с Украины, корейцы Дальневосточного края. В частности, только за октябрь-ноябрь 1937 г. в Узбекистан прибыло 74500 корейцев[14.С.62]. Затем стали выселяться народы Северного Кавказа, Грузии и Крыма на которых огульно было навешано обвинение в "пособничестве гитлеровским оккупантам". Так, постановлением Государственного Комитета Обороны в 1944 г. в республику лишь из Крыма было выслано 151424 крымских татар. Из Грузии в Узбекистан прибыло около 110 тыс. турок-месхетинцев. Десятки тысяч переселенцев составляли представители других народностей.

Стихийная миграция в республику приобрела широкий размах еще в начале 20-х голодных лет. Она шла главным образом из России, Казахстана и Украины.

Заметным фактором роста миграционного притока в Узбекистан стала целенаправленная переброска союзной администрацией "трудовых ресурсов".

Это отчетливо проявилось в связи с форсированной индустриализацией. С середины 20-х из центральных регионов на постоянное местожительство в Узбекистан стали систематически направляться крупные группы рабочих, специалистов, призванных содействовать развёртыванию индустриального строительства и формированию республиканского отряда рабочего класса. Только в 1933–1938 гг. в край прибыло 650 тыс. человек.

В последующие советские десятилетия курс на умножение многонациональности остался неизменным.

Бывший Советский Союз представлял собой новый вид государственности идеократического, вненационального, тоталитарного типа, особый вид империи. В подходе к национальному вопросу ощущался «двойной стандарт»: один подход к народам стремившимся освободиться от ига колониализма в Азии, Африке, Латинской Америке и другой к народам, стремившимся сбросить ярмо системы внутри Союза.

С начала 20-х годов Сталин развернул борьбу против так называемого «буржуазного национализма», отодвинув на задний план борьбу с великодержавным шовинизмом. Одним из первых пострадал сотрудник Наркомнаца, татарский коммунист Султан Галиев. А.Икрамов и Т.Рыскулов выступили на совещании летом 1923г., где затрагивался этот вопрос. А.Икрамов отметил нетерпимую обстановку внутри партии, атмосферу страха, указал, что в Туркестане во многом сохранилась система колониального режима. В конце 30-х годов эти выступления стали одним из элементов обвинительных заключений, приведших к уничтожению Т.Рыскулова и А.Икрамова.

В ходе массовых репрессий обвинения в национализме становились смертным приговором не только для политических деятелей, но и для деятелей культуры, поэтов, писателей. Файзулла Ходжаев, Акмаль Икрамов, Фитрат, Чулпон, Усмон Насыр, Абдулла Кадыри и многие другие вошли в этот трагический ряд погибших от произвола. В доносе на писателя Абдуллу Кадыри сообщалось: «...является убежденным националистом. Имел тесную связь с контрреволюционно настроенным духовенством. В своих произведениях он явно проводил контрреволюционную линию, в них он клеветал на современный узбекский народ, высмеивал русских, а также выступал против колхозного строя» [15.].

В годы сталинского правления «тройками» НКВД Узбекистана были арестованы более 41 тыс. человек, из них более 37 тыс. судимы, 6920 человек расстреляны. Вообще же за период 1939–1953г. было арестовано 61799 человек, из них 56112 отбывали различные сроки 7100 были расстреляны. Позднее большинство из них были реабилитированы, но в значительной части посмертно.

Таким образом, если в 20-е годы национальная жизнь шла довольно активно, начинала осуществляться политика коренизации аппарата, расширилось издание литературы на национальных языках, работали школы, общества, изучались приезжающими в республики языки коренных народов, то в 30-е годы всё это резко идет на убыль. Закон 1932 года, посвященный общественным организациям, жестко ограничил всю общественную жизнь, в том числе и национальную. А в период массовых репрессий она почти

полностью прекратилась. В 30-40-х гг. ликвидируются практически все формы автономии национальных меньшинств, усиливается нивелирующее воздействие господствующей идеологии, развиваются тенденции к насильственному стиранию этнических особенностей. В результате национальная проблематика была вытеснена на периферию массового сознания, но исключить ее полностью не удалось.

Но прошедшие политические процессы требовали резкого нового направления в политике. Потому, что «военные» приёмы, насилия разозлили народы и настроили их на борьбу против Советского строя. В дальнейшем недовольство узбекского народа и интеллигенции привели к различным мнениям.

Зарубежный исследователь У.Фирман в 20-годы о местной политике писал следующее: «После революции были предприняты попытки устранить неравенство национальных языков, наблюдавшееся при царизме. Он утверждает, что эти попытки якобы потерпели неудачу по следующим причинам: отсутствие необходимых средств и опыта в осуществлении новой властью «социальных мероприятий, а также то, что стремление к национальному равенству» будто бы разделяли не все русские, у многих якобы все еще сохранялся колониальный взгляд на «туземные» народы... «Коренизация» проводилась в то время, когда первый пятилетний план поставил перед всеми отраслями экономики большие задачи, что, сдерживало процесс «коренизации». Для экономики требовались знающие, политически надежные специалисты. Третий этап языкового планирования автор определяет как отход от политики «коренизации» и максимального использования местных языков в системе образования, партийно-административной сфере и экономики. Этот отход продолжался, по утверждению автора, на протяжении всех предвоенных лет. «Вся стратегия ускоренной подготовки политически благонадежных и опытных местных кадров потерпела провал» [16.С.130]..

В начале 30-х годов практическая деятельность исчерпала своё содержание и о ней говорилось на партийных, отчетах, «Несмотря на 13-летие октябрьской победы и широкий размах социальной перестройки, политика коренизации шла подобно черепахе» [17.].

Выдвинутая в 30-е годы теория слияния наций давала установку всей национальной политике. И если раньше в республиках национальные языки пользовались равными с русским языком правами, то теперь на первое место была поставлена пропаганда и изучение русского языка. Постановление 1938 года об обязательном обучении русскому языку в национальных республиках создало ему исключительные условия. Для него отводили учебные часы, в значительной степени, за счет национальных языков. Национальный язык, как один из основных критериев национального самосознания, вытеснялся на второй план. Негативное влияние на развитие узбекского языка оказала и смена алфавитов (в 1929 г. замена узбекской письменности на основе арабской графики латиницей, а в 1940 г. — кириллицей).

