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ECONOMY. ECONOMIC SCIENCE. OTHER BRANCHES OF THE ECONOMY

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ENVIRONMENTAL PROTECTION. WATER MANAGEMENT, HYDROLOGY

IMPROVING THE PERFORMANCE EFFICIENCY OF AGRICULTURAL ORGANIZATIONS USING WATER-SAVING TECHNOLOGIES

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Abstract

Water resources are of great value for the whole world and the economies of all countries, the stock of which has significantly decreased in recent years. Most (about 70 %) of all drinking water reserves are used for irrigation in the agricultural sector. This indicator varies depending on the intensity of consumption in different countries, an increase which indicates an acute shortage of water. Reducing the number of available water resources encourages the use of resource-saving technologies that can significantly reduce water waste. World experience shows that over the past decades there have been qualitative changes in resource-saving technologies that allow collecting, storing, and recharging water resources. Also important is the option of using alternative water sources, which have already become a replacement and there as on for the increase in traditional water sources. The article discusses alternative water sources and their use in countries with water shortages.

Key words: *alternative water sources, water shortage, desalinated seawater, rainwater harvesting, reclaimed water, irrigation.*

Introduction. The territory of the Republic of Uzbekistan is located in the arid zone and is separated from the outlet of the sea, which makes acutely feel the shortage of water resources. In the Republic of Uzbekistan, the main water sources for agriculture are two transboundary rivers Amudarya and Syrdarya. The total annual water consumption in Uzbekistan averages 51 km^3, of which about 46.8 km^3 or 90 % is used in agriculture [1]. But even with such a volume of water, the need for it in agriculture cannot be fully satisfied. Accordingto FAO data [2], Uzbekistan consumes 169 % of the country's water reserves. Experts assess the level of pressure on water resources in Uzbekistan as critical.

These indicators tend to increase, as the population of the country is growing from year to year, therefore, the need for drinking water and agricultural products is increasing, for the cultivation of which water is essential. Climate change significantly affects these indicators too.

Under modern conditions, resource-saving technologies are becoming increasingly relevant all over the world, in this case, water-saving technologies that allow efficient use of water resources. The FAO notes that in the period from 2015 to 2018, the indicator of the efficiency of water use in the world increased by 9 % [2]. These positive changes have occurred mainly due to the industrial production sector. In 86 countries, the FAO notes, in the period from 2006 to 2018, the efficiency of the use of water resources in agriculture also increased [2]. Techniques for sustainable water supply in agriculture include organic farming practices which limit substances that would contaminate water, efficient water delivery, micro-irrigation systems, adapted water-lifting technologies, zero tillage, rain water harvesting, runoff farming, and drip irrigation. Drip irrigation, sprinkler irrigation, and pulsar system technologies are being actively introduced in Uzbekistan to prevent irrational use of water, which significantly reduces water waste and increases the efficiency of its use. Despite such excellent results, under conditions of water shortage, other sources of water should be also considered.

Alternative water sources (AWS), such as rainwater harvesting, reclaimed water, desalination, and others, are of great interest. While not strictly saving water, they can reduce the pressure on water bodies and the public water supply at critical times. Benefits include reducing reliance on rivers and wells, reducing water bills from water distribution systems, and saving the costs of wastewater treatment facilities.

Materials and Methods. 1. Desalinated seawater (DSW). In many parts of the world where freshwater of good quality was scarce or not available for irrigation, there was used seawater, which is abundant in coastal areas. In the long run, irrigation with brackish and saline water produces soil salinization unless a supplementary volume of water is applied to leachthe added salts from the root zone [3]. To reduce water consumption and improve the productivity of salt-sensitive crops desalinated water was considered a good, but still a high-cost alternative.

Desalination is the process of converting saline water into potable water by removing salts and other solids from seawater and brackish water. The technologies used in desalination are divided into two main groups – thermal and membrane [4]. Thermal technologies use the process of condensation of water vapor separated from sea salt by boiling. Thermal technologies include multi-stage flash distillation, multi-effect distillation, vapour compression distillation, and solar distillation [4].

Membrane technologies involve a semi-permeable barrier and driving force to the process of desalination. They include reverse osmosis (RO), electro-dialysis (ED), nanofiltration, ultrafiltration, and microfiltration. The most used method is reverse osmosis (RO), which produces 69% of all desalinated water and its high productivity is one of its advantages over other technologies [5]. Reverse osmosis concentrates salts in seawater under high pressure and forces the water to pass through a semi-permeable membrane, leaving behind salts and other residues. RO technology is listed as the most promising among membrane techniques because it removes smaller contaminants – including some pharmaceutical compounds – and carries a smaller carbon footprint than many other desalination technologies [6].

Solar energy may also be used to produce water vapour, which is then condensed on a cooler surface to form the desalinated water [7]. However, this process produces only a small amount of water and is generally ignored as a technological solution [7].

The costs of desalinated water are high enough that its major use is urban rather than in irrigated agriculture [7]. Desalination of seawater is one of the main alternatives for the substitution of water shortage in the Arabian Gulf countries and other countries [8], where DSW is consumed mostly for urban use. Although desalinating the seawater is costly, it is still an important option for compensating for the

water shortage [8].

About 16,000 desalinating plants have been created worldwide, which emit 95.4 million m^3 of desalinated water per day and the majority (47.5%) falls on the countries of the Middle East and North Africa [5]. These countries produce 45.32 million m^3 of desalinated water, while in the USA only 10.91 million m^3 [5].

Desalination sets its standards depending on the final consumption, whether it is drinking or irrigation. Less stringent standards are set for irrigation than for drinking, and, consequently, less energy is spent on desalination for irrigation. One of the countries actively using this method since 1967 is Spain, 22% of the irrigated waters of which are desalinated [7]. In terms of the use of desalinated water in agriculture, Spain ranks first [3]. The desalination plant with a maximum production capacity of 145,000 m^3 per day, located in south-eastern Spain, is the most powerful in all of Europe [9].

Initial experiences with DSW for crop irrigation have highlighted its main strengths [10]:

1. it is an unlimited agricultural water supply, which additionally provides drought risk-buffering value;
2. its low salinity can produce significant increases in the quality and quantity of crop yields, especially when replacing low-quality water supplies in water-stressed regions;
3. the replacement of traditional water sources with DSW provides new water policies and water management options.

The principal concerns are [10]:

1. the high energy consumption, which results in considerably higher costs than for other water supply options;
2. the boron concentration, which is above the threshold for sensitive crops, implying toxicity risks;
3. the exacerbation of the water-energy nexus in DSW production, i.e., high greenhouse gas emissions that feed the climate change processes.

