ECONOSCITECH INTEGRATION

ISSUE 10 PART II

INTERNATIONAL SCIENTIFIC ELECTRONIC JOURNAL

TASHKENT STATE UNIVERSITY OF ECONOMICS

American University of Technology
Powered by Arizona State University®

ISSN: 3060-5075



Acceptance of articles
PUBLISHED MONTHLY

ARTICLE CONTRIBUTORS
PROFESSORS, SCHOLARS, SPECIALISTS, AND RESEARCHERS



Google scholar

OpenAIRE

ISSN INTERNATIONAL STANDARD SERIAL NUMBER DENMARK

CONTACT: +998 94 3540880 https://econoscitech-integration-journal.uz

2026



EDITOR-IN-CHIEF:
Zufarova Nozima Gulamiddinovna
DSc., Dean of Tourism Faculty, TSUE

DEPUTY EDITOR-IN-CHIEF:
Makhmudov Nosir Makhmudovich
DSc., Prof., Academican

DEPUTY EDITOR-IN-CHIEF:
Suyunov Dilmurod Xolmurodovich
Doctor of Economics (DSc), Professor,

DEPUTY EDITOR-IN-CHIEF:
Allayarov Shamsiddin Amanullayevich
doctor of economics (DSC), professor

RESPONSIBLE SECRETARY:
Otaboyev Axmed Maxsudbek o‘g‘li
TSUE independent researcher

THE SCIENTIFIC-POPULAR ELECTRONIC JOURNAL **"ECONOSCITECH-INTEGRATION"** HAS BEEN REGISTERED UNDER THE NUMBER C-5669651 BY THE AGENCY FOR INFORMATION AND MASS COMMUNICATIONS (AOKA) OF THE REPUBLIC OF UZBEKISTAN, EFFECTIVE FROM OCTOBER 9, 2024.

In accordance with Resolution No. 384/6 dated April 10, 2026, issued by the Presidium of the Supreme Attestation Commission under the Ministry of Higher Education, Science and Innovation of the Republic of Uzbekistan, this journal is included in the list of recommended international scientific publications for publishing the primary research findings of doctoral dissertations in the field of Economic Sciences.

Partners: Tashkent State University of Economics / American University of Technology in Tashkent (AUT)

Electronic publication. Issue 10. PART II
500 pages. Approved for publication in October 2026.

Editorial Board Members:


Sharipov Kongratbay Avezimbetovich,
Doctor of Technical Sciences (DSc), Professor


Teshabayev To‘lqin Zakirovich,
Doctor of Economic Sciences (DSc), Professor


Said Irandoust,
Doctor of Chemical Engineering Sciences, Professor


Abdurakhmanova Gulnora Kalandarovna,
Doctor of Economic Sciences (DSc), Professor


Khudoykulov Sadirdin Karimovich,
Doctor of Economics, (DSc), Professor


Tokunaga Masahiro,
professor, PhD of Economics of the Faculty of Business and Commerce


Debasis Das,
professor Department of Computer Science


Nitin Goje,
professor and Program Lead - Computer Science


Nargizakhon Shamshieva
Doctor of Economic Sciences, Professor


Rakhmonov Norim Razzakovich,
Doctor of Economic Sciences (DSc), Professor

Bayxonov Bahodirjon Tursunbayevich
Doctor of Science (DSc), Professor


Shomurodov Ravshan Tursunkulovich,
PhD, Associate Professor


Boymuratov Abduraxmat Djumayevich
Doctor of Philosophy (PhD) in Economics


Sharopova Nafosat Radjabovna
DSc, Associate Professor


Sultanova Kamila Mukhtorali Kizi
Master of Science

CONTENTS

THE ORGANISATIONAL AND ECONOMIC MECHANISM FOR MANAGING THE COMPETITIVENESS OF ENTREPRENEURIAL ENTITIES: A SUBSYSTEM-BASED FRAMEWORK AND A MEASUREMENT-ORIENTED CLASSIFICATION OF FACTORS 14
Akhmadjanov Abrorbek Akbarjon ugli

STATISTICAL ANALYSIS OF HUMAN CAPITAL ALLOCATION EFFICIENCY ACROSS SECTORS OF UZBEKISTAN'S ECONOMY 23
Ne'matova Gulchehraxon

АКТУАЛЬНЫЕ ВОПРОСЫ ОЦЕНКИ КРЕДИТОСПОСОБНОСТИ КОМПАНИЙ 32
Шомуродов Равшан Турсункулович

A COMPARATIVE STATISTICAL ASSESSMENT OF REAL ECONOMIC GROWTH ACROSS UZBEKISTAN'S REGIONS, 2010–2025 38
Shamsiyeva Nigora Rafiq qizi

ЗЕЛЁНАЯ ЭКОНОМИКА КАК ИНСТРУМЕНТ ОБЕСПЕЧЕНИЯ ЭКОНОМИЧЕСКОЙ БЕЗОПАСНОСТИ ГОСУДАРСТВА: МЕЖДУНАРОДНЫЙ ОПЫТ И ОСОБЕННОСТИ РАЗВИТИЯ В УЗБЕКИСТАНЕ 45
Хурсандов Комилжон Махматкулович