Апофеозом «национальной политики», унижения человека и целых народов, стали репрессии и депортации. За 30-40-е гг. были насильственно перемещены, без права возвращения на родину, лишены гражданских прав,

имущества, унижены поляки, немцы, корейцы, калмыки, карачаевцы, чеченцы, ингуши, турки-месхетинцы, балкарцы, крымские татары и т.д. В период «хрущевской оттепели», в 50-е годы они были освобождены из-под административного надзора, но не получили конфискованного имущества и права возвращения на Родину.

Итак, после победы Октябрьского переворота вся власть в России перешла в руки диктатуры пролетариата. Общество было разделено на различные группы. После Октябрьского переворота лозунг "Вся власть Советам!" стал пустой болтовней. Большевистская партия вытеснила этот лозунг из жизни. Установление диктатуры пролетариата продемонстрировало необходимость решения этих конфликтов силой. [18.С.83]. В Туркестане среди местного населения не сформировался пролетариат, способный прочно удержать диктатуру в своих руках. Рабочие европейской национальности, отравленные имперской политикой предыдущего правительства, не могли претендовать на политическую элиту. По мнению большевиков, при построении советской власти в Туркестане необходимо было опираться на российский пролетариат и его основную силу - Российскую коммунистическую партию.

В советское время в официальной политике компартии особое внимание уделялось национальному вопросу. От произведений В.И.Ленина и И.В.Сталина до официальных документов Коммунистической партии и докладов партийных руководителей особое внимание уделялось национальному вопросу.

Большевики и левые эсеры, отрицая законное право мусульманского населения на управление краем, исключили возможность согласованного решения вопроса о власти и тем самым сделали неизбежным будущий переход национальных и демократических сил в оппозицию в политической жизни Туркестана. Коренное население Центральной Азии (Туркестана - автор) было отстранено от суверенного правления в течение последних 130 лет. [19.С.207].

В настоящее время в Узбекистане проживают свыше 130 национальностей. И проблема межнациональных отношений актуальна и для независимого Узбекистана. Правительство Узбекистана делает все для того, чтобы всем народам, проживающим в Узбекистане было спокойно и комфортно, жить и трудиться в республике. Эти принципы учитываются как во внутренней так и внешней политике независимого государства. В Узбекистане в настоящее время функционируют более 60 национально- культурных центров. Главной задачей которых являются сохранение языка, традиций, обычаев всех народов, проживающих в Узбекистане.

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РОЛЬ БАНКОВСКОГО СЕКТОРА В ПОДДЕРЖКЕ УСТОЙЧИВОГО РАЗВИТИЯ СЕЛЬСКОГО И ВОДНОГО ХОЗЯЙСТВА УЗБЕКИСТАНА

Киличева Феруза Бешимовна - кандидат педагогических наук, доцент, заведующий кафедрой узбекского языка и литературы, Национальный исследовательский университет “Ташкентский институт инженеров ирригации и механизации сельского хозяйства”, Узбекистан

Мирзаев Азизжон Шерзод угли - студент 2-го курса 207 группы направления образования “бухгалтерский учет и аудит”

Аннотация. В данной статье проводится оценка влияния многочисленных факторов на развитие банковского сектора в поддержке устойчивого развития сельского и водного хозяйства Узбекистана. Вместе с тем, в статье рассмотрены основные факторы, которые влияют на

степень развития банковской деятельности в Узбекистане и ухудшение финансового состояния банков второго уровня, на основании этого проведены соответствующие выводы об уровне зависимости деятельности банка от этих факторов, а также предложены соответствующие мероприятия по повышению эффективности деятельности банка.

Ключевые слова: банковская деятельность, фактор, эффективность, стратегия, неопределенность, риск, резервы, чистые классифицированные кредиты.

Annotatsiya. Ushbu maqolada O'zbekistonda qishloq va suv xo'jaligining barqaror rivojlanishini qo'llab-quvvatlashda bank sektori rivojlanishiga ko'plab omillarning ta'siri baholanadi. Shu bilan birga, maqolada O'zbekistonda bank faoliyatining rivojlanish darajasiga va ikkinchi darajali banklarning moliyaviy ahvoli yomonlashishiga ta'sir etuvchi asosiy omillar ko'rib chiqilib, shundan kelib chiqib, bank faoliyatining ushbu omillarga bog'liqlik darajasi to'g'risida tegishli xulosalar chiqariladi va bank faoliyati samaradorligini oshirish bo'yicha tegishli chora-tadbirlar taklif etiladi.

Kalit so'zlar: bank faoliyati, omil, samaradorlik, strategiya, noaniqlik, risk, zaxiralar, sof tasniflangan kreditlar.

Abstract. This article assesses the impact of numerous factors on the development of the banking sector in supporting sustainable development of agriculture and water management in Uzbekistan. At the same time, the article examines the main factors that affect the degree of development of banking activities in Uzbekistan and the deterioration of the financial condition of second-tier banks, based on this, appropriate conclusions are drawn about the level of dependence of the bank's activities on these factors, and appropriate measures are proposed to improve the efficiency of the bank.

Key words: banking, factor, efficiency, strategy, uncertainty, risk, reserves, net classified loans.

Введение. На развитие сельского и водного хозяйства в значительной степени влияют экономические условия, включая доступность кредитов, стоимость сельскохозяйственного оборудования и средств производства. Уровень государственной поддержки, программы субсидирования и правовое регулирование — все это оказывает влияние на мотивацию фермеров и рентабельность сельскохозяйственных операций. В этой связи трудно переоценить роль банковского сектора в поддержке устойчивого развития сельского и водного хозяйства Узбекистана.

Деятельность банков состоит из совокупности процессов, которые напрямую зависят от многочисленных факторов макросреды, мезосреды (отрасли) и т.д. Для классификации факторы группируются по различным категориям: в зависимости от места возникновения бывают внешние и внутренние факторы; в зависимости от значимости результата имеют место основные и вспомогательные; по структуре подразделяются на простые и сложные; по времени действия группируются на постоянные и временные. Факторы, связаны со средой, в которой работает банк - это внешние факторы.

Факторы, которые непосредственно связаны с деятельностью банка, и самостоятельно определяют его банковскую политику называются внутренними. При осуществлении процесса прогнозирования необходимо всесторонне оценить влияние этих факторов, выявить предпосылки, которые препятствуют или стимулируют развитие банковской деятельности, выявить основные меры для оптимизации банковской деятельности и обеспечению более эффективной работы банка. Не принимая во внимание влияния этих факторов невозможно формировать стратегии развития банка и банковской системы в целом.

