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Jurnal 1992-jıldan «Qaraqalpaqstan muǵallimi» atamasında shıǵarıla baslaǵan. 2004-jılda «Ilim hám jámiyet» atamasına ózgertilip, 01-022-sanlı gúwalıq penen Qaraqalpaqstan Respublikası Baspasóz hám xabar agentligi tárepinen dizimge alınǵan.

2020-jılı 7-avgustta Ózbekstan Respublikası Prezidenti Administracyası janındaǵı xabar hám ǵalaba kommunikaciyalar agentligi tárepinen qayta dizimge alınıp, 1098-sanlı gúwalıq berilgen.

«Ilim hám jámiyet» jurnalı Ózbekstan Respublikası Ministrler Kabineti janındaǵı Joqarı Attestaciya Komissiyası kollegiyasınıń qararı menen tómende kórsetilgen ilimler boyınsha ilim doktorı dárejesin alıw ushın maqalalar járiyalanıwı tiyis bolǵan ilimiy basılımlar dizimine kirgizilgen:

- 01.00.00 – fizika-matematika ilimleri;
- 03.00.00 – biologiya ilimleri;
- 05.00.00 – texnika ilimleri;
- 07.00.00 – tariyx ilimleri;
- 10.00.00 – filologiya ilimleri;
- 11.00.00 – geografiya ilimleri;
- 13.00.00 – pedagogika ilimleri;
- 19.00.00 – psixologiya ilimleri.

holda hosildorlik suv miqdoriga proporsional deb hisoblanadi.

1-jadvaldagi hosildorlik va suv miqdorlari ma'lumotlaridan foydalanib regressiya tahlili orqali differesial model qo'llanilishi mumkin. Har bir nuqtada dY/dx qiymati quyidagicha hisoblanadi:

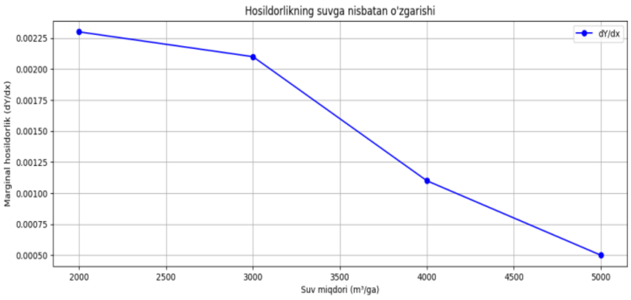
$$\frac{dY}{dx} = \frac{y_{i+1} - y_i}{x_{i+1} - x_i} \qquad (4)$$

1-jadvaldagi tuqtalarda (4) ning qiymatlari 2-jadvalda keltirilgan.

2-jadval. Marjinal samaradorlikni hisoblash natijalari

i	x_i (m³/ga)	y_i (t/ga)	dY / dx
1	1000	2.5	0,0023
2	2000	4.8	0,0021
3	3000	6.9	0,0011
4	4000	8.0	0,0005
5	5000	8.5	

2-jadvaldagi marjinal samaradorlik dY / dx qiymatlari kamayib bormoqda, ya'ni o'zgarmas emas. Agar dY / dx qiymati o'zgarmas bo'lganda hosildorlik va suv miqdori proporsional bo'lar edi. Lekin dY / dx qiymatlari kamayib borishi hosildorlik va suv miqdori o'rtasida to'g'ri proporsionallik yo'qligini ko'rsatadi. Python dasturlash tilida 1-jadvaldagi ma'lumotlar asosida 2-jadvaldagi natijalar va uning 2-rasmdagi grafik natijalari olindi.



2-rasm. Hosildorlikning suv miqdoriga nisbatan o'zgarishi.