DIAGNOSIS-BASED TARGETING OF SUPPORT FOR CREATIVE ECONOMY ENTITIES: AN INDEX-BASED ALLOCATION MECHANISM (EVIDENCE FROM UZBEKISTAN) 56
Kurbonova Zebiniso Azimovna

MANAGING INNOVATION RISKS IN THE DEVELOPMENT OF THE GREEN ECONOMY 63
Madraximova Shohista Bahrom qizi

IMPROVING THE INVESTMENT STRATEGY FOR SUSTAINABLE DEVELOPMENT OF INDUSTRIAL ENTERPRISES 72
Samijonov Musobek

HOW CAN BEHAVIOURAL AND PSYCHOLOGICAL THEORIES EXPLAIN PATTERNS OF ARTIFICIAL INTELLIGENCE (AI) USE AMONG 15-YEAR-OLD STUDENTS, AND HOW ARE THESE PATTERNS ASSOCIATED WITH LEARNING OUTCOMES AND ACADEMIC PERFORMANCE? 86
Fayazov Xasan Jaxongir o'g'li

OPPORTUNITIES FOR IMPROVING THE AUDIT OF EXTRABUDGETARY REVENUES IN HIGHER EDUCATION INSTITUTIONS BASED ON INTERNATIONAL STANDARDS 94
Abduraxmonov Saidqosimxon Abduhamid o'g'li

REGIONAL DIFFERENTIATION OF SMALL BUSINESS AND PRIVATE ENTREPRENEURSHIP ACTIVITY: A COEFFICIENT-BASED INDEX FOR THE DISTRICTS OF NAMANGAN REGION, UZBEKISTAN 100
Malikov Ulug'bek Xoldarboyevich

INTEGRATED ASSESSMENT OF COMMERCIAL BANKS' ECONOMIC SECURITY: RISK-BASED EVIDENCE FROM UZBEKISTAN 106
Shavkat Makhramovich Uralov

CURRENT CHALLENGES AND PROSPECTS FOR ENHANCING COMMERCIAL BANKS' REVENUE GENERATION 113
Ostonakulova Gulchekhrakhon Mukhammadyokub kizi

THE INTERRELATIONSHIP BETWEEN CORPORATE GOVERNANCE, INTERNAL CONTROL SYSTEMS, AND FINANCIAL DISCIPLINE IN STATE-OWNED TRANSPORT ENTERPRISES 120
Raxmatov Ziyodullo Nosirovich

CONTENTS

BEYOND THE 3R APPROACH: INSTITUTIONAL STRUCTURE AND OPERATIONAL DYNAMICS OF THE 9R CIRCULAR ECONOMY HIERARCHY 130
Mirzayev Muzaffar Maxmudovich

INTEGRATED ASSESSMENT OF THE ECONOMIC DEVELOPMENT OF RAILWAY ROLLING STOCK MANUFACTURING AND REPAIR ENTERPRISES: A WEAKEST-LINKSENSITIVE AGGREGATION APPROACH 141
Mannonov Shohruhmirza Abdirashid o‘g‘li

ADVANCED INTERNATIONAL MODELS FOR ORGANIZING FOOD SUPPLY FOR MILITARY PERSONNEL: EXPERIENCES OF SEVEN LEADING COUNTRIES AND THEIR ADAPTATION TO THE NATIONAL GUARD SYSTEM 148
Sharifov Akmal Mamadaminovich

THE SIGNIFICANCE OF TRADITIONAL CRAFTSMANSHIP IN PRESERVING INTANGIBLE CULTURAL HERITAGE: THE CONTRIBUTION OF DILBAR MEROSI AND ITS RELATIONSHIP WITH CULTURAL TOURISM IN UZBEKISTAN 156
Tongotarova Zuhra
Amiriddinova Muslima

PROSPECTS FOR THE APPLICATION OF CLOUD COMPUTING IN THE DEVELOPMENT OF MODERN INFORMATION SYSTEMS 160
Bozorova Irina Jumanazarovna

INNOVATIVE APPROACHES TO ECONOMIC INCENTIVES FOR ENHANCING SOIL FERTILITY 168
Muslimjon Isakhanov

CONCEPTUAL FOUNDATIONS FOR DEVELOPING MARKETING STRATEGIES TO DIVERSIFY TOURISM SERVICES: THE CASE OF KHOREZM REGION 176
Komilov Dostonbek Ro‘zimboy o‘g‘li

REGULATORY FRAMEWORK FOR THE ACCOUNTING AND AUDITING OF FINANCIAL INSTRUMENTS IN UZBEKISTAN: A CLAUSELEVEL COMPARATIVE ANALYSIS WITH IFRS 9 AND ISA 540 (REVISED) 187
Shanasirova Nodira Abdullaevna

IMPROVING INTEGRATED MANAGEMENT OF INDUSTRIAL ENTERPRISES THROUGH ERP SYSTEMS: A DYNAMIC INVENTORY CONTROL AND AI-ASSISTED DECISION SUPPORT FRAMEWORK 197
Farhod Toshmuradovich Xoliyarov

THE ESSENCE, NECESSITY, AND SIGNIFICANCE OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN THE BANKING SYSTEM 205
Jurayeva Sevara Zakirovna

СОВЕРШЕНСТВОВАНИЕ СИСТЕМЫ СТРАХОВАНИЯ ЖИВОТНОВОДСТВА В УЗБЕКИСТАНЕ 212
Хужакулова Ирода Ураловна

IMPROVING THE ORGANIZATIONAL AND ECONOMIC MECHANISM FOR THE TRANSITION TO CLOUD SOLUTIONS IN COMMERCIAL BANKS 219
Jumayev Sohib Bahodirovich

EXPANDING THE SCOPE OF GREEN BANKING SERVICES IN UZBEKISTAN: BASED ON INTERNATIONAL EXPERIENCE 226
Mirzakhmedova A.A.