Меры по совершенствованию банковской стратегии. В современных условиях можно будет повысить эффективность банковской деятельности путем определения влияния факторов на развитие банковской деятельности в Узбекистане.

Методология. Банковская деятельность включает в себя макросреду, мезосреду (отрасль) и т.д. и представляет собой набор процессов, зависящих от факторов. Для классификации факторы сгруппированы по следующим признакам: в зависимости от места возникновения делятся на внутренние и внешние факторы; в зависимости от важности результата - на первичные и вторичные; в зависимости от структуры факторы делятся на простые и сложные; по продолжительности различают постоянные и временные.

Внешние факторы связаны со средой, в которой работает банк. Факторы, непосредственно связанные с функционированием банка, который самостоятельно определяет свою банковскую стратегию, являются внутренними.

Изучив классификацию факторов, влияющих на развитие банковской деятельности, А.В. Котов отметил, что можно выделить две группы факторов: макроуровень (природные, политико-правовые, социокультурные, технологические, экономические) и мезоуровень (отраслевое воздействие) [4].

На развитие банковской деятельности в наибольшей степени влияют экономические факторы.

Помимо общей ситуации в национальной экономике, существуют факторы макроэкономического характера, такие как налоговая система и уровень развития различных типов рынков.

Для того чтобы оценить влияние развития различных рынков на банковскую деятельность, необходимо проанализировать общее состояние финансового рынка и динамику его показателей, а именно денежно-кредитную политику страны, уровень развития финансового сектора.

Исходя из динамики показателей банковской системы, валютного рынка, фондового рынка, стабильности национальной валюты, можно определить, насколько успешным будет развитие банковского сектора в будущем.

Несмотря на то, что макроэкономические факторы оказывают значительное влияние, отраслевые факторы также могут оказывать влияние на банковскую деятельность. Существует три группы факторов мезоуровня, которые влияют на уровень развития банковского сектора:

1) уровень развития и основные критерии банковской деятельности, которые формируют основу банковской системы;

2) правовое обеспечение, определяющее основные «правила игры» как для банков, так и для обслуживающих их предприятий;

3) бизнес-среда, непосредственно влияющая на уровень институционального развития банковской деятельности.

Такие факторы, как уровень социально-политической ситуации, общая экономическая ситуация, развитие финансовых рынков, банковской системы, являются внешними факторами. На общую экономическую ситуацию влияют производственный потенциал экономики, конкурентоспособность товаров и услуг, сальдо счетов движения капитала, уровень развития финансовых рынков.

Динамичное развитие финансового рынка можно охарактеризовать конкуренцией на финансовом рынке и рассмотреть следующие показатели, такие как процентные ставки по банковским депозитам, которые напрямую зависят от доходности денежного и валютного рынков; обменный курс национальной валюты, который формируется под влиянием объема спроса на иностранную валюту, валютные операции; выдача кредитов, паритет покупательной способности национальной валюты, уровень инфляции и инфляционные ожидания, политика правительства, денежная эмиссия. В принципе, уровень ликвидности банковской системы, прибыльность банковских операций, система страхования вкладов могут быть охарактеризованы уровнем развития банковского сектора. В то же время, следует отметить, что внутренние факторы включают в себя набор индивидуальных критериев банка, специфику стратегии банка и его внутренней политики. Из этих факторов основным фактором, оказывающим существенное влияние на финансовую устойчивость банка оказывают индивидуальные особенности банка.

Такие факторы, как характер и сфера деятельности, структура, степень независимости, вид деятельности, являются факторами, которые оказывают непосредственное влияние на конечные результаты деятельности банка. Портфель активов более диверсифицирован благодаря своему высокому качеству и масштабу деятельности банка.

Специализация банка, приоритетность каждой операции определяют состав и структуру активов, их качество и, в конечном счете, прибыль.

Деятельность банков подвержена риску изменения процентной ставки, если банки работают на межбанковском рынке с высоколиквидными ценными бумагами и кредитами, процентные ставки по которым фиксированы. Если банки второго уровня предоставляют крупные кредиты без тщательного анализа кредитоспособности заемщика, они подвергаются кредитному риску.

Банки могут нести риск потери ликвидности, за исключением мобильности и срочности активов и пассивов, которые определяют возможность конвертации краткосрочных ресурсов в долгосрочные инвестиции. Совместные банковские риски могут привести к риску неплатежеспособности (риск потери капитала и дохода). Особенности организации банковской деятельности в Узбекистане регулируются Законом Республики Узбекистан «О банках и банковской деятельности», который регулирует отношения в области банковской деятельности [1]. Банки имеют

право осуществлять банковскую деятельность только при наличии положений, внутренних правил, определяющих общие условия операций.

В целях обеспечения финансовой стабильности банков, а также защиты интересов их вкладчиков и поддержки стабильности денежно-кредитной системы Республики Узбекистан уполномоченный орган регулирует деятельность банков. Пруденциальные нормативы, установленные уполномоченным органом Республики Узбекистан для банков, включают показатели минимального размера уставного капитала банка; минимального размера собственного капитала банка; коэффициента достаточности капитала; максимальной величины риска на одного заемщика; коэффициента ликвидности; пределы открытой валютной позиции.

На современном этапе развития экономики страны факторы внешней среды оказали существенное влияние на развитие банковского сектора в Узбекистане. В соответствии с Указом Президента Республики Узбекистан «О стратегии реформирования банковской системы Республики Узбекистан на 2020 - 2025 годы» в ходе последовательного реформирования финансового сектора реализован ряд мер, в результате которых созданы необходимые правовые условия для ведения прогрессивного банковского бизнеса и усиления конкурентной среды в секторе. Также приняты обновленные законы Республики Узбекистан «О Центральном банке Республики Узбекистан», «О банках и банковской деятельности», «О валютном регулировании» и «О платежах и платежных системах», соответствующие международным стандартам и создающие привлекательную правовую среду для иностранных инвестиций в финансовую сферу [2].

В настоящее время банковский сектор Узбекистана стремительно развивается. В банковскую систему Узбекистана входит 33 банка, включая 12 банков с госдолей, а также 15 частных и 5 иностранных банка. На 1 ноября активы банков составляют 39 млрд долларов (419 трлн сумов), при этом 82% приходится на государственные банки. Обязательства банков достигли 33 млрд долларов (352,6 трлн сумов), из них 40% — депозиты.

Совокупный капитал банков находится на уровне 6,2 млрд долларов (66 трлн сумов), из них 81% — капитал госбанков [3].