The main economic constraints on desalinating seawater are the repayment of the investment and energy consumption [3]. However, with the improvement of desalination technologies, especially recently RO, the price and energy consumed fell, which made desalination more affordable for the agricultural sector.

Currently, the main problem of the desalination industry from an ecological point of view is brine, which is thrown into the sea or collected on land after receiving fresh water from the saline one. Recent research has focused on studying and solving the problems of the impact of brine on the environment. Despite the apparent negative effects of desalination, the positive opinions of scientists are based on the fact that in the current situation with a shortage of water resources, it is better to continue desalinating seawater than using water with high salinity, which has toxic effects and depleting the remaining freshwater.

1. Rainwater harvesting (RWH)

The term 'water harvesting' generally refers to the collection of rainstorm-generated runoff from a particular area (a catchment) in order to provide water for human, animal, or crop use [11]. The collected water can be used immediately for its intended purpose or stored in reservoirs and disposed of later at the required time. Water harvesting is an ancient method of providing freshwater, especially in areas much distant from rivers and lakes. Water harvesting divides into 4 main groups: fog harvesting, rainwater harvesting, floodwater harvesting, and groundwater harvesting [12].

The techniques of rainwater harvesting (RWH) can serve the following purposes [12] see Figure 1:

One of the ancient methods of collecting rainwater was the construction of a dug well, into which water flowed after the rain through a specially dug trench and dams in a small open area, since it was a difficult task to control runoff on a large area. The modern ones have been invented and improved on the basis of the ancient ones and are more efficient in comparison.

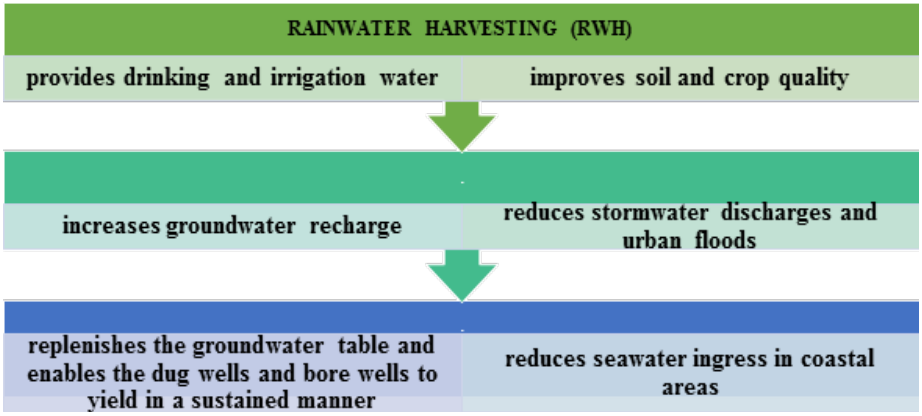

Figure 1. Rainwater harvesting (RWH)

The simplest, though generally most expensive,way to induce runoff is to cover the surface with animpervious apron of such materials as plastic, rubber,or aluminum sheeting, or by asphalt or concretepaving [11]. A possibly more economical approach is tocause the soil itself to shed, rather than absorb the rain [11] and thus direct the water into the reservoir. Such a method contributes to the preservation of a larger amount of water unlike the ancient one, in which water could be absorbed and go underground, so other outdoor areas had to be taken into account.

But these methods are more related to floodwater harvesting, while rainwater harvesting in the modern sense mainly refers to the collection of water from rooftops and roof-like surfaces. Despite the name, all methods are aimed at collecting rainwater and nothing else.

The rainwater collection system consists of the following main elements (Figure 2):

1. a catchment area, from the surface of which rainwater can be collected. The simplest ones are rooftop, vessels at the edge of the roof, or any other outdoor area;
2. gutters and downspouts, with which the collected water is poured from the catchment areas into the reservoirs, and

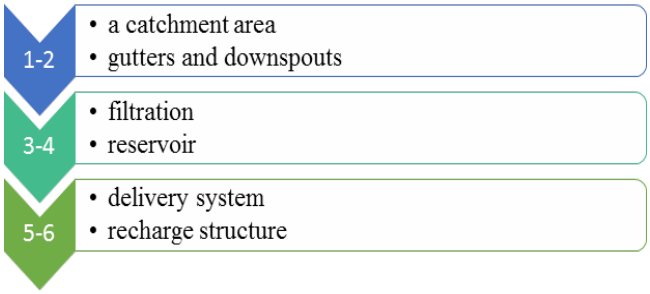

Figure 2. The rainwater collection system

before getting into the reservoir, the water is filtered and pretreated;

3. a filtration, consisting of several stages, each of which is aimed at removing solid particles, biological and chemical substances from the composition of water;

4. a reservoir that can serve as a cistern and storage tank;

5. delivery system, with which the collected water is delivered for final consumption;

6. recharge structure in the form of dugwell,borewells can fill groundwater aquifers.

To prevent water shortages in many countries, houses have been equipped with a rainwater collection system. In the cities of Brazil, for example, in 2003, a program was introduced to provide 1 million homes with RWH system, which includes a catchment tank with a capacity of 16,000 liters. By 2015, there were 578,336 catchment systems in operation [13]. Also, many large structures, such as the Velodrome in the London Olympic Park, UK, are equipped with an RWH system.

2. Reclaimed water (RW)

Water reclamation has the same technical feature that is inherent in both desalination and rainwaterharvesting, that is, it processes, filters and makes the water more suitable for use with a minimal negative effect, but the raw material for it is wastewater. Reclaimed water (RW), also treated or cleaned wastewater, is the end product of the reclamation process.

Water reclamation is the process of multi-stage advanced purification of used industrial, municipal, and domestic water for further potable and non-potable consumption. Even though recently RW has become popular for drinking, its importance for non-drinking purposes, such as irrigation, is very great. Reclaimed water may even improve agricultural productivity owing to the high nutrient content and reducing costs spent on fertilizer while still producing a high crop yield [6]. According to the research of Carr et al [14] in Jordan, the plant-beneficial nutrients that water was tested for were potassium, phosphate, sulphate, and magnesium, and barley was the test crop being grown at each research site.

The options for sustainable reuse projects are related to the quality of the effluent, and the environmental risk associated with land application for a variety of crops and activities [15]. Even though the soil capacity to attenuate contaminants is taken into account, quality requirements of the treated wastewater used for irrigation purposes have to be met [15].