AN ECONOMETRIC ASSESSMENT OF GUIDE TRAINING, SERVICE QUALITY, AND TOURIST SATISFACTION: THREE STANDARD TOOLS AND WHAT EACH OF THEM REVEALS 232
Misirxonov Habibxon Iskandar o‘g‘li

RISK-TIERED CUSTOMS CLEARANCE OF TRAVELLERS BASED ON ADVANCE INFORMATION AS A TOOL FOR DEVELOPING CROSS-BORDER TOURISM IN UZBEKISTAN 243
Ergashev Qobiljon Ernazarovich

CREDIT RISK CAPITAL DIAGNOSTICS UNDER LIMITED DEFAULT DATA IN UZBEKISTAN 249
Gaybullaev Umidillaxon Hasan ugli

ASSET EFFICIENCY AND PROFITABILITY OF LARGE HOTEL ENTERPRISES IN UZBEKISTAN: EVIDENCE FROM FINANCIAL STATEMENTS FOR 2021–2025 256
Rakhimov Hasan Abdusaitovich

ECONOMIC EFFICIENCY OF AI-BASED VIRTUAL TRY-ON TECHNOLOGIES IN ENHANCING DIGITAL MARKETING STRATEGIES IN THE FASHION INDUSTRY 263
Ahmedova Rayhona Jasurbek qizi

DIRECTIONS FOR IMPROVING STATE FISCAL (BUDGETARY AND TAX) POLICY 272
Asatullaev Khurshid Sunatullaevich

АНАЛИЗ СОВРЕМЕННОГО СОСТОЯНИЯ И ПЕРСПЕКТИВ РАЗВИТИЯ УСТОЙЧИВОГО БИЗНЕСА В ДЕЯТЕЛЬНОСТИ АО «УЗБЕКИСТОН ТЕМИР ЙУЛЛАРИ» 277
Абдурахманова М. Т.
Машарипов Масъуд Нумонжонович

STRUCTURAL SOURCES OF LABOUR PRODUCTIVITY GROWTH IN UZBEKISTAN IN THE CONTEXT OF GLOBAL TRENDS 284
Artiqova O‘g‘iljon Zafar qizi

EFFICIENT USE OF ECONOMIC RESOURCES IN THE CONTEXT OF DIGITAL TRANSFORMATION 290
Muydinov Khurshidbek Abdullaevich

IMPROVING THE ACCOUNTING AND AUDIT OF TAX OBLIGATIONS 295
Dulabov Zafar Akbarovich

ECONOMETRIC MODELLING METHODS FOR ASSESSING THE INVESTMENT ATTRACTIVENESS OF INDUSTRIAL ZONES: A METHODOLOGICAL FRAMEWORK WITH EVIDENCE FROM UZBEKISTAN 299
Bozorova Nargiza Tolibjonovna

SUSTAINABLE UTILISATION OF THE TOURISM AND RECREATIONAL POTENTIAL OF PROTECTED NATURAL AREAS: THE CASE OF JIZZAKH REGION 307
Mamadiyorov Adhamjon Kuchkar ugli

THE MAIN ECONOMIC FACTORS AFFECTING AGRICULTURAL PRODUCTION ON FARMS 321
Axmedova Mavluda Shavkatovna

THE IMPACT OF DIVIDEND POLICY ON FINANCING DECISIONS AND CAPITAL STRUCTURE IN JOINT-STOCK COMPANIES 327
Abdurazakova Nargiza Rixsibayevna

METHODOLOGY FOR FINANCING JOINT-STOCK COMPANIES THROUGH IPOS, SPOS, AND FPOS 332
Abdurazakova Nargiza Rixsibayevna

FUNDAMENTALS OF INTERNAL AUDIT ORGANIZATION IN BUDGETARY ORGANIZATIONS 342
Nurmetov Nurmat Aminbayevich

THE IMPORTANCE OF TALENT MANAGEMENT IN ENSURING MANAGEMENT EFFECTIVENESS 347
Xolbayev Shaxriyor Abdullayevich
Nasimov Dilmurod Abdulloyevich

A METHODOLOGY FOR CONSTRUCTING AND ASSESSING AN INTEGRATED RESOURCE EFFICIENCY INDEX FOR INDUSTRIAL ENTERPRISES 355
Rasulova Durdona Gayratovna

THE IMPORTANCE OF ORGANIZING ESG AUDITS IN CONSTRUCTION AND CONTRACTING ORGANIZATIONS 360
Tulovov Erkinjon Tolqin ugli

CONTENTS

CONTENTS

TESTING A PUBLISHED PROVISION MATRIX: EVIDENCE FROM AN UZBEK ELECTRICITY DISTRIBUTOR 365
Suyunov Jaloliddin O‘ktam o‘g‘li