Стабильность коммерческих банков в первую очередь обусловлена общеэкономическими факторами. Они оказывают существенное определяющее влияние на стабильность узбекских банков. Финансовые факторы развития и состояние финансового рынка также оказывают большое влияние на стабильность коммерческого банка.

Состояние финансового рынка зависит от следующих факторов: денежной эмиссии, уровня инфляции, процентов по краткосрочным кредитам, порядка государственного регулирования внешнеэкономической и валютной среды, золотовалютного фонда государства, объема внешних долг государства. Поэтому коммерческим банкам следует уделять большое внимание организации собственной модели управления, при которой управленческие решения принимаются в соответствии с условиями внешней среды банка.

Большое значение в стабильности банка придается внутренней политике, которая в нем проводится. Она должна противостоять основным причинам банкротства: рыночному росту цен на ценные бумаги и потерям в активах из-

за просроченных невозвратных кредитов; росту позиций; преступной деятельности высококвалифицированных специалистов, коррупции. Успех или упадок многих коммерческих банков с самого начала определяется их организационной структурой. Узбекские банки не уделяют должного внимания стратегическому планированию и управлению, внутреннему контролю и работе руководства.

В связи с этим многие операции на финансовом рынке, которые приносят большую прибыль, в будущем могут оказаться неудачными. Ко второй группе внутренних факторов, влияющих на стабильность банка, относятся технологические факторы, к которым относится ориентация банка на развитие банковских технологий, спрос на новые банковские продукты и услуги на рынке.

Глобальная банковская деятельность ставит перед банками проблемы, которые невозможно решить без использования новых информационных технологий в поиске широких и всеобъемлющих решений. Автоматизация широко используется меняются традиции банковского обслуживания. Сегодня не так-то просто представить успешную работу банков без компьютерной системы. Внедрение новых продуктов - это не только внедрение программных продуктов, но и продвижение сервисов, ориентированных на клиента.

Таким образом, банковские компьютерные и телекоммуникационные технологии приводят к ускорению требований банковского сектора к международному банковскому сообществу, что, соответственно, является основой стабильного функционирования коммерческих банков.

Рассмотренный перечень внутренних и внешних факторов, которые могут повлиять на стабильность коммерческого банка, очень индивидуален и зависит от состава работы тех или иных отдельных банков и специфики организаций. Кроме того, не следует забывать о внешних факторах, которые задают конкретные параметры их деятельности, независимые от самих банков, и оказывают существенное влияние на стабильность деятельности банка в условиях глобальной экономики. В то же время коммерческие банки всегда должны стремиться к тому, чтобы повысить качество факторов, влияющих на стабильность банка, не ограничивая влияние внутренних банковских факторов.

Кроме того, среди внешних и внутренних факторов, негативно влияющих на стабильность коммерческого банка, могут наблюдаться положительные тенденции, например, ускоренный рост собственного капитала банков, улучшение структуры активов, расширение спектра банковских услуг – трастовых, лизинговых, факторинговых и т.д.

Заключение. Таким образом, стабильность коммерческого банка - это сложная общеэкономическая категория, которая контролирует выполнение всех условий и находится под строгим контролем со стороны других банков. Поэтому для существования конкретного банка необходимо оценить его финансовую устойчивость с учетом вышеперечисленных факторов.

Современная банковская отрасль находится в поиске оптимальных форм кредитной системы, эффективного механизма рынка капитала, способов обслуживания коммерческой структуры. Создание стабильной, гибкой и эффективной системы банковского сектора является одной из важнейших и

главнейших задач экономических реформ в Узбекистане. Банк - крупномасштабная структура, обладающая большой финансовой мощностью и значительным денежным капиталом, является необходимым компонентом эффективного функционирования рыночных механизмов, его стабильность влияет на социально-экономическое положение страны.

Устойчивое развитие сельского и водного хозяйства Узбекистана зависит от комплексного подхода к анализу всех названных факторов и необходимости формирования эффективной государственной политики, направленной на улучшение производственных процессов, модернизацию технологий и расширение рынков сбыта. Создание благоприятных экономических условий будет способствовать укреплению аграрного сектора и обеспечению продовольственной безопасности страны.

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ЭФФЕКТИВНОСТЬ КОМПОЗИТНЫХ ТЕХНОЛОГИЙ В РАЗВИТИИ ОРОШАЕМОГО ЗЕМЛЕДЕЛИЯ КАЗАХСТАНА

Т.С.Ишангалиев¹, Д.Я. Пак², М.Ш. Ирназаров³

¹ К.т.н., доцент, НАО «Казахский национальный аграрный исследовательский университет», г. Алматы, Республика Казахстан, timurlan2017@gmail.com;

² Магистрант, НАО «Казахский национальный аграрный исследовательский университет», г. Алматы, Республика Казахстан, dima1kz@mail.ru

³ Директор, ТОО «I.M.- PARTNER», г. Тараз, Республика Казахстан, i.m.partner@mail.ru;

Xulosa. Ushbu maqolada Qozog'iston Respublikasida sug'oriladigan hududlarni kengaytirish bo'yicha davlat strategiyasini amalga oshirish doirasida an'anaviy temir-beton tizimlariga muqobil yechim sifatida kompozit konstruksiyalarni joriy etish imkoniyatlari kompleks tahlil qilingan. Ko'p qirrali

texnik-iqtisodiy tadqiqotlar asosida innovatsion materiallarning suv resurslaridan foydalanishni optimallashtirish va sugʻorish infratuzilmasini modernizatsiya qilish jarayonlarini jadallashtirishdagi ustun xususiyatlari namoyish etilgan.

Kalit soʻzlar: kompozit texnologiyalar, shisha tolali plastmassa, sugʻoriladigan dehqonchilik, irrigatsiya tizimlari, suv tejash, temir-beton lentalar, filtratsiya yoʻqotishlari, sugʻorish kanallarini modernizatsiya qilish, filtratsiyaga qarshi qoplamalar

Аннотация. В настоящей статье представлен комплексный анализ потенциала имплементации композитных конструкций как альтернативного решения традиционным железобетонным системам в рамках реализации государственной стратегии экспансии орошаемых территорий Республики Казахстан. На основании многоаспектного технико-экономического исследования демонстрируются преимущественные характеристики инновационных материалов в контексте оптимизации водопользования и интенсификации процессов модернизации ирригационной инфраструктуры.