The most important criteria for evaluation of the treated wastewater are as follows [15]:

1. Salinity (especially important in arid zones). In the semi-arid areas, in soils irrigated with high salinity wastewater decreased plant growth, a decline of crop yield which occurs gradually allowing crop selection, and limited oxygenation were observed [16];

2. Heavy metals and harmful organic substances. In small concentrations, heavy metals like Cd, Cr and Ni are useful nutrients for crops, but in higher concentrations, they can be toxic to vegetables and fodder crops due to their high uptake rates [16];

3. Pathogenic germs. People are exposed to pathogens by direct contact with the contaminated water (accidental ingestion, inhalation, or dermal contact) prior, during, or after irrigation [16], which can lead to serious diseases.

To bring the composition of wastewater to the quality that would meet the requirements for the use of treated wastewater for irrigation purposes, various combinations of wastewater treatment methods are used. The general wastewater treatment process includes the following steps:

1. Preliminary treatment. As a conventional treatment, it is commonly followed by membrane separation of large debris and heavy inorganic materials;

2. Primary treatment. This process consists of precipitating readily settleable solids at the bottom of the container and allowing lighter materials to float on the surface of the water. It includes anaerobic digestion, activated sludge and etc.;

3. Secondary treatment. This process is a type of biological treatment that removes suspended solids, colored substances, odors, bacteria, and most viruses. It includes microfiltration, various ultrafiltration techniques, sand filters, ozonation, biological active filters, granulated active carbon filter, UV and chlorination [17];

4. Tertiary treatment and disinfection. It represents an additional treatment that removes residual phosphorus, nitrogen and pathogenic concentration in the final effluent.

In recent years, wastewater treatment methods have been improved at various stages of purification, which has made water reclamation more efficient and economically affordable in the price and quantity of the final treatment product. For example, in 2012, a wastewater treatment plant with a capacity of 250,000 m^3 per day was introduced in New Cairo, Egypt [18]. Almost 10 years later, in 2021, The Bahr el Baqar purification plant was inaugurated in Egypt with a daily production capacity of 5.6 million m3 [19].

Results. In the context of climate change and the reduction of traditional water sources around the world, measures are being taken to improve methods of obtaining water and reduce pressure on water resources. According to Statista [20], the Central Asian countries were given high ratings due to the risk of drought (Figure 3).

According to AQUASTAT [21], Uzbekistan ranks first in terms of the amount of water consumed for irrigation among the countries of Central Asia. The lack of implementation of high-tech methods of water conservation is one of the reasons for the pressure on its water sources, as mentioned earlier (Figure 4).

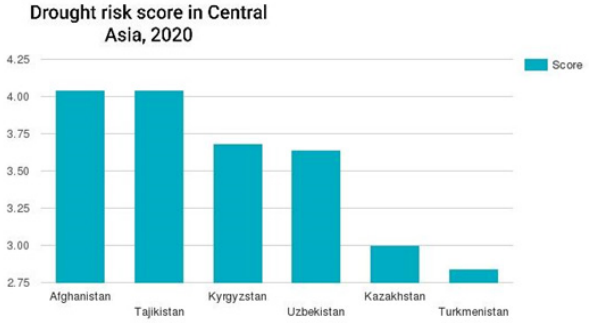

Figure 3. Drought risk score in Central Asia. Source: Statista [20]

Desalination is the most expensive of the alternatives presented in this article. But despite the cost, it is this source that has the greatest chance of replenishing the missing resources. An important feature of desalination is its material – seawater, which covers most of the earth. In the conditions of Uzbekistan, the use of desalination is extremely difficult, if it is even possible. The cost of training specialists and the latest technology, and since the country has no access to the sea, the lack of basic material makes this technology very expensive. However, when considering AWS, a long-term perspective is required, in which many costs

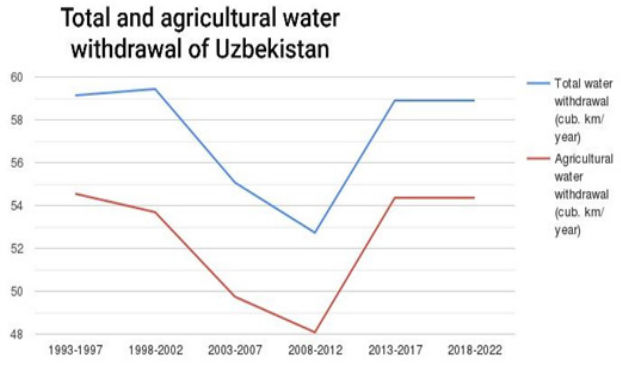

Figure 4. Total and agricultural water withdrawal of Uzbekistan. Source: AQUASTAT[21]

will pay off, and the ability to reduce the cost of agricultural products will grow, which will increase the profit and incentive of agricultural organizations. A striking example is the installation in Kazakhstan with a capacity of more than 70,000 m^3 per day [22].

Rainwater harvesting seems to be a more available way of obtaining water for agricultural needs, unlike desalination of seawater from a financial point of view. The only obstacle is the variability of the weather, which is difficult to predict. Therefore, RWH is considered a relatively unreliable source of water, especially in arid regions. However, in the example of Uzbekistan, it is worth noting that after 2-3 years of drought and summer heat comes a period of heavy rains throughout the country. Even with an average rainfall of 200-300 mm per year, an impressive amount of rainwater can be collected. According to an estimate, for an average rainfall of 1000 mm, approximately 4 million liters of rainwater can be collected in a year from an acre of land (i.e. 4046 m2) [23]. According to D. Hillel, in a desert with seasonal rainfall of 250 mm, 200 thousand m^3 of water can be obtained per square kilometer of treated area [11]. In this case, RWH can be of great importance.

Another feature of our country is that in many large cities there is an ariq network, which is a network of ditches running along roads throughout the city. This network was historically intended for providing drinking water to the population, and later in the 20th century it was used to divert rain, remaining water from watering lawns, etc. Unfortunately, at present this network has turned into a channel in which garbage and sand are clogged, which prevents the flow of water from flowing further. The water accumulated in the ditch during the rain causes serious flooding.

The use of an ariq network to collect rain from cities and towns would greatly contribute to the transformation of the RWH method into the main replacement of fresh water for irrigation in Uzbekistan.

Water reclamation, as well as RWH, is an affordable method of obtaining water for irrigation purposes. The infrastructure of Uzbekistan is more adapted to the requirements of the RW method, since, unlike RWH and DSW, there are technologies for primary wastewater treatment in the country. The introduction of the latest technologies and methods for purification will allow the use of high-quality reclaimed water for agriculture. Uzbekistan's data for 2020 are presented in Table 1 to consider the possibilities of using RW technologies.