INTERNATIONAL EXPERIENCE IN IMPROVING COMMERCIAL BANK CAPITAL EFFICIENCY AND OPPORTUNITIES FOR ITS APPLICATION IN UZBEKISTAN’S BANKING PRACTICE 376
M. Sa’dullaeva

DETERMINANTS OF PURCHASE CHANNEL CHOICE AND THE ECONOMIC EFFICIENCY OF E-COMMERCE TOOLS FOR SMALL FOOTWEAR BUSINESSES: EVIDENCE FROM A MULTINOMIAL LOGIT MODEL IN UZBEKISTAN 383
Makhmudova Munisakhon Abbos qizi

IMPROVING THE EFFICIENCY OF FINANCIAL RESOURCE ALLOCATION FOR FUNDING CIVIL SOCIETY INSTITUTIONS THROUGH ARTIFICIAL INTELLIGENCE TECHNOLOGIES 392
Khusanov Otabek Nishonovich

FORMATION AND DEVELOPMENT OF ECONOMIC SUPPORT MECHANISMS FOR EXPORT ACTIVITIES AT THE REGIONAL LEVEL 398
Dadajanova Moxinur Alisher qizi

ENHANCING THE EFFICIENCY OF THE PUBLIC PROCUREMENT SYSTEM: INSTITUTIONAL REFORMS AND INTERNATIONAL BEST PRACTICES 405
Kurbonbekov Sardorbek Ravshanovich

INTEGRATED STATISTICAL ASSESSMENT AND ECONOMETRIC MODELLING OF BUSINESS DEVELOPMENT ACROSS THE REGIONS OF UZBEKISTAN 412
Saidova Markhabo

QUANTITY IS NOT QUALITY: TRADITIONAL BIOMASS, ADAPTIVE CAPACITY, AND THE GROWTH RETURNS TO RENEWABLE ENERGY IN BRICS+ ECONOMIES, 2002–2022 417
Muslimova Farangiz

DOES INDUSTRIAL EXPANSION STILL DRIVE INCOME GROWTH? AN ARDL ANALYSIS OF INDUSTRIALISATION, ELECTRICITY CONSUMPTION, AND ECONOMIC GROWTH IN UZBEKISTAN 424
Eshboev Mirjalol Bakhrom ugli
Rayimbaev Otabek Uktamboy ugli

IMPROVING THE METHODOLOGY FOR ASSESSING THE INSTITUTIONAL AND ECONOMIC EFFICIENCY OF MANAGEMENT MODELS IN TEXTILE INDUSTRY ENTERPRISES 439
Avulchayeva Feruza Jurakuziyevna

A STATISTICAL ASSESSMENT OF TOURISM CLUSTERS IN DRIVING REGIONAL ECONOMIC GROWTH: A COMPARATIVE ANALYSIS OF UZBEKISTAN AND CYPRUS 445
Dilshodjon Nematov

CONTROLLING FREQUENCY-INDUCED IMPLICIT WEIGHTS IN MULTI-SOURCE CONSUMER PRICE DATA
(A Two-Stage Geometric Aggregation Approach and Evidence from Uzbekistan) 450
Ismailova Shaxnoza

ASSESSMENT OF THE EFFECTIVENESS OF EXISTING ORGANIZATIONAL AND ECONOMIC MECHANISMS FOR MANAGING INNOVATION ACTIVITIES IN TEXTILE INDUSTRY ENTERPRISES 456
Abdurahmanova Feruza Nusratovna

GOVERNING DIGITAL CHANGE THROUGH SCHOOL LEADERSHIP COMPETENCIES 462
Avazbek Esanov

THEORETICAL FOUNDATIONS AND INTERNATIONAL EXPERIENCE IN THE DEVELOPMENT OF SMALL BUSINESS AND PRIVATE ENTREPRENEURSHIP 468
Kaxorova Zamira Safaraliyevna

IFRS LINE: AN AUTHOR'S MODEL OF PARALLEL ACCOUNTING UNDER IFRS AND THE NATIONAL ACCOUNTING STANDARDS OF THE REPUBLIC OF UZBEKISTAN 474
Rakhimova Khalida Bakhodurovna

IMPROVING A MULTIFACTOR REGRESSION MODEL FOR ASSESSING THE WORK PERFORMANCE OF FACULTY MEMBERS IN HIGHER EDUCATION 480
Sultanova Kamila Mukhtorali kizi

ANALYSIS OF THE DEVELOPMENT STATUS OF THE FOOD INDUSTRY IN THE KHOREZM REGION AND THE EFFECTIVENESS OF STATE REGULATION 487
Xolmuratov Jamshidbek Xayrulla ugli

ECONOMIC–MATHEMATICAL MODELLING OF THE RELATIONSHIP BETWEEN INNOVATION OUTCOMES AND COMMERCIALISATION TIME IN COTTON-TEXTILE CLUSTERS 495
Tadjiyev Sadulla Muxidinovich

CONTEMPORARY TRENDS IN INDUSTRIAL DEVELOPMENT 501
Kasimov Azamat Abdukarimovich

WAYS TO IMPROVE MANAGEMENT EFFICIENCY THROUGH ARTIFICIAL INTELLIGENCE TECHNOLOGIES 509
Mardiev Bunyod Sirojiddin o'g'li
Amanova Lola Baydulla qizi

TIME-AWARE ALLOCATION OF CUSTOMS INSPECTION RESOURCES ACROSS RISK LANES: DECLARATION-LEVEL EVIDENCE FROM UZBEKISTAN 514
Kilichov Nazar Bafoyevich