Xulosa. Shunday qilib, hosildorlikning suv miqdoriga nisbatan proporsionalligini aniqlashda quyidagi xulosalar olindi: agar regressiya tahlili natijasida chiziqli bog'liqlik aniqlansa, hosildorlik suv miqdoriga proporsional deyish mumkin; agar agronomik modellarda ekinning suvga sezgirligi koeffitsienti qiymati 1 ga yaqin bo'lsa, hosildorlik suvga to'g'ri proporsional bo'lishi ehtimoli yuqori; agar marjinal samaradorlik qiymati o'zgarmas bo'lsa, bu ham proporsionallikning isboti hisoblanadi. Bu natijalar ixtiyoriy o'simliklar va o'simliklarni parvarishlovchi tashkilotlarda suvni tejash va optimal sug'orish strategiyalarini ishlab chiqishda foydalanilishi mumkin.

Adabiyotlar

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REZYUME. Bu maqolada hosildorlikning suv miqdoriga nisbatan proporsionalligini aniqlashning matematik modellari va usullari tahlil etildi. Maqolaning asosiy maqsadi - suv resurslarini samarali foydalanish va hosildorlikni oshirish uchun ilmiy asoslangan yechimlarni taklif etishdir.

РЕЗЮМЕ. В этой статье были проанализированы математические модели и методы для определения пропорциональности урожайности относительно количества воды. Основная цель статьи – предложить научно обоснованные решения для эффективного использования водных ресурсов и повышения урожайности.

SUMMARY. This article analyzes mathematical models and methods for determining the proportionality of yield in relation to the amount of water. The main goal of the article is to propose scientifically grounded solutions for the efficient use of water resources and the increase of yield.

USING ARTIFICIAL INTELLIGENCE TO EVALUATE THE RISKS ASSOCIATED WITH YIELD SHORTAGE

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Chirchik state pedagogical university

Tayanch so'zlar: raqamli iqtisodiyot, qishloq xo'jaligi, noaniq ma'lumotlar, robototexnika, sun'iy yo'ldoshlar, masofadan zondlash qurilmalari, masofaviy datchiklar, tuproq holatini kuzatish.

Ключевые слова: цифровая экономика, сельское хозяйство, неоднозначные данные, робототехника, спутники, средства дистанционного зондирования Земли, дистанционные датчики, мониторинг состояния почвы.

Key words: digital economy, agriculture, ambiguous data, robotics, satellites, remote sensing devices, remote sensors, soil condition monitoring.

Artificial intelligence and data mining technologies Artificial intelligence (AI) refers to automated processes and phenomena that occur in conditions that are nearly optimal and have the potential to improve with the accumulation of a critical mass of statistical data [1; 2]. AI is gaining traction quickly and in large volumes across different sectors of the national economy (different types of economic activity) [3; 4; 5]. This is brought about by the rapid advancement of computer-aided technologies' processing power and the ongoing efforts of experts to identify the optimal course of action for resolving pressing issues [6]. When it comes to precise and dependable assessment and diagnosis (i.e., financial risk assessment, natural and climatic phenomenon evaluation, and disease diagnosis), artificial intelligence has proven to be a more efficient and successful method [4; 7]. When compared to traditional data processing and analysis techniques, this technology produces better forecasting outcomes. At the moment, the implementation of artificial intelligence systems is in its infancy, but the success of such programs, despite the shortcomings of the technology (determining the optimal architecture of simulated artificial neural networks, the need for expensive computer equipment that can cope with labor-intensive computational algorithms, the lack of necessary information libraries and databases), shows better results compared to previously used methods [8; 9; 10]. Computing systems with AI capabilities guarantee more precise, dependable, and effective outcomes.

Data processing, information flow, and knowledge management are all part of the information systems lifecycle management that data mining contributes to. Data mining and artificial intelligence technologies are already being applied in numerous sectors of the national economy. In medicine, they enable prompt and highly accurate diagnosis based on the analysis of copious amounts of ambiguous data. In daily life, these technologies are utilized extensively. Artificial intelligence enables the complete automation of hazardous and damaging production processes in the industrial sector. Artificial intelligence (AI)-driven smart home technology manages alerts, handles transactions, and even makes purchases on an employee's behalf. In agriculture, these technologies are becoming more and more significant.