Ключевые слова: композитные технологии, стеклопластик, орошаемое земледелие, ирригационные системы, водосбережение, железобетонные лотки, фильтрационные потери, модернизация оросительных каналов, противofiltrационные покрытия

Annotation. This article presents a comprehensive analysis of the potential implementation of composite structures as an alternative solution to traditional reinforced concrete systems within the framework of the state strategy for expanding irrigated areas in the Republic of Kazakhstan. Based on a multifaceted techno-economic study, the article demonstrates the advantageous characteristics of innovative materials in the context of optimizing water use and intensifying the modernization processes of irrigation infrastructure.
Keywords: composite technologies, fiberglass, irrigated agriculture, irrigation systems, water conservation, reinforced concrete flumes, filtration losses, modernization of irrigation channels, anti-filtration coatings

1. Введение/актуальность

Обеспечение продовольственной безопасности Республики Казахстан в условиях прогрессирующих климатических трансформаций и эскалации дефицита водных ресурсов детерминирует необходимость фундаментального пересмотра методологических подходов к организации аграрного производства. Согласно Концепции развития системы управления водными ресурсами на 2024-2030 годы, стратегическим вектором государственной политики является увеличение ареала орошаемых земель до 2,5 млн га к 2030 году [1].

Имплементация данной стратегической инициативы предполагает не только конструирование новых гидротехнических сооружений, но и комплексную реновацию существующей ирригационной инфраструктуры. Комплексный план развития водной отрасли Республики Казахстан на 2024–2028 годы предусматривает интенсивную интеграцию водосберегающих технологий и композитных материалов при одновременном расширении орошаемых территорий [2].

Императивность модернизации ирригационных систем обусловлена неудовлетворительным техническим состоянием значительной части функционирующей инфраструктуры. Согласно статистическим данным, водохозяйственная система Казахстана инкорпорирует 8577 каналов общей протяженностью около 3500 км магистральных и межхозяйственных водотоков, 55% которых характеризуются неудовлетворительным техническим состоянием [1].

Более 75% ирригационных каналов реализованы в земляном исполнении, что детерминирует значительные потери воды при транспортировке. В соответствии с исследованиями [1], средние потери воды при транспортировке от источника до аграрных полей составляют приблизительно 40%, а на уровне полевых работ – дополнительные 20–30%. С учетом потерь в межхозяйственных и внутриводохозяйственных каналах совокупные потери превышают 50%.

Структурный анализ водопотерь демонстрирует, что при условии принятия общих потерь в ирригационной системе за 100%, их дистрибуция представлена следующим образом: фильтрационные потери – 70–75%, эвапорационные потери – 3–5%, технические потери – 20–25%. В ирригационной сети общие фильтрационные потери воды распределяются приблизительно следующим образом [3]:

- в магистральных каналах, их ответвлениях и межхозяйственных распределителях – около 30–35%;
- во внутриводохозяйственной оросительной сети – 50–55%;
- во временных оросителях – до 10%.

2. Цель/задачи

Целью данного исследования является сравнительный анализ технических и эксплуатационных характеристик стеклопластиковых ирригационных систем в сопоставлении с традиционными железобетонными аналогами для определения имплементационного потенциала в контексте модернизации ирригационной инфраструктуры Республики Казахстан.

Для достижения поставленной цели сформулированы следующие исследовательские задачи:

- Проанализировать применение композитных материалов в гидротехническом строительстве.

- Идентифицировать материалы и технологические процессы производства стеклопластиковых и железобетонных ирригационных систем.
- Реализовать сравнительный анализ гидравлических характеристик дифференцированных типов оросительных лотков.
- Осуществить сравнительный анализ технических параметров материалов для оросительных лотков.
- Исследовать затраты на изготовление конструкций.
- Провести сравнительное исследование эксплуатационных характеристик и интеграционного потенциала с водосберегающими технологиями.

3. Методология

Методы исследования включают всестороннее изучение физических и механических свойств материалов, а также анализ рабочих параметров оросительных систем, которые используют разные конструктивные решения. Исследование основывается на интеграции нескольких методологических подходов:

- Системный анализ
- Сравнительный анализ
- Метод экспертных оценок

Теоретический фундамент применения композитных материалов в ирригационных системах базируется на ряде фундаментальных концепций материаловедения, гидравлики и строительной механики [4]:

- Теория анизотропных композиционных материалов
- Концепция оптимального проектирования конструкций из композиционных материалов
- Теория гидравлических сопротивлений в открытых руслах
- Методология оценки долговечности полимерных композитов

4. Результаты

Анализ производства и эксплуатации оросительных систем показывает существенные различия между используемыми материалами и технологиями. Стеклопластиковые оросительные лотки представляют собой композитные конструкции, изготавливаемые методом формования на основе стекловолокна и полимеров [5]. Производственный процесс основан на нескольких технологических методах, включая контактное формование, вакуумную инфузию и RTM (Resin Transfer Molding). В противоположность этому, технология производства железобетонных лотков предполагает наличие существенно более сложного и продолжительного цикла [6], включающего изготовление арматурных каркасов, подготовку опалубки, приготовление бетонной смеси, её укладку и уплотнение, выдерживание бетона до набора прочности и финишную обработку поверхностей.

С гидравлической точки зрения, основными показателями,

характеризующими свойства лотков, являются коэффициент шероховатости, пропускная способность, потери на фильтрацию и устойчивость гидравлических характеристик во времени [7]. Для геокомпозитных лотков коэффициент шероховатости теоретически предполагается равным 0,009–0,011, в то время как для железобетонных этот показатель составляет 0,012–0,015. В настоящее время в КазНАИУ проводятся гидравлические исследования по определению фактического коэффициента шероховатости стеклопластиковых лотков. Пропускная способность у геокомпозитных лотков выше на 20–25% по сравнению с железобетонными, а потери на фильтрацию для стеклопластиковых лотков практически отсутствуют.