НАКОПЛЕНИЕ КАПИТАЛА ОПЕРЕЖАЕТ РОСТ ПРОИЗВОДИТЕЛЬНОСТИ: ТЕХНИКО-ИНДИКАТИВНАЯ МАТРИЦА ДЛЯ ПРОИЗВОДИТЕЛЕЙ СПОРТИВНОГО ОБОРУДОВАНИЯ В УЗБЕКИСТАНЕ 519
Хамракулов Ихтиёр Бахтиёрович

AN INTEGRATED FRAMEWORK FOR ASSESSING AND ENHANCING OPERATIONAL PERFORMANCE IN ORGANIZATIONS 526
Oybek Rixsillayevich Sheraliyev

REGIONAL FRUIT BRANDS AND EXPORT COMPETITIVENESS IN UZBEKISTAN 530
Karimova Maftuna Nurdinovna

STRATEGIC INVESTMENT POLICY AND MANAGEMENT MODERNIZATION IN UZBEKISTAN'S CONSTRUCTION MATERIALS INDUSTRY: EMPIRICAL EVIDENCE AND STRUCTURAL TRAJECTORIES 536
Kutbitdinova Moxigul Inoyatovna

A RISK-BASED AUDIT METHODOLOGY FOR ELECTRICITY LOSSES IN DISTRIBUTION UTILITIES: EVIDENCE FROM UZBEKISTAN 543
Xojimuradov Zuxriddin Shukurullo o'g'li

PROSPECTS FOR DIVERSIFYING UZBEKISTAN'S MELON AND GOURD EXPORTS TO EUROPEAN UNION MARKETS: RESULTS OF THE HERFINDAHL–HIRSCHMAN INDEX (HHI) AND REGRESSION ANALYSIS 552
Rakhimov Feruz Uygunovich

ECONOMIC AND THEORETICAL FOUNDATIONS OF IMPROVING THE ECONOMIC EFFICIENCY OF RAILWAY TRANSPORT ENTERPRISES THROUGH ARTIFICIAL INTELLIGENCE 558
Shakirova Farogat Boltaevna

P2P-ПЛАТЕЖИ И РАЗВИТИЕ БЕЗНАЛИЧНОЙ ЭКОНОМИКИ УЗБЕКИСТАНА: АНАЛИЗ ОФИЦИАЛЬНЫХ ДАННЫХ ЗА 2024–2026 ГГ. 564
Абдукаримова Мастурабону Кодир кизи
Хамидова Фаридахон Абдулкарим кизи

CONTENTS

STATISTICAL ASSESSMENT OF TOURISM DEVELOPMENT DYNAMICS AND FORECASTING OF FOREIGN TOURIST FLOWS IN BUKHARA REGION 569
Kamolov Xudoyor Zoyirovich

IMPROVING CORPORATE INCOME TAX REVENUE FORECASTING IN UZBEKISTAN: A HYBRID APPROACH BASED ON INTERNATIONAL EXPERIENCE 576
Zoxidov Shaxzod Shavkat o‘g‘li

OPTIMISATION MODELLING OF RESOURCE USE IN FISHING USING THE SIMPLEX METHOD 583
Askarov Bakhtiyar Mamitovich

CONTENTS

OPTIMISATION MODELLING OF RESOURCE USE IN FISHING USING THE SIMPLEX METHOD

Askarov Bakhtiyar Mamitovich
PhD in Economics
Acting Associate Professor, Department of Software Engineering
University of Innovation Technologies
ORCID: 0009-0002-2259-4914
Email: dosikkim3@gmail.com

Abstract. This article describes the development of an information system based on the simplex algorithm to ensure efficient resource utilisation in the fishing sector. The system enables the optimal allocation of limited resources in fish production. The algorithm was implemented in the Python programming language and tested on real data using the scipy.optimize.linprog function. The results demonstrated that the system is effective in promoting efficient resource utilisation and improving economic efficiency.

Keywords: fisheries optimisation, simplex algorithm, information system, linear programming, Python programming language, resource management, economic efficiency.

Аннотация. В данной статье описывается процесс разработки информационной системы на основе симплекс-алгоритма для обеспечения эффективного использования ресурсов в секторе рыболовства. Система позволяет оптимально распределять ограниченные ресурсы при производстве рыбной продукции. Алгоритм был реализован на языке программирования Python и протестирован на реальных данных с использованием функции scipy.optimize.linprog. Результаты показали, что система способствует рациональному использованию ресурсов и повышению экономической эффективности.

Ключевые слова: оптимизация в рыболовстве, симплекс-алгоритм, информационная система, линейное программирование, язык программирования Python, управление ресурсами, экономическая эффективность.

INTRODUCTION

Fishing has both economic and ecological significance, and the efficient use of resources is one of the main factors contributing to the successful operation of this industry. Factors such as limited land, labour, and material resources necessitate optimal solutions for fish production. One of the modern approaches to addressing this challenge is the development of information systems based on mathematical models and algorithms. This article examines the development and effectiveness of an information system designed to optimise fishing activities using the simplex algorithm. The simplex algorithm makes it possible to identify optimal solutions for resource allocation, thereby contributing to improved economic outcomes in the fishing sector.