Table 1

Water use indicatrors

Total domestic water use	*963 million m^3/year*
Proportion of domestic water use converted into generated wastewater	*80 %*
Total generated household wastewater	*770 million m^3/year*
Proportion of sewer wastewater safely treated at treatment plants	*79,1 %*
Volume of household wastewater collected (total)	*313,9 million m^3/year*
Volume of safely treated household wastewater (total)	*248,6 million m^3/year*
Proportion of safely treated household wastewater	*32,3 %*

Source: WHO, UN-HABITAT [24]

As can be seen from Table 1, the proportion of safely treated household wastewater is only 32%, which indicates the need to improve the treatment technology. However, Uzbekistan's potential is huge. An impressive amount of wastewater produced by households will significantly reduce agricultural costs, and the advantages of reclaimed water will have a good effect on soil productivity and the cost of final products.

Conclusion. The shortage of drinking water around the world encourages the improvement of water-saving technologies, the effectiveness of which will help significantly reduce the pressure on the main sources of drinking water. Increasing water reserves in the context of demographic growth will provide an increasing population with sufficient water and agricultural products.

Alternative sources of water within the framework of increasing the economic efficiency of resource use make it possible to overcome the challenges of technological progress of agriculture in Uzbekistan.

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IMPROVING OF THE EMPLOYMENT EFFICIENCY THROUGH MODERNIZATION OF THE COCOON PROCESSING ENTERPRISES IN NAMANGAN REGION

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Abstract

In article stated that the modernization of the cocoon processing enterprise in the silk industry in Namangan region. Considered the current state of permanent and seasonal employment in a sector itself. Therefore, analyzed modernized facilities and volumes of the attracting investment in the silk industry. Given recommendations for the effective improving of the employment efficiency at the cocoon processing enterprise in Namangan region.

Keywords: *silk industry, sericulture, cocoon processing enterprise, modernization, investment, creating new jobs, permanent and seasonal workers*

Introduction. Demand for silk raw materials, especially silk products is growing in the world market. In accordance to International Sericulture Commission, in recent years, about 153,000 tons of cocoon raw materials have been grown in the world. For instance, intensive cultivation of cocoons is mainly due to the Republic of China (104 thousand tons), India (29.2 thousand tons) as well as the third country Uzbekistan (21,4 tons). We think that the demand for silk products is expected to increase in the future according to the rapid growth of the world's population [1].

At present day, in agriculture complex of the Republic of Uzbekistan, especially, sericulture is one of the special branches. Our country ranks along quintuples of the producers of silk-product in the world and certainly, this is connected with presence raw materials resource. In our country is carried out transition on cluster system on agricultural branches. The head of the state of our country has especially paid attention to step by step to proceed on cluster ʻs method on silk branches and the organizations of manufacture.

In the initiative of the President of the Republic of Uzbekistan Sh. Mirziyoyev issues of clustering of important sectors of our economy have risen to the level of state policy. One of the important tasks is to establish a silk cluster in the market condition through the rapid development of the cocoon industry, the introduction of a cluster system that covers the entire technological chain from the process of growing cocoons to its sale [2].

As we know, sericulture suggest that a good deal of competitive advantage lies outside companies and even outside their industries, residing instead in the locations at which their business units are based.

Materials and Methods. In this article is used the laws of the Republic of Uzbekistan, the resolution of the President of the Republic of Uzbekistan. Analyzed problems that occurred in silk industry. As a methodology of research observation methods were used.

Nowadays, all the legal resolutions for the organization of clusters and organizational and economic conditions are created by our state. For instance, over the four years, several resolutions are signed by President of our country. For instance, Resolution of the President of the Republic Uzbekistan №. PP-2856«On Measures to Establish Activity of the Association of "Uzbekipaksanoat" in 2017, Resolution of the President of the Republic Uzbekistan. №. PP-4047 "On Additional Measures to Support the Accelerated Development of the Silk Industry in the Republic of Uzbekistan in 2018, Resolution of the President of the Republic Uzbekistan №. PP-4441 "The further development of sericulture and deep processing of production" in 2019, Resolution of the President of the Republic Uzbekistan №. PP-4567 "On additional measures to develop the silkworm feed base in the silkworm industry" in 2020. These resolutions will be make opportunities to increase and establish of the silk industry [3].

The silk industry permits us to examine impact of foreign trade from export side. Rather than suffering under a competitive disadvantage, silk industry benefited from considerable advantages not only its previous experience and technological skill but also an expanding world market [4].

In order to improve employment efficiency at the cocoon processing enterprise and to maintain the Uzbek silk and its relatively free world market, it have to modernize. Although "modernization" can be defined in narrow technological terms, it may be intended to change the production structure of the enterprise or to improve product quality by converting to a new production method or by improving the comprehensiveness of the use of raw materials.

Data collection. Currently, the development of a competitive environment in the markets through the establishment of regional clusters in Namangan region that formation of new competitive structures and enhances the competitiveness of cluster-based enterprises. When organize, cocoon processing enterprises, the main focus is on microeconomic factors which efficient use of natural resources by local enterprises, highly skilled workforce, maximum use of public and innovative infrastructure services and opportunities for attracting investments will be created.

The farms engaged in the production of alive cocoons, cocoon processing enterprise, silkworm enterprises and other silk goods producing enterprises have sufficient potential, there are opportunity to combine the activities of these economic entities on the basis of a cluster system in Namangan region.

In our opinion, one of the main goals are the development of the formation of new enterprises in the silk industry, equipped with modern techniques, strengthening the industry's food supply, introduction of effective methods of silkworm care and production of quality cocoons, application of innovations in production of the product creation and export them (Figure 1).