Artificial intelligence and data mining are used in forecasting. It has been demonstrated in [1-3] that the application of machine learning technology has allowed for the acquisition of precise predictions regarding the likelihood of drought in eastern Australia. Similar outcomes were achieved in Pakistan with a machine-learning model in [4-5]. The application of data mining and artificial intelligence technologies in management decision-making to mitigate the effects of climate hazards and control crop yields is made possible by the continual analytical analysis. The creation of mathematical models is crucial and demands a lot of work in the management of water resources in the agro-industrial sector. The precise assessment of evapotranspiration is a multifaceted undertaking and is necessary for managing agricultural resources and designing irrigation systems in an efficient manner.

Data mining and artificial intelligence technology make it feasible to precisely identify weeds in crops. To identify crop and weed species, a novel approach based on machine learning and hyperspectral imaging techniques was created in [5-7]. With the help of the suggested method, different types of weeds may be accurately identified, which can have a positive economic impact and lower the amount of herbicide treatment required for crops.

We can emphasize the general traits of the agro-industrial complex by summarizing the data on data mining and artificial intelligence technologies utilized in the agro-industrial sector. The agro-industrial complex uses data mining and artificial intelligence technologies that have several noteworthy characteristics, including [8-9]:

- technical solutions, mostly in the form of software-hardware instruments, for carrying out specific activities in the agro-industrial sector, such as forecasting how agriculture would develop in response to several variables (temperature, soil quality, rainfall, and market pricing). Artificial intelligence and data mining technologies are frequently employed in conjunction with robotics, tool selection, and obstacle and object recognition.
- working with large amounts of data in the intellectual analysis of the development strategy of the agro-industrial complex;
- solutions used in agriculture, or in the development of an optimal strategy for managing the agro-industrial complex; - functioning in livestock houses or in open areas, which makes it necessary to orientate in space, often with the recognition of patterns (of various unsorted objects); - the outcomes of these technologies are used when solving intellectual problems in the agro-industrial sector.

With the advent of these technologies, fewer people will be employed in businesses that pose a risk to people and animals, such as those that deal with pesticides, plant spraying, and manure cleanup. As a result, the sector will become more alluring to young professionals.

Artificial intelligence improves managerial decision-making efficiency and raises knowledge levels by offering precise projections of profitability, price, and market hazards. Agro-industrial sector investors are frequently discouraged by significant yield shortage risks, abrupt price swings, etc.

2. Methods.

The predictive yield model is determined as, c/ha:

$$y^T = y^П + \Delta y.$$

When modeling the forecast of cotton yield in a fuzzy environment, we accept the following notation.

P_{kij} - sown area of cotton, ha;

Y_{kij} - cotton yield, c/ha;

μY_{kij} - membership function for cotton yield;

C_{kij} - breeding cotton variety

N_{kij} - introduction of the amount of nitrogen to cotton plant, kg/ha;

μN_{kij} - membership function for the introduced amount of nitrogen to cotton plant.

Potential yield is determined by the following formula

$$\overline{Y}_{kij} = (\sum_{s=1}^{m} \mu^s Y_{kij} Y_{kij}^s / \sum_{r=1}^{m} \mu^r Y_{kij})(1+w_{ki}),$$

where w_{ki} is the coefficient of recovery of crop shortage due to adverse weather conditions and water supply.

This strategy currently has a bright future in the fields of agriculture and the agro-industrial complex because it will actually cause the sector to become more digital.

A thorough examination of the area based on observation materials for soil, erosion, reclamation, geobotany, water management, land management, and other types of surveys comes before the land organization. A qualitative description of agricultural land is compiled using this data.

In order to address the issues of land improvement and transformation, a soil map that includes specific details about each type of soil, such as population density and humus content, must be used.

Research on the economic appraisal of lands and the evaluation of the soil were carried out in [3-6]. These materials can be applied to the land organization. A land cadastral map, which displays agricultural land with all types of soil and evaluates land quality classes determined by the economic assessment's findings, might serve as the beginning point in this situation. Soil variations and their complexes are included in each class; these differ from one another by ten points. Since the economic assessment is typically done using a 100-point rating system, 10 assessment classes that highlight the best, average, and worst lands can be created.