The growing importance of sustainable resource management in the fishing industry highlights the need for scientifically grounded approaches to production planning and decision-making. Fishing enterprises often operate under conditions of limited financial resources, fluctuating market prices, and varying production requirements. These factors can complicate the allocation of available resources among different fish species and production activities. Traditional planning methods may not fully account for the interdependence of production costs, resource availability, and expected profitability. Therefore, the application of mathematical optimisation methods provides an opportunity to improve production planning, minimise unnecessary resource consumption, and support economically justified management decisions.

Linear programming is particularly relevant to resource allocation problems because it enables the simultaneous consideration of multiple constraints and economic objectives within a unified mathematical framework. The simplex algorithm, as one of the established methods for solving linear programming problems,

INTERNATIONAL SCIENTIFIC ELECTRONIC JOURNAL

INTERNATIONAL SCIENTIFIC ELECTRONIC JOURNAL

can be applied to determine optimal production quantities while accounting for available land, labour, feed, and other essential resources. Integrating this algorithm into an information system allows optimisation calculations to be automated and facilitates the evaluation of alternative production scenarios. Such an approach can improve the accuracy and efficiency of resource management, strengthen the adaptability of fishing enterprises to changing economic conditions, and contribute to the long-term economic and environmental sustainability of the industry.

LITERATURE REVIEW

The need for optimisation in the fishing sector. Effective resource management in the fishing sector is crucial for ensuring economic stability and ecological balance. The efficient utilisation of available limited resources often requires complex mathematical calculations. Addressing this challenge through modern technologies and algorithms, rather than relying solely on traditional methods, provides more effective solutions.

The simplex algorithm is a widely used tool for optimisation problems that ensures maximum efficiency while accounting for resource constraints. This algorithm allows several constraints and objective functions to be considered simultaneously. The information system developed in this research enables the practical application of the algorithm and the identification of solutions appropriate to real-world conditions in the fishing industry.

Existing research on mathematical optimisation in fisheries and aquaculture highlights the importance of integrating economic planning with efficient resource allocation. Studies examining operational production planning demonstrate that mathematical models can support decision-making under resource limitations and changing production conditions. In particular, stochastic optimisation approaches provide opportunities to account for uncertainty in production processes, while linear programming methods offer structured solutions for determining optimal resource combinations. These approaches are particularly relevant to fish production, where feed availability, labour requirements, production capacity, and market conditions directly influence economic performance. The application of optimisation techniques can therefore contribute to more accurate production planning, improved resource utilisation, and the identification of economically sustainable production strategies.

The development of information systems based on mathematical optimisation algorithms represents an important direction in improving the practical applicability of resource management models. Previous studies on optimisation methods have demonstrated the usefulness of computational approaches for solving production planning problems across different economic sectors. In this context, the implementation of the simplex algorithm using the Python programming language and the «scipy.optimize.linprog<4»function provides a practical framework for analysing resource constraints and evaluating alternative production scenarios. By combining mathematical modelling with automated calculations, such systems can reduce the complexity of resource allocation decisions and facilitate timely adjustments to changing economic conditions. Nevertheless, the practical effectiveness of these approaches depends on the accuracy of input data, the appropriate formulation of constraints, and the correspondence between mathematical assumptions and actual production conditions. These considerations provide the methodological foundation for developing and evaluating the information system proposed in the present study.

RESEARCH METHODOLOGY

To apply the simplex algorithm, it is first necessary to define the objective function. The objective is to maximise profit from fishing. However, the Python library function performs minimisation rather than maximisation. Therefore, the profit maximisation problem must be reformulated as a minimisation problem by multiplying the objective function by −1. The objective function and constraints are described in detail below.

Objective function:

Objective function:

$$Z = -\sum_{i=1}^{8} c_i x_i$$

Here:

c_i - income from each unit of fish product (1 kg calculated price).

x_i - variables for determining the optimal quantity of each product.

The model incorporates resource constraints based on the availability of production inputs. The following restrictions were selected:

1. Land area constraint:

$$\frac{1}{400}x_1 + \frac{1}{450}x_2 + \cdots + \frac{1}{423}x_8 \leq B_1$$

B_1 Below is the total available land resources (in square meters).
2. Labour constraint:

$$\frac{1}{680}x_1 + \frac{1}{850}x_2 + \cdots + \frac{1}{780}x_8 \leq B_2$$

B_2Here is the total available labor resources (hours).
3. Feed constraint:

$$3x_1 + 2.8x_2 + \cdots + 4.1x_8 \leq B_3$$

B_3Here is the total available amount of feed (kg).
4. Mineral fertiliser constraint:

$$0.3x_1 + 0.2x_2 + \cdots + 0.34x_8 \leq B_4$$

B_4 Below is the total amount of available mineral fertilizers (kg).
5. Organic fertiliser constraint:

$$2.1x_1 + 1.9x_2 + \cdots + 2.2x_8 \leq B_5$$

B_5 Here is the total amount of available organic fertilizers (kg).
6. Limit on lime:

$$x_1 + 0.5x_2 + \cdots + 1.3x_8 \leq B_6$$

B_6 Here is the total amount of available lime (kg).

$x_i \geq 0$ In all of them, each restrictive (non-negative) condition is introduced.