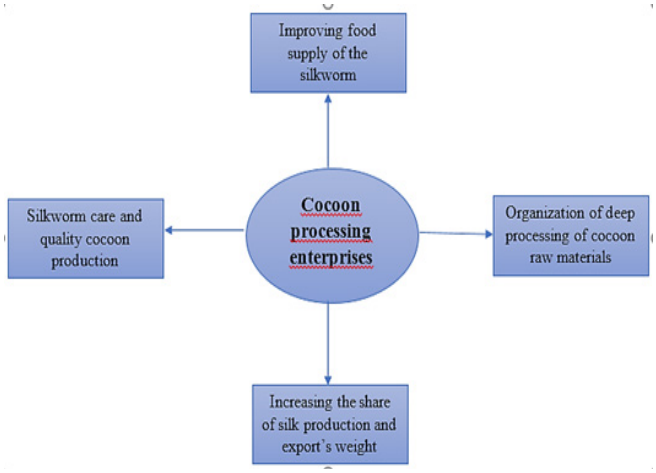

Figure 1. Production system based on an integrated technological chain in the cocoon processing enterprises

According to the "Namangan Agropilla" department's materials [8], in the past decline of economic efficiency of the silk industry can be inferred as follows:

First of all, the used of obsolete equipment in the enterprises of the silk industry. Secondly, in recently years the fodder base of the sericulture in Namangan region has decreased. In 2018, the amount of mulberry trees were 5897,7 mln. In addition, 2804,0 hectares of mulberry plantations. The following year, food supply continued falling down. In 2020, the volume of the mulberry trees got to 3723,3 mln. as well as mulberry plantation 2854,0 of mln.ha. The fodder base of the sericulture decrease by 68 % compared to 2017.

- insufficient supply of cocoon raw materials at the cocoon processing enterprises;
- higher production costs that effects profitability of the cocoon processing enterprises;
- insufficient silkworm seeds in producing by silkworm enterprises;
- low level of motivation of the population and workers to participate in the cocoon season by enterprises and etc.

In our opinion, indicated factors will be worse effect to development of the cocoon processing enterprises in Namangan region, especially, fodder base of sericulture industry. We think that there will be to create a market mechanism by increasing the mulberry leaf and its productivity which is a source of food for the silk industry, actually, to create new business opportunities for additional income through the production and sale of mulberry leaves in sericulture industry.

Analyses and Results. Nowadays, cocoon processing enterprises have been gradually transferred to the cluster method of production organization. This is stipulated by the presidential decree on measures for the further development of the silk industry in Uzbekistan. Enterprises belonging to the "Uzbekipaksanoat" Association will receive benefits and preferences for the period from 2018 to 2023. Their goal is to modernize production facilities, increase the volume of competitive and export-oriented products, and create a sufficient fodder and raw materials base in the country.

Namangan region is one of the regions of Uzbekistan, located in the southern part of the Fergana Valley. It is known for textile and light industry and other branches of productions. Namangan region plays significant role in the agriculture, especially sericulture industry.

Sericulture can help keeping the rural population employed and to prevent migration to big cities and securing remunerative employment; it requires small investments while providing raw material for textile industries [5]. Besides, year after year the permanent and seasonal workers increase in the rural areas of the Namangan region. (Figure 2)

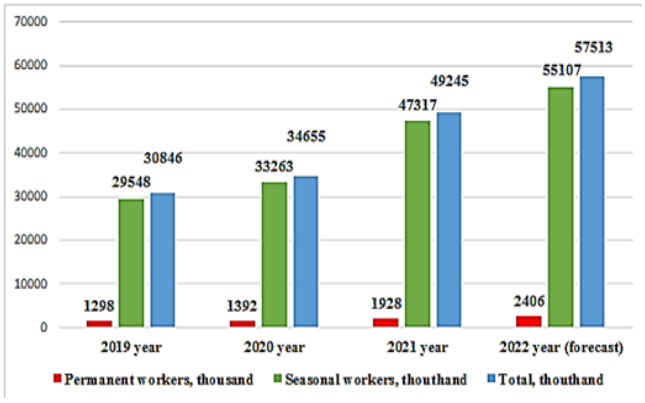

Figure 2. Employment indicators of the silk industry in Namangan region.

Source: The diagram is prepared on the basic of the Department of "Namangan Agropilla" materials.

Discussion. Recently years, significant progress has been made in the areas of Namangan region. According to the Department of "Namangan Agropilla" materials, there were 1298 thousand permanent workers and 29548 thousand seasonal workers were provided on the silk sector in the region in 2019. Thus, in 2020 the amount of the people increased to 1392 thousand permanents and 33263 thousand seasonal workers. The following year, there were 1928 thousand permanent workers at the silkworm and cocoon processing enterprises and 47,317 thousand people during the cocoon season [6].

At present time, there are six silk cocoon enterprises which play an important role in the silk industry of the Namangan region as well as manage cluster method to the organization structure. They have great potential for the production of silk raw and silk fabrics. They are:

-"Verigrowipagi" foreign private enterprise;
-"Golden silk" foreign factory;
-"Fabric Tex" silk cocoon processing enterprise;
-"Marjon tola fayz" silk cocoon processing enterprise;
-"Zilol silk" silk cocoon processing enterprise;
- "Raw silk" silk cocoon processing enterprise;
- "Sof ipak invest" Silkworm breeding factories.

The government especially pay attention to modernize silk enterprise and factories. For instance, the total investments 50.7 million US dollars were attracted to the silk sector that foreign direct investment amounted to 20.4 million US dollars in 2019. In the end of the year, 57 enterprises were fully modernized for technical and technological re-equipment. Due to the modernization of the silk sector which 14.5 thousand permanent and 410.8 thousand seasonal jobs were created in 2020. Last 2021, the total volume of attracted investments in the silk industry amounted to 68.1 million US dollars that was 134% more than last year. Particularly, foreign direct investments were 33.1 million US dollars [7].

In our opinion, any enterprise is faced with the problem of falling profitability. If this factor is not calculated in advance, management may be faced with the fact that the only option is liquidation of the factory. This can be avoided

with timely modernization of the company or expansion of investment activities. Therefore, modernization of the factories will help to contribute not only developing of production capacity of the silk cluster enterprises, but also creating new jobs for rural people who live in the country.

In our opinion, in the effective development of the silk industry in Namangan region, first of all, it is important to provide the necessary food supply and the supply of quality cocoon raw materials to enterprises. As a result, silk processing plants will be able to operate at full capacity. This, in turn, affects the increase in the volume of silk products.

Conclusion. Any cocoon processing enterprises are faced with the problem of falling profitability. If this factor is not calculated in advance, management may be faced with the fact that the only option is liquidation of the enterprise. In a future, we have to following these steps.

Thus:

-this can be avoided with timely modernization of the cocoon processing enterprises or expansion of investment activities;

-modernization of the cocoon processing enterprises will help to contribute not only developing of production capacity of the enterprises, but also creating new jobs for rural people who live in the country.

-introduce modern and innovative technologies in the process of cocoon processing enterprises;

-increase production and export of silk products and attract foreign direct investment in cocoon processing enterprises;

-the level of supply of sufficient cocoon raw materials to cocoon processing enterprises will increase and profitability will increase;

-further promotes the effective development of the cocoon processing enterprises in Namangan region.