3. Results.

The qualities listed below are:

- a range of options (different cotton plant breeding variants based on soil type and fertilization method);

- feature sets (technological and biological traits that determine the suitable variation to choose);

The experiment was conducted to choose from four breeding varieties S-4727, Tashkent 1, 159-F, 108-F of cotton plant ($X=\{x_1,x_2,...,x_4\}$) the best variety according to the following characteristics ($P=\{p_1,p_2,...,p_4\}$): yield, fiber length, fiber strength, seed oil content [2].

The importance of each feature is given and expressed through fuzzy densities

$$g_1=0,66,\ \mathbf{g_2=0,89},\ \mathbf{g_3}=0,96,\ g_4=0,93$$

$$h_1=0,19,\ h_2=0,21,\ h_3=0,22,\ h_4=0,24$$

$$g_\lambda(x_1,x_2,x_3,x_4)=1.$$

$$g_\lambda(x_1,x_2)=g_1g_2\lambda+g_1+g_2=-0,96\times0,66\times0,89+0,66+0,89=0,99,$$

$$g_\lambda(x_1,x_3)=g_1g_3\lambda+g_1+g_3=-0,96\times0,66\times0,96+0,66+0,96=1,02,$$

$$g_\lambda(x_1,x_4)=g_1g_4\lambda+g_1+g_4=-0,96\times0,66\times0,93+0,66+0,93=1,01,$$

$$g_\lambda(x_2,x_3)=g_2g_3\lambda+g_2+g_3=-0,96\times0,89\times0,96+0,89+0,96=1,03,$$

$$g_\lambda(x_2,x_4)=g_2g_4\lambda+g_2+g_4=-0,96\times0,89\times0,93+0,89+0,93=1,02,$$

$$g_\lambda(x_3,x_4)=g_3g_4\lambda+g_3+g_4=-0,96\times0,96\times0,93+0,96+0,93=1,05,$$

$$h_1=0,19,\ h_2=0,21,\ h_3=0,22,\ h_4=0,24.$$

The 108-F variety is the best among the suggested cotton breeding varieties, according to the ranking results of all breeding varieties, since its degree of participation in the fuzzy set has the biggest value (0.24).

4. Conclusion. The three innovations mentioned in this article—all of which have to do with using artificial intelligence—are starting to make a bigger impact in farming. This is because the agro-industrial complex's current issues are best solved by automating agricultural operations, which enables growing the necessary quantities of food and crops more quickly without running the danger of lowering the end product's quality. The writers went into greater detail to emphasize the following advantages:

the reduction of risks associated with not meeting planned indices or timely appointment and substantiation of new standard values;

the timely implementation of necessary measures to safeguard agricultural and agro-industrial facilities in response to changes in natural and climatic conditions;

the increase in crop yields and animal productivity that will feed the world's growing population;

the reduction of production costs based on the introduction of precise production principles and the collection of operational data for its efficient and automated management;

solving logistics problems that will reduce the number of intermediaries from the manufacturer to the final consumer, which would be reflected in the cost reduction of the consumer product;

the aim is to gradually lessen the scarcity of skilled workers and generate employment opportunities by developing computer systems that facilitate artificial intelligence technologies;

additionally, timely communication of relevant information to agricultural producers and their clients is also a priority.

We conclude by noting that artificial intelligence technologies successfully show up when there is improved quantitative data processing. The evaluated data may also be ill-organized and fragmented at the same time. These include diagnostic data and medical test results in the healthcare business; index dynamics and cash flow in the economy; indicative numbers recorded by air defense systems in the military industry; a single document control in jurisprudence, etc. Artificial intelligence technologies are currently being introduced worldwide in this regard. Agriculture's branches are not an exception because this approach makes it possible to address issues based on combinatorial explosions, which are problems with vast amounts of data that are slow to evaluate and give irrelevant solutions.

These tasks can involve analyzing data from photography, building autonomous humanoid systems that can carry out agricultural duties, and operational analysis of data from videography. As previously mentioned, applying AI technology in this way can help the agro-industrial complex's businesses grow into industry leaders while simultaneously producing more and higher-quality agricultural products.