$B_1, B_2, \ldots, B_6$ The above-mentioned target function and limitations require the user to enter the resources available to them, i.e., their values, as additional arguments. For this purpose, a user-friendly interface is created and data reception is carried out. The implementation of a simplex algorithm based on the objective function and boundary conditions is presented below. For this, the Python programming language was used.

Simplex Algorithm Implementation in Python. Implementing the simplex algorithm in Python is relatively straightforward and efficient using the «scipy.optimize.linprog<4» function. This function is designed to solve linear programming problems and offers the following advantages:

1. Convenient syntax – The algorithm can be implemented in just a few lines of code.
2. Efficiency – The ability to process large amounts of data.
3. Flexibility – The objective function and the number of variable constraints can be modified easily.

In this research, the objective function and constraints are formulated as follows:

Objective function – Negative coefficients are used to calculate the maximum profit from the product.

Constraints – Specific limits are established based on land area, labour availability, and other resources.

The algorithm is executed in the following sequence:

1. Identifying constraints – Linear equations are formulated for each resource.
2. Executing the simplex algorithm – Optimisation is performed using the linprog function.
3. Analysing the results – Optimal solutions and resource allocation are determined within the specified constraints.

Artificial intelligence (AI) tools were used to a limited extent, accounting for approximately 10% of the overall research preparation process. Their use was primarily confined to language refinement, technical editing, and structural support. The selection of research methods, analysis and interpretation of findings, formulation of scientific conclusions, and overall scientific responsibility remained entirely with the author.

The flowchart of the algorithm is presented below (Figure 1).

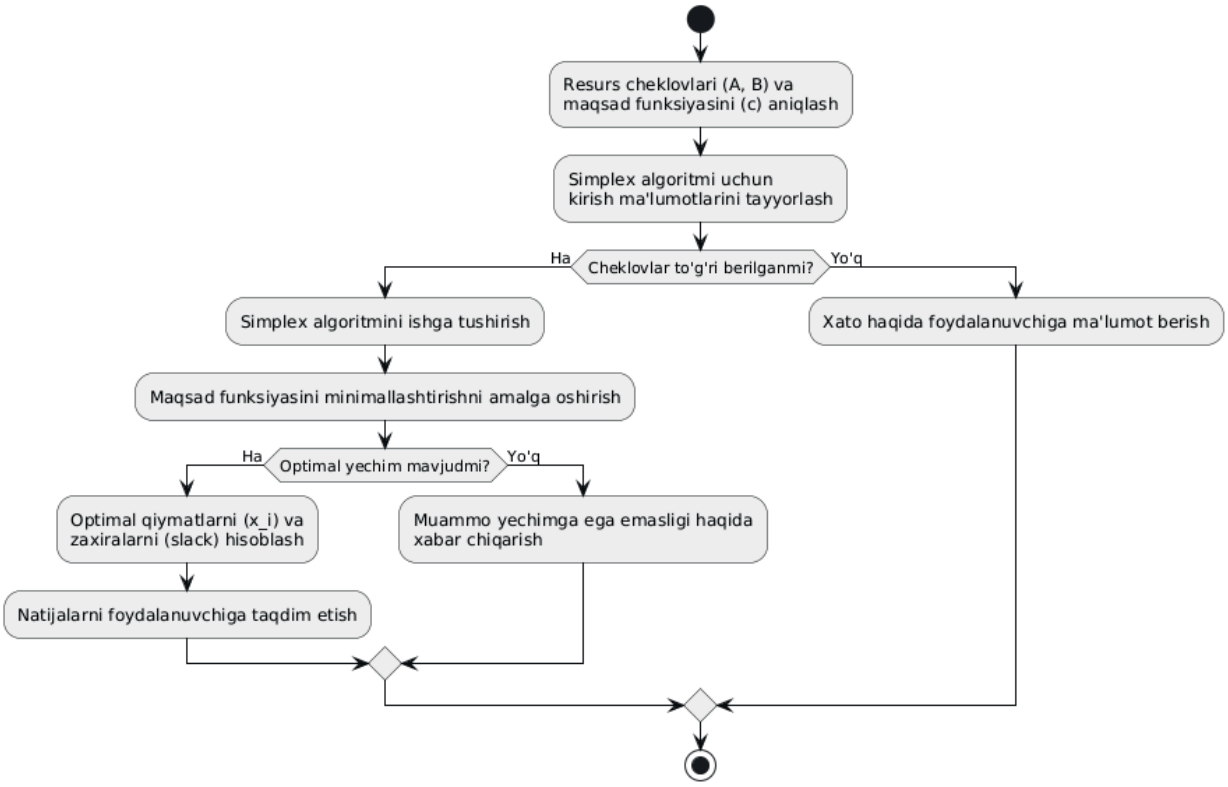


Figure 1. Basic block diagram of the algorithm[1]

ANALYSIS AND RESULTS

As a result of testing the system using real data, the following findings were identified:

1. Optimal solutions: The optimal quantities of different fish species required to maximise economic benefits were determined.

2. Efficient resource utilisation: Improvements in resource utilisation efficiency were achieved.

3. System speed: The developed algorithm contributed to increased data processing speed.

4. Economic efficiency and profit maximisation: Testing demonstrated the potential to increase the overall profitability of the fishery by an average of 15–20% under conditions of limited financial and material resources (feed, fuel, labour, and time).