In a conclusion, today Namangan region is taking consistent measures to develop the silk industry, introduce modern and innovative technologies in the process of growing and processing silkworm cocoons, increase production and export of silk products and attract foreign direct investment in the silk sector.

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STUDYING THE CONCEPT AND ESSENCE OF THE ECONOMIC EFFICIENCY OF FISH PRODUCTION

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Abstract

This article gives information about concept and essence of the economic efficiency of fish production. Moreover, the article discusses the opinions and views of a number of foreign and domestic economists on ways to improve the economic efficiency of fish farming. Performance indicators were recommended in the economic evaluation of fish farming. The directions of the state support of the industry were also recommended and classification of factors affecting the efficiency of fish farming were analyzed.

Key words: *intensive fish farming, economic efficiency, state support, cost calculation effectiveness, commercial fisheries, resource-saving technologies.*

Introduction. The ultimate goal of any production is to obtain economic results. To determine the efficiency of production activity, it is necessary to consider the economic effect of the activity in relation to its costs, therefore, an important condition for production activity is to determine its economic efficiency. For a deep and detailed study of the issue, it is very important to carefully analyze the concept of "economic efficiency".

In foreign and domestic literature there are different explanations of the essence of economic efficiency. The description of this concept was first given in the work "Economic Table" by the physiocrat F. Keane, and the term "efficiency" was first used in the work "The Theory of Comparative Advantage" by D. Ricardo.

Representatives of the classical school of economics expressed the opinion that economic efficiency can be achieved only in market conditions, in conditions of private ownership, where each owner (private entrepreneur) seeks to save available resources. Further development of the concept of efficiency is reflected in the works of the neoclassical economic school. For example, Arthur Pigou describes the concept of national income in his Welfare Economics. According to him, overall productivity is determined by national income, which in turn is a measure of overall welfare [1].

Among the researchers involved in the achievement of well-being (efficiency), the representatives of the Lausanne school Leon Valras and Vilfedo Pareto stand out. In his work on the theory of general economic equilibrium, L. Walras tried to reveal the general principles of a market economy, he explains the conditions for maximizing utility, which is one of the achievements in the study of economic efficiency [2]. The principles of the theory of general economic equilibrium by L. Walras were further developed in the works of V. Pareto, another representative of the Lausanne school of economics. The theory of welfare (efficiency) is the theory of the economic frontier, that is, the task of the theory is the optimal distribution of economic resources and output. Thus, V. Pareto emphasized that optimal economic decisions ensure the efficiency of economic activity. The Pareto principles formed the basis of the modern mathematical theory of welfare economics (efficiency) [3]. Ludwig von Mises was a supporter of the ideas of V. Pareto, who recognized that maximum efficiency cannot be achieved with central planning in the economy.

Literature review. The founder of the statehood theory and one of the supporters of the monarchy was the English scientist T. Hobbes, who emphasized that the most important tasks of the government are efficiency, legislation, order, and, above all, peacekeeping. The thinker was convinced that indifference is required when choosing a form of government. Any reforms to improve the situation will lead to anarchy and civil war [4]. Studying the theory of Western scientists, it should be noted that the views of T. Hobbes and V. Pareto correspond to the views on efficiency, therefore, in the theory of values, they substantiated their reasoning, assigning the leading role to individuals. Both Hobbes and Pareto rejected the possibility of common interests and the need to compare the economic situation of individuals.

Thus, V.Pareto's concept is agreement with the uncertainty of public welfare, agreement with the inequality of personal values (Pareto's principle of rationality).

It can be said that the situation in which the production potential of the economy is used to the maximum leads to the greatest efficiency, and the best results cannot be achieved with the same resources. This conclusion was made by the famous economist M.Alla. She says: "... the maximum level of efficiency corresponds to the limit of the set of conditions that can be achieved using the resources and knowledge of society, using a set of unattainable conditions. Any state below this limit is inefficient, any state above the limit is impossible, and all conditions within the limit meet the general goal of maximum efficiency [5].

Modern economic sciences do not stop at determining efficiency; various scientific articles and scientific works are now available for study, confirming the versatility and depth of this category and the importance of its disclosure. In the definition of economic efficiency, which is given in the encyclopedic dictionary as "Capital", we can say that this is one of the aspects of production.

In a broader sense, economic efficiency is the same as the efficiency of the allocation of resources in the economy, the volume of production of goods and services occurs in full, reflecting consumer preferences for these goods and services, and certain goods and services are produced at appropriate minimum prices or the efficiency of economic activity, economic programs and activities, achieving the greatest volume of production using specific cost resources [6].

Many authors deal with the definition of economic efficiency. A.V.Khomutetskaya defines this category as the efficiency of using resources to achieve a specific goal. In simple words, efficiency means achieving excellent results with minimal effort. But when you delve into the problem, the concept of efficiency loses its transparency, becomes relative and difficult to quantify. This is where new concepts such as economic efficiency and management efficiency come in, and it is necessary to understand the difference between them. Economic efficiency (production efficiency) is the ratio between the costs of the production process and the useful result [7].

The efficiency indicator is the most important indicator in the development of the economy of the state and an individual enterprise, in addition, the final costs are expressed in the form of predetermined fixed and working capital, and the final results are expressed in the form of profits. The economic efficiency of an enterprise is discussed only from the point of view of making correct, qualified management decisions, and a comparison of costs and results is used to justify management decisions [8, 9].

Materials and Methods. To determine the efficiency of the economy, based on the foregoing, research scientists pay great attention to the resource composition of the category under study. In addition, resources, in their opinion, do not independently affect economic efficiency, they are affected by their optimal use, and in general it is carried out together with the efficiency of managerial, production, technical and other processes (Figure 1).

Efficiency should preferably be taken into account in the context of individual sectors. Here, the analysis of fish farming in the operating fish farms of the regions showed us that there are opportunities to increase the economic efficiency of the production of fish transfer materials and marketable fish in the conditions of cooperation between fish farms and nurseries.

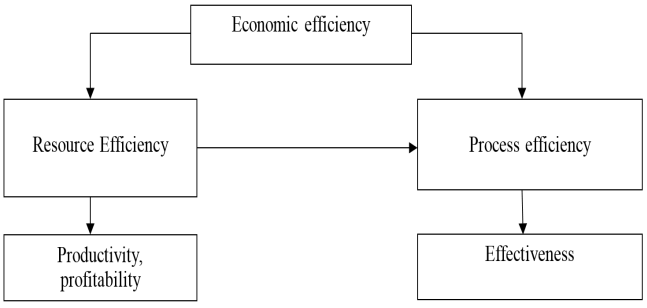

Figure 1. The composition of the category "Economic efficiency" [10]

Such cooperation allows fish farms to keep fish in fish farms for future breeding, and local quality fish transplant material reduces transportation costs, increases the volume of fish transplant material, reduces the cost of production, which allows products to be competitive and available throughout the year. These measures will give an additional impetus to improving the economic efficiency of commercial fisheries.