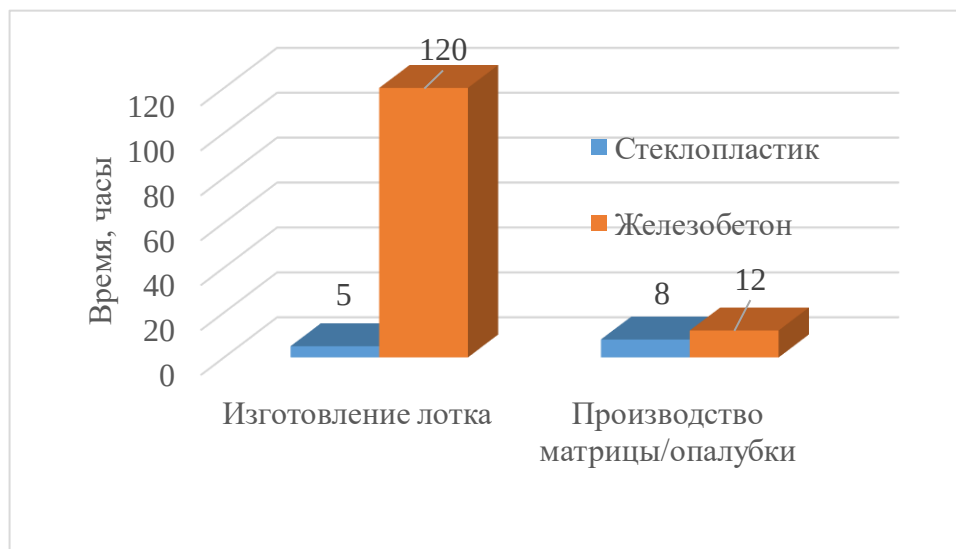
Сопоставление основных технических характеристик оросительных лотков представлено в таблице 1. Сравнение стеклопластиковых и железобетонных лотков показывает значительные преимущества первых: по прочности стеклопластик превосходит железобетон более чем в 100 раз, обеспечивает полную герметичность и стеклопластиковый лоток в 13 раз легче железобетонного. Экономическая эффективность стеклопластика достигается за счет более длительного срока службы, минимальных потерь воды и экономии на логистике благодаря меньшему весу.

Таблица 1. Сопоставление основных технических характеристик оросительных лотков

Характеристика	Стеклопластик	Железобетон (М300)
Прочность на изгиб	441–882 МПа	4 МПа
Прочность на растяжение	568–882 МПа	4,6 МПа
Водонепроницаемость	Полная (W20 эквивалент)	Средняя (W6–W8)
Вес стандартного лотка	Около 150 кг	1920 кг
Нормативный срок службы	50 лет	40 лет

Анализ производственных процессов и временных затрат, представленный на рисунке 1, демонстрирует, что продолжительность технологического цикла изготовления стеклопластиковых изделий составляет всего 5 часов, в то время как производство железобетонных лотков требует 120

часов [8]. Готовность к транспортировке наступает через 24 часа для



стеклопластиковых конструкций и через 28 дней для железобетонных изделий.

Рисунок 1. Затраты времени на отдельные циклы изготовления изделий

Интеграция стеклопластиковых оросительных систем с современными водосберегающими технологиями позволяет максимизировать эффективность использования водных ресурсов. За последнее пятилетие площади с применением водосберегающих технологий полива в Республике Казахстан увеличились на 77% - с 184 до 326 тыс. га [2].

Важно отметить, что режим эксплуатации каналов напрямую сказывается на объёме водопотерь. Исследования состояния оросительных систем Казахстана выявили их прерывистый характер работы. Циклы полива и простоя сменяют друг друга каждые 5-15 дней, с 2-8 поливами за сезон. В периоды между поливами русла каналов пересыхают, что приводит к увеличению потерь на фильтрацию. Магистральные каналы и их распределители первого порядка работают непрерывно в течение периода орошения, что приводит к меньшим потерям воды [4].

В 1980-х годах для снижения фильтрационных потерь в оросительных каналах применялся комплекс противофильтрационных мероприятий, но в условиях Казахстана на магистральных каналах наибольшее распространение получили железобетонные покрытия, в ряде случаев комбинируемые с геосинтетическими мембранами.

5. Заключение

Проведенное исследование позволяет сформулировать следующие выводы:

• Стеклопластиковые оросительные системы демонстрируют существенные преимущества по сравнению с традиционными железобетонными аналогами, включая [5], [7]:

- Превосходящие прочностные характеристики при значительно меньшей массе
- Сокращение производственного цикла в 24 раза
- Увеличенный срок службы без необходимости проведения периодических ремонтных работ

• Оптимизированные гидравлические характеристики стеклопластиковых лотков обеспечивают увеличение пропускной способности ирригационных систем на 20-25% при идентичных геометрических параметрах [7].

• Имплементация стеклопластиковых оросительных систем способствует достижению стратегических целей государственной программы по расширению площади орошаемых земель [1], [2].

• Интеграция стеклопластиковых оросительных систем с современными водосберегающими технологиями формирует синергетический эффект, значительно повышающий эффективность использования водных ресурсов [8].

На основании проведенного исследования можно сформулировать следующие рекомендации:

• Министерству водных ресурсов и ирригации Республики Казахстан целесообразно внести корректировки в нормативно-техническую документацию для упрощения процедуры согласования проектов с использованием композитных материалов, рассмотреть возможность включения стеклопластиковых оросительных систем в перечень приоритетных технологий, субсидируемых в рамках программ поддержки развития орошаемого земледелия.

• Региональным водохозяйственным организациям рекомендуется при разработке проектов модернизации ирригационной инфраструктуры проводить технико-экономическое сравнение вариантов с использованием различных материалов.

• Научно-исследовательским организациям рекомендуется инициировать комплексную программу полевых испытаний стеклопластиковых оросительных систем в различных агроклиматических зонах.

• Необходимо изучить возможность интеграции стеклопластиковых систем с перспективной разработкой - конструкцией противофильтрационного покрытия из геокомпозитного полимерного материала с КПД до 95% и сроком службы до 80 лет (патент на полезную модель № 7345 от 12.08.2022) [9].

• Рекомендуется более широкое применение высоконадежных конструкций противофильтрационных облицовок оросительных каналов с применением геосинтетических материалов, которые в различном сочетании позволяют создать противофильтрационные конструкции, практически полностью исключаящие потери на фильтрацию и обеспечивающие повышение КПД каналов оросительных систем.

6. Оригинальность

Научная новизна исследования заключается в комплексном анализе потенциала имплементации стеклопластиковых конструкций в системах орошаемого земледелия Казахстана с учетом специфических агроклиматических условий региона и актуальных государственных программ развития водного хозяйства. В отличие от предшествующих исследований, данная работа предлагает системный подход к оценке эффективности композитных технологий с учетом не только технико-экономических параметров, но и стратегических национальных приоритетов в области водосбережения и продовольственной безопасности.