5. Balanced resource allocation: The model accurately allocated resource quantities among different fish species, helping to prevent resource shortages and excessive accumulation (waste).

6. Algorithm stability and adaptability: Calculations performed using the scipy.optimize.linprog function demonstrated the algorithm's high stability under varying input data, enabling rapid recalculation and the generation of new optimal decisions when market prices or resource constraints change.

7. Adaptability to market fluctuations: The developed simplex model demonstrated the ability to adapt rapidly to external factors, such as fluctuations in feed prices and changes in consumer demand.

8. Risk and human error mitigation: By reducing reliance on subjective decision-making, the mathematical optimisation approach significantly reduced strategic management risks in the fishing sector.

9. Environmental sustainability: Rationalised feed distribution and optimised biomass density contribute to reduced aquatic pollution, aligning economic objectives with environmentally sustainable aquaculture standards.

Thus, the implemented information system based on the simplex algorithm provides a reliable mathematical foundation for strategic resource allocation. The results demonstrate its considerable practical value in modernising resource management and improving the economic viability of the fishing industry.

1 Author's development.

CONCLUSION AND RECOMMENDATIONS

In this study, an information system based on the simplex algorithm was developed to enable optimal resource allocation in the fishing sector. The system facilitated the identification of effective approaches to utilising limited land, labour, and material resources while maximising profitability indicators. During its operation, the system enabled the analysis of economic indicators, rational resource allocation, and improvements in production efficiency. The results demonstrated the potential to increase overall profitability by an average of 15–20% under the resource constraints considered in the study.

The findings indicate that mathematical optimisation methods can play an important role in improving resource management and supporting economically justified decisions in the fishing industry. The application of the simplex algorithm enables enterprises to determine optimal production quantities for different fish species while considering available resources and operational constraints. Furthermore, the adaptability of the developed system to changes in market prices, resource availability, and consumer demand provides opportunities for more flexible production planning. The integration of mathematical modelling with information technologies can therefore contribute to improved operational efficiency, reduced resource waste, and more sustainable fish production.

Based on the research findings, the following recommendations are proposed:

1. Implement optimisation-based resource planning. Fishing enterprises should incorporate the developed simplex-based information system into their production planning processes to improve the allocation of feed, labour, land, and other limited resources. Regular optimisation calculations can support more efficient resource utilisation and economically justified production decisions.

2. Improve data collection and model adaptability. Enterprises should regularly update information on production costs, available resources, market prices, and demand for different fish species. Integrating these data into the optimisation system would enable timely adjustments to production plans and improve the accuracy of resource allocation decisions under changing economic conditions.

3. Strengthen economic and environmental sustainability. Resource optimisation should consider both profitability and environmental requirements. Particular attention should be given to efficient feed utilisation, appropriate biomass density, and the prevention of excessive resource consumption. This approach would support economic performance while contributing to environmentally responsible aquaculture practices.

Further development of the proposed information system and its integration with emerging digital technologies could enhance its practical applicability and analytical capabilities. Future research may focus on expanding the range of optimisation parameters, incorporating additional production and environmental constraints, and evaluating the system's effectiveness under different operational conditions. These improvements would contribute to the long-term economic and ecological sustainability of the fishing sector.

REFERENCES

1. Bakhrankova K., Middun K. T., Uggen K. T. Stochastic Optimization of Operational Production Planning for Fishing // Research in the Field of Fishing. – 2014. – Vol. 157. – P. 147–153.
2. Craviro J. et al. System for Optimizing Fish Production: An Example of Semi-Intensive Aquaculture of Colossoma macropomum (Osteichthyes, Serrasalmidae) // Latin American Journal of Water Research. – 2019. – Vol. 47. – P. 492–501.
3. Neller J. A., Mead R. Simplex Method of Function Minimization // Computer Journal. – 1965. – Vol. 7, № 4. – P. 308–313.
4. Patcharaprakiti J., Jakkawan R., Patcharaprakiti N. Optimization of Batik Production Using the Rapid Simplex Method // Burapha Science Journal. – 2024. – Vol. 29, № 1 (January–April). – P. 147–159.
5. Samuelson K. Comparative Evaluation of the Stochastic Simplex-Bisection Algorithm and the SciPy Optimize Module // 2015 Federated Conference on Computer Science and Information Systems (FedCSIS). – IEEE, 2015. – P. 573–578.
6. Yakubjonovich V. A. Mechanisms of Financial Support for Farms Specializing in Fish Farming // Modern Trends and Factors of Development of the Introduction of Digital Technologies in Education. – 2024. – Vol. 36. – P. 124–130.

Proofreader: Xondamir Ismoilov

Layout and Designer: Hasan Maqsudov

2026. № 10/2

© When materials are reproduced, the ECONOSCITECH-INTEGRATION journal must be cited as the source. Authors are responsible for the accuracy of the information in materials and advertisements published in the journal. Editorial opinions may not always align with those of the authors. Submitted materials will not be returned to the editorial office.

To publish articles in this journal, you may submit articles, advertisements, stories, and other creative materials through the following links. Materials and advertisements are published on a paid basis.

You may subscribe to the journal at any time using the following details. Once subscribed, please send a screenshot or photo of your payment confirmation to our Telegram page @iqtisodiyot_77. Based on this, we will send the latest issue of the journal to your address each month.

Our address: Tashkent city, Yunusobod district, 19th block, House 17.