The work's outcomes systematize knowledge about artificial intelligence technologies that are currently on the market. These technologies have, in one way or another, shown themselves to be effective in solving issues related to agriculture and the agro-industrial complex, and over the next five to seven years, there will be a significant push toward their dissemination. With the introduction of the technologies discussed in the article, their current development enables the economic entity to extract the dominant competitive advantages and the associated considerable economic effect.

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REZYUME. Maqolada qishloq xo‘jaligining noaniq ma’lumotlar bilan ishlashi uchun ko‘plab istiqbollarni taqdim etadigan raqamli iqtisodiyot va tegishli texnologiyalarning paydo bo‘lishi haqida takidlab o‘tilgan. Asosan, maqsad qishloq xo‘jaligi ishchilariga qishloq xo‘jaligi sharoitlarida katta hajmdagi ma’lumotlarni taqdim etuvchi ilg‘or texnologiyalardan foydalanish imkoniyatlari ko‘rib chiqilgan.

РЕЗЮМЕ. В статье освещено появление цифровой экономики и связанных с ней технологий, которые открывают множество перспектив для работы с неопределенными данными в сельском хозяйстве. В основном были рассмотрены возможности использования передовых технологий, обеспечивающих большой объем информации в условиях сельского хозяйства целевым сельхозработникам.

SUMMARY. The article highlights the emergence of the digital economy and related technologies, which provide many perspectives for working with uncertain data in agriculture. Mainly, the possibilities of using advanced technologies that provide were considered a large amount of information in agricultural conditions to the target agricultural workers.

SENSORS FOR DETERMINING MICROCLIMATES IN FRUIT AND VEGETABLE STORAGE FACILITIES

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Tayanch so‘zlar: mikroiqlim sensorlari, meva va sabzavotlarnisaqlash, harorat monitoringi, namlik nazorati, IoT-texnologiyasi, atmosferani boshqariladigan saqlash, oziq-ovqat mahsulotlarini saqlash, energiya tejaydigan sensorlar, qishloq xo‘jaligi innovatsiyasi, oziq-ovqat barqarorligi.

Ключевые слова: датчики микроклимата, хранение фруктов и овощей, мониторинг температуры, контроль влажности, технология IoT, хранение в контролируемой атмосфере, сохранение продуктов питания, энергоэффективные датчики, сельскохозяйственные инновации, продовольственная устойчивость.

Key words: microclimate sensors, fruit and vegetable storage, temperature monitoring, humidity control, IoT technology, controlled atmosphere storage, food preservation, energy-efficient sensors, agricultural innovation, food sustainability.

The storage of fruits and vegetables requires specific environmental conditions to maintain their freshness and quality. Microclimate control in storage warehouses is essential to ensure optimal temperature, humidity, and air quality. Advanced sensors play a crucial role in monitoring and managing these factors.

Sensors for determining microclimates in fruit and vegetable storage facilities are essential for maintaining quality and extending shelf life. These sensors measure temperature, humidity, carbon dioxide, and oxygen levels, directly affecting the preservation of produce. Temperature sensors ensure optimal cooling, while humidity sensors prevent dehydration and fungal growth. Carbon dioxide and oxygen sensors help regulate controlled atmosphere storage, slowing respiration rates and extending freshness. Advanced sensors provide real-time data and enable automated adjustments for efficiency. IoT-enabled sensors allow remote monitoring and alerts for quick action when needed [1]. Energy-efficient and wireless sensors reduce costs and simplify installation. Regular calibration ensures accuracy and reliability. Integrated systems using sensor data improve decision-making and optimize storage conditions. Their versatility makes them suitable for various storage types,

M A Z M U N Í

TÁBIYIY HÁM TEXNIKALÍQ ILIMLER

Fizika. Matematika. Texnika. Informatika

Biologiya. Zoologiya. Ximiya. Ekologiya

Geografiya

JÁMIYETLIK HÁM EKONOMIKALÍQ ILIMLER

Tariyx. Huqıqtanıw. Ruwqıylıq tiykarları

TIL BILIMI HÁM ÁDEBIYATTANÍW

Til bilimi

Ádebiyattanıw