Проведен всесторонний сравнительный анализ эксплуатационных характеристик стеклопластиковых и железобетонных оросительных систем применительно к условиям Казахстана с учетом периодичности функционирования ирригационной инфраструктуры и специфики ее интеграции с современными водосберегающими технологиями. Предложенные рекомендации по модернизации нормативно-технической базы и механизмов государственной поддержки внедрения инновационных материалов представляют практическую ценность для развития водохозяйственного комплекса страны.

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XO‘JALIK YURITUVCHI SUB‘EKTLARINING DAVLAT BYUDJETI BILAN O‘ZARO MUNOSABATLARI TAHLILI

Zokir Mamatkulov – Termiz Davlat Universiteti magistranti

Annotatsiya. Xo‘jalik yurituvchi sub‘ektlar iqtisodiyotning asosiy tashkilotchilari sifatida davlat byudjeti bilan muhim o‘zaro munosabatlarga ega. Ushbu munosabatlar soliq tizimi, subsidiyalar, davlat xarajatlari va moliyaviy hisobot tizimi orqali amalga oshiriladi. O‘zbekiston Respublikasida xo‘jalik yurituvchi subyektlarning davlat byudjeti bilan aloqasi nafaqat iqtisodiy rivojlanishni ta‘minlash, balki ijtimoiy barqarorlikni qo‘llab-quvvatlashda ham muhim ahamiyatga ega. Ushbu maqolada xo‘jalik yurituvchi sub‘ektlarning davlat byudjeti bilan o‘zaro munosabatlari nazariy asoslari va buxgalteriya hisobi nuqtai nazaridan batafsil tahlil qilinadi.

Kalit so‘zlar: Xo‘jalik yurituvchi sub‘ektlar, soliq, subsidiya, iqtisodiyot

Аннотация. Хозяйствующие субъекты, как основные организаторы экономики, имеют важное взаимодействие с государственным бюджетом. Эти отношения реализуются через налоговую систему, субсидии,

государственные расходы и систему финансовой отчетности. В Республике Узбекистан взаимоотношения хозяйствующих субъектов и государственного бюджета имеют важное значение не только в обеспечении экономического развития, но и в поддержании социальной стабильности. В статье дается подробный анализ взаимоотношений субъектов хозяйствования и государственного бюджета с теоретической и бухгалтерской точек зрения.

Ключевые слова: Хозяйствующие субъекты, налог, субсидия, экономика

Abstract. *Economic entities, as the main organizers of the economy, have important interactions with the state budget. These interactions are carried out through the tax system, subsidies, state expenditures, and the financial reporting system. In the Republic of Uzbekistan, the interaction of economic entities with the state budget is important not only for ensuring economic development, but also for supporting social stability. This article analyzes in detail the interaction of economic entities with the state budget from the theoretical and accounting perspectives.*

Keywords: *Business entities, tax, subsidy, economy*

Kirish.

Xo'jalik yurituvchi sub'ektlar deganda korxonalar, firmalar, tashkilotlar va yakka tartibdagi tadbirkorlar tushuniladi, ular o'z faoliyatlarini daromad olish maqsadida yuritadilar [1,2]. Davlat byudjeti esa davlatning moliyaviy resurslarini boshqarish vositasi bo'lib, unda daromadlar va xarajatlarning umumiy balansi aks etadi. Nazariy jihatdan, xo'jalik yurituvchi sub'ektlar davlat byudjeti bilan quyidagi asosiy yo'nalishlar orqali o'zaro aloqada bo'ladi:

- Soliq to'lovlari: xo'jalik yurituvchi sub'ektlar davlat byudjetining asosiy daromad manbai hisoblanadi. Ular foyda solig'i, qo'shilgan qiymat solig'i (QQS), aksiz solig'i va boshqa majburiy to'lovlarni amalga oshiradi;

- Subsidiyalar va imtiyozlar: Davlat byudjetidan xo'jalik yurituvchi sub'ektlarga qo'llab-quvvatlash maqsadida subsidiyalar, soliq imtiyozlari yoki grantlar ajratilishi mumkin [4,5];

- Davlat xaridlarida ishtirok etish: xo'jalik yurituvchi sub'ektlar davlat buyurtmalari orqali byudjet mablag'larini o'zlashtiradi;

- Moliyaviy hisobot va nazorat: xo'jalik yurituvchi sub'ektlarning faoliyati davlat organlari tomonidan soliq va buxgalteriya hisobi asosida tekshiriladi.

O'zbekiston iqtisodiyotidagi xo'jalik yurituvchi sub'ektlarning davlat byudjetiga ta'siri makroiqtisodiy ko'rsatkichlar, xususan, YaIMning o'sishi, ish o'rinlari yaratilishi va eksport hajmi bilan chambarchas bog'liq [5,6].

Soliq to'lovlari xo'jalik yurituvchi sub'ektlar va davlat byudjeti o'rtasidagi moliyaviy munosabatlarning asosiy poydevori hisoblanadi. O'zbekiston Respublikasi Soliq kodeksiga muvofiq, xo'jalik yurituvchi sub'ektlar davlat byudjetini moliyalashtirishda markaziy rol o'ynaydi. Ushbu bo'limda soliq turlari, ularning hisoblanishi, buxgalteriya hisobidagi aks ettirilishi, iqtisodiy ta'siri va mavjud muammolar chuqur tahlil qilinadi [6,7,8,9].

Asosiy soliq turlari va ularning xususiyatlari

Xo'jalik yurituvchi sub'ektlar tomonidan to'lanadigan soliqlar to'g'ridan-to'g'ri va bilvosita soliqlar sifatida ikkiga bo'linadi. Quyida asosiy soliq turlari va ularning xususiyatlari keltiriladi:

1. Foyda solig'i

Stavka: Umumiy tartibda 15%, kichik biznes uchun 4-8% (soddalashtirilgan tartibda).

Ob'ekt: Korxonaning sof foydasi (daromadlar minus xarajatlar).

Hisoblash:

Sof foyda = Umumiydaromad – Xarajatlar

Foyda solig'i = Sof foyda × Stavka Foyda solig'i

Masalan, agar korxona 600 mln so'm daromad va 450 mln so'm xarajatga ega bo'lsa:

Sof foyda = 600 – 450 = 150 mln so'm

Foyda solig'i = 150 × 0,15 = 22,5 mln so'm

2. Qo'shilgan qiymat solig'i (QQS)

Stavka: 12% (2023 yildan boshlab pasaytirilgan).