The indicator of economic efficiency for the fishing industry will be specified and will have a number of specific characteristics. Here are some authors, E.V. Levkina, M.E. Vasilenko, having considered the effectiveness of the fishing industry, came to the conclusion that this indicator reflects the efficiency of fish production, and also shows the level of development of the fishery complex of the country or region [11]. According to scientists, efficiency can be classified according to characteristics, more precisely, it is divided into indicators of economic and social efficiency according to its structure; according to the nature of the object assessment, it is divided into full and local, and depending on the purpose of use - into planned, practical and normative (Table 1).

Table 1

Classification of effectiveness by features [11]

According to the composition			
Economical		Social	
Object evaluation function			
Full		Local	
Intended use			
Planned	Practical	Normative	
Calculation method			
Абсольют		Comparison	
Generalization level			
Economy as a whole	Network	Enterprise	Structural division
Object of assessment			
Production and economic activity of the enterprise	Economic processes	Elements of business processes (operations, processes, contracts, agreements, etc.)	Individual production and economic solutions in the field of production and management

When evaluating intensification, one should take into account the increase in costs relative to production factors that increase the fish productivity of water bodies and commercial fish catches. The level of intensification of lake commercial fisheries is represented by the following indicators [12]:

- average annual values of fixed production assets in fisheries;
- average annual values of fixed production assets used in the cultivation, fishing and processing of lake fish;
- cost of the most efficient means of production;
- production costs;
- lake fertilization costs;
- costs for the mechanization of production processes in fish farming and fishing;
- the ratio of intensively managed water bodies to the total area of lakes in the water sector.

Cost calculation plays an important role in determining the effectiveness of fish farming.

It should be noted that the real cost as an economic indicator in determining the efficiency of the fish farming allows for an accurate assessment of the effectiveness, taking into account the influence of external factors. Thus, the real cost of 1 centner of commercial fish is calculated according to the following formula [13]:

$$RC_{cf} = MV_{cf} - DC_{cf} - SEC_{cf}, \quad (1)$$

Here, MV_{cf} – the market value of 1 centner of commercial fish, sum;

DC_{cf} – costs associated with the delivery of 1 centner of fish to the nearest (operating) market, sum;

SEC_{cf} – Estimated costs for the sale of 1 centner of marketable fish, sum.

Currently, fish production complexes are faced with the task of organizing the most optimal production and achieving high performance results. To do this, it is necessary to analyze the factors affecting the efficiency of fish farming and draw the appropriate conclusions (Table 2).

According to O. Ponomareva, several factors influence the activity and efficiency of fish farming (Figure 2):

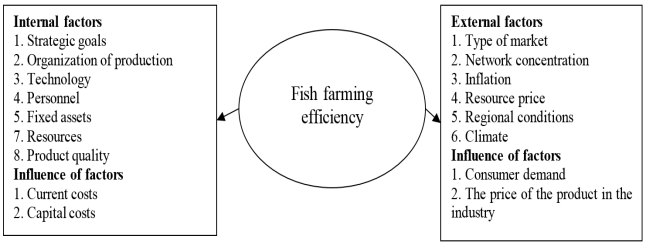

Figure 2. Classification of factors affecting the efficiency of fish farming [14]

Discussion and suggestions. In our opinion, organizational and economic measures to improve the efficiency of fish farming and find solutions to existing problems under the influence of factors and regulation are the main issues in the areas of state support, and this is reflected in the following picture, i.e. as an example of state support mechanisms for fisheries (Figure 3).

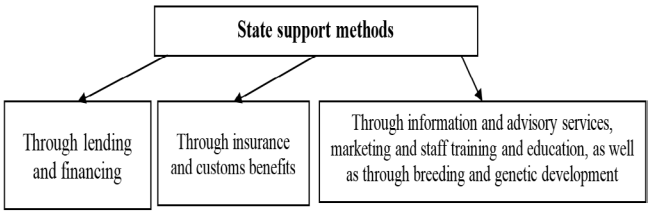

Figure 3. State support of the fish farming (Recommended by the author)

Today, fish is becoming a strategic resource when it comes to medicinal consumption. Therefore, highly qualified specialists in the field of managerial decision-making are required in order to increase the efficiency of the fishery complex to perform the following tasks [15]:

- development of waste-free and low-cost resource-saving technologies;
- use of production facilities (equipment) with high productivity;
- increase the utilization rate of equipment;
- replacement of simple equipment with automated one and introduction of a multidisciplinary service system.

In addition to the above remarks, it can be said that foreign economists Arthur Pigou, Leon Walras, Vilfedo Pareto, English economist T. Hobbs, R.G. Krause, M. Alle, Russian economists A.V. Khomutetskaya, Z. M. Talperin, E. D. Shchetinina, V. P. Volkov, A. I. Ilyin, I. A. Minakov, N. Ya. Kovalenko, O. N. Ponomareva, I. A. Chernyavsky and others in their studies of the concept of economic efficiency of agricultural products in the context of sustainable development of agriculture, they expressed their various approaches and scientific views, such as the differences between the concepts of "efficiency" and "performance", the concept of economic efficiency of fish production, categories, criteria, types and indicators for determining economic efficiency and calculation formulas. In addition, leading scientists in the field of fisheries of our republic Kurbanov R., Elmurodova B., Shokhimardonov D., Kurbanov A., Niyozov D., Komilov B. and others studied issues related to the technology and efficiency of fish production and make a great contribution to the development of the fishing industry of the country with their research [17, 18, 19, 20, 21].

In particular, the foreign economist I. A. Chernyavsky considers it expedient in his research to study three types of indicators of the efficiency of the fishing industry [16]:

1. Social efficiency:

-number of newly created jobs;

-salary level;

-the level of social stability in the industry;

-the ratio of average wages and minimum wages in enterprises;

-social payments of the enterprise at the expense of one employee.

2. Environmental efficiency:

-volumes of discharges and residues into the environment (water bodies). The evaluation process is carried out according to the established indicators in comparison with the threshold standards (this indicator should not decrease after the launch of the project);

-evaluation of the profitability of the implementation of production through a closed technological cycle of processing fish resources.