Ob'ekt: Tovarlar va xizmatlarning qo'shilgan qiymati.

Hisoblash:

QQS = (Sotishqiymati – Xaridqiymati) × 0,12 QQS = (Sotish qiymati - Xarid qiymati) × 0,12

Misolda, agar korxona 200 mln so'mlik mahsulot sotsa (QQS bilan) va 100 mln so'mlik xom ashyo sotib olsa (QQS bilan):

Sotishdagi QQS: 200 × 0,12 = 24 mln so'm

Xariddagi QQS: 100 × 0,12 = 12 mln so'm

To'lanadigan QQS: 24 – 12 = 12 mln so'm

3. Jismoniy shaxslar daromad solig'i (JShDS)

Stavka: 12%.

Ob'ekt: Xodimlarning ish haqi.

Hisoblash:

Masalan, xodimning oylik maoshi 5 mln so'm bo'lsa:

JShDS = 5 × 0,12 = 600 ming so'm

4. Ijtimoiy sug'urta badallari

Stavka: 12% (ish beruvchi tomonidan).

Ob'ekt: Xodimlarning ish haqi jamg'armasi.

Hisoblash: Agar korxonada 10 xodim bo'lib, umumiy ish haqi 50 mln so'm bo'lsa:

Ijtimoiy badal = 50 × 0,12 = 6 mln so'm

5. Yer va mol-mulk solig'i

Stavka: Ob'ekt qiymatiga qarab o'zgaradi (masalan, yer solig'i gektariga 1-5 mln so'm).

Ob'ekt: Korxonaga tegishli ko'chmas mulk va yer uchastkalari.

O'zbekiston Respublikasida raqamli iqtisodiyotni rivojlantirish strategiyasi (2020-2030 yillar uchun) doirasida xo'jalik yurituvchi sub'ektlarning davlat byudjeti bilan munosabatlari yangi bosqichga o'tdi. Elektron tijorat, onlayn to'lov tizimlari va raqamli soliq hisobotlari xo'jalik yurituvchi sub'ektlarning byudjet bilan aloqasini soddalashtirdi.

- Yangi soliq tizimi: 2023 yildan boshlab O‘zbekistonda “E-Soliq” tizimi joriy etildi, bu xo‘jalik yurituvchi sub’ektlarning soliq deklaratsiyalarini onlayn topshirish imkonini berdi. Masalan, QQS hisobotlari endi real vaqt rejimida tekshiriladi.
- Buxgalteriya hisobida aks ettirish: Raqamli tranzaksiyalar avtomatik tarzda buxgalteriya dasturlariga integratsiya qilinadi. Masalan, agar korxona “Click” yoki “Payme” orqali 10 million so‘m to‘lov qabul qilsa:
 - Debit: 3110 (Hisob raqamidagi pul mablag‘lari) – 10 mln so‘m
 - Kredit: 5210 (Sotishdan tushum) – 8,8 mln so‘m
 - Kredit: 6412 (QQS bo‘yicha qarzarlar) – 1,2 mln so‘m

Tahlil va natijalar: Raqamli tizimlar soliq yig‘imlarini 15-20% ga oshirdi (Soliq qo‘mitasi ma‘lumotlari, 2024), ammo kichik bizneslarda raqamli infratuzilma yetishmasligi muammo sifatida qolmoqda.

Barqaror rivojlanish maqsadlari va xo‘jalik yurituvchi sub’ektlar
Xo‘jalik yurituvchi sub’ektlarning davlat byudjeti bilan munosabatlari faqat moliyaviy jihat bilan cheklanmaydi. BMTning Barqaror rivojlanish maqsadlari doirasida O‘zbekiston “yashil iqtisodiyot”ga o‘tishni boshladi. Bu xo‘jalik yurituvchi sub’ektlar uchun yangi imkoniyatlar va majburiyatlar keltirib chiqardi:

- Yashil soliq imtiyozlari: 2024 yildan boshlab qayta tiklanadigan energiya manbalaridan foydalanadigan korxonalarga foyda solig‘i bo‘yicha 50% chegirma berilmoqda.
- Ekologik soliqlar: Plastmassa ishlab chiqaruvchi korxonalarga qo‘shimcha ekologik soliq joriy etildi (1 kg uchun 500 so‘m).

Buxgalteriyada: Agar korxona 100 million so‘mlik “yashil” loyiha uchun imtiyoz olsa:
Debit: 6410 (Soliq xarajatlari) – 7,5 mln so‘m (oddiy 15% o‘rniga)

Kredit: 3310 (Davlat bilan hisob-kitoblar) – 7,5 mln so‘m

Xo‘jalik yurituvchi sub’ektlarning davlat byudjetiga ta’sirining statistik tahlili. Tadqiqot natijalarininiyanada ishonchli qilish uchun so‘nggi statistik ma‘lumotlarni kiritish mumkin. Masalan:

- 2024 yilda O‘zbekiston davlat byudjetining 60% dan ortig‘i (taxminan 150 trillion so‘m) xo‘jalik yurituvchi sub’ektlar tomonidan to‘langan soliqlar hisobidan shakllandi (Moliya va Iqtisodiyot vazirligi ma‘lumotlari).

- Kichik biznes va yakka tadbirkorlik soliq to‘lovlarida 25% ulushga ega.

Grafik misol:

Soliq turi	2023 yil (trln so‘m)	2024 yil (trln so‘m)	O‘shish (%)
Foyda solig‘i	25	30	20%
QQS	40	48	20%
JShDS	15	18	20%

Xulosa va takliflar. Xo‘jalik yurituvchi sub’ektlarning davlat byudjeti bilan munosabatlarini yaxshilash uchun xalqaro tajribani qo‘shish foydali bo‘lardi:

- Singapur modeli: Kichik biznes uchun soliq stavkalari 0-5% gacha pasaytirilgan, bu esa xo‘jalik yurituvchi sub’ektlar sonini 2 barobarga oshirdi.

• Germaniya: "Industrie 4.0" dasturi doirasida raqamli transformatsiyaga o'tgan korxonalarga davlat byudjetidan grantlar ajratiladi.

FOYDALANILGAN ADABIYOTLAR RO'YXATI:

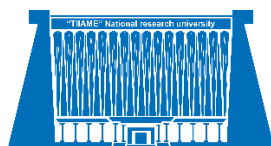
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39, Qori Niyoziy Street, 100000
Phone: +998 71 237-46-68
Email: admin@tiame.uz