3. Economic efficiency. When determining economic efficiency, two main tasks can be named: directly - this means achieving the maximum effect within the framework of given costs (in conditions of limited resources) and, conversely, implies achieving a given effect in conditions of minimum cost.

In our opinion, fish productivity, average daily live weight gain, feed consumption per 1 centner of production, production volume per 1 kg of feed, volume of feed and fertilizer used per 1 hectare of pond, labor costs per 1 hectare of pond, 1 centner of production. Evaluation and analysis of labor costs for cultivation, the cost of 1 q of production and profit from sales, the level of profitability, etc., more fully reveal the economic and social nature of fish farming. Improving these indicators means more efficient investment in fisheries. We believe that without intensive technologies it is impossible to achieve economic efficiency in fish production.

Conclusion. In conclusion, we can say that the concept of economic efficiency of fish farming is represented by minimizing production costs and maximizing profits for the production of 1 kg of fish. Economic efficiency is ensured through the economical use of resources, increasing the volume of fish production using the most optimal resource-saving technologies, providing high-quality and affordable products for the consumer, and reducing feed costs as much as possible (for example, by growing feed crops in the fish farms). Currently, the largest share of costs is the cost of feed, as well as the cost of fish fry. When studying the economic efficiency of fish farming, first of all, it is very important to make a clear and correct calculation of the cost of fish farming. It is also possible to scientifically substantiate economic efficiency by paying close attention to the specific characteristics of the fishing

industry, the optimal fishing location, the depth or shallowness of the ponds, the death of fish due to diseases, changes in demand and supply for fish products, the market price of fish and other important aspects.

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IMPROVING THE ECONOMIC MECHANISM FOR INCREASING THE EFFICIENCY OF INVESTMENT IN SMALL BUSINESS AND PRIVATE ENTREPRENEURSHIP

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Abstract

The article explains the role of government programs in small business investment, the features of development and alternative scenarios to increase its efficiency. Through econometric models, the relationship between the volume of foreign loans attracted to fixed capital by small businesses and the number of small business and private entrepreneurs operating in sectors of national economy and the number of small companies and private entrepreneurs operating in sectors of the national economy is also highlighted.

Key words: *Investments, government programs, investor, financial services, risk, investment relations.*

Introduction. Small businesses and private entrepreneurship are considered important factors in ensuring sustainable economic growth due to global structural reforms, including in Uzbekistan. Recent years have seen the importance of small business and private entrepreneurship in assuring the sustainable development of various sectors of the economy, creating jobs, increasing employment, strengthening the income base, and enhancing the business and competitive environment in the country.

"An active entrepreneur is one who is capable of creating a competitive product, new jobs, and feeding his family as well as society as a whole, as President Shavkat Mirziyoyev said. Creating favorable conditions for the import and introduction of high-tech machinery and equipment into our country should be our top priority to expand the ranks of such entrepreneurs [1].

Literature review. As a result of the post-coronavirus pandemic, the President outlined eight key areas that will enable him to ensure the growth of the economy. Small businesses have been identified as a "growth point" of the economy in the development of these areas. A low share of small businesses is noted in the high-tech industry, and a mechanism for government incentives is to be developed, as well as the creation of regional small industrial zones [2].

In light of the above, it can be stated that the government has been prioritizing the development and implementation of government programs aimed at improving the attractiveness of small business and private entrepreneurship, including the effective growth of small businesses.

Research methodology. A major objective of socioeconomic reforms in the country is to stimulate employment in the small business sector and improve investment efficiency. Furthermore, great attention is paid to developing an active business environment in the country by implementing state programs that will create favorable business conditions.

"An active entrepreneur" is one who produces competitive products and, most importantly, creates new jobs for himself, his family, and society as a whole, as noted by the President of the Republic of Uzbekistan. We should begin by expanding the ranks of such entrepreneurs and creating favorable conditions for the import and introduction of modern technology, machinery, and equipment based on the latest scientific achievement in our country [3]. As a means of achieving these goals, "as part of the Action Strategy for Uzbekistan's further development between 2017 and 2021, consistent growth of entrepreneurship will be achieved through significantly simplifying business procedures, improving infrastructures, and expanding financial resources" [4].

Analysis and results. By making a comparative analysis of the experience of developed countries in improving economic mechanisms for increasing efficiency of small business investments in our country in recent years, it will be necessary to identify opportunities for creative use in the practice of our country. In most developed countries, government programs support small businesses through investments. Additionally, financial support for small businesses should be provided, including allocation of subsidies to this sector, the provision of raw materials, and the formation of government orders that include financial incentive measures. widely used.

The advantages of state support for the development of small business and private entrepreneurship through the method of government procurement over other methods are reflected in the following:

- partially protected from competition;
- full use of technical and technological capacity of the enterprise;
- there is an opportunity to use employee efficiently;
- high prices are guaranteed for products;
- production stability is ensured at the enterprise, etc.

In the United States, a mechanism has been developed to increase the efficiency of investment in small business and private entrepreneurship, which is saturated with components of a market economy. is guaranteed for up to 50-90 percent of the. This will reduce the risk level of investments in small business and increase the investment attractiveness of the industry. It should be noted that the

amount of collateral for loans is determined by how much of the loans received by small businesses are directed to innovative activities.

It is, if the borrowed funds are completely directed to innovative activities, then 90% of the borrowed money will be Guaranteed by the state, but only if some part or all of the borrowed funds are directed to innovation activities, then the total debt Guarantees are provided at 50-90 percent, depending on the size of fund. In addition, based on the total number of borrowings from banks, the amount of guarantees is determined in the order: [5]

Up to $ 750,000, 75% guarantee;

- Up to $ 100,000, 80% guarantee.

Also, in accordance with the programs of small business support provided by the state, the interest rate for loans to representatives of this sector is 2.75 for up to 10 years for working capital and up to 25 years for fixed capital. provided in an amount not exceeding one percent. In particular, the U.S. Small Business Administration will be able to increase subsidies for the following small businesses: [6]

- Veterans of the Armed Forces;
- enterprises representing the people and their owners;
- Enterprises located in areas with high unemployment.

The main sources of investment in small business in the UK are loans from commercial banks and savings funds. The country also has a large number of companies involved in financing small businesses. In the United Kingdom, there are mechanisms to provide financial assistance to small businesses on the basis of targeted government programs, which include: [7]

- "Grants program" - a program of financial assistance to local small businesses by local governments and small business support agencies
- The "Enterprise Establishment" program is a program aimed at providing employment to the unemployed through the establishment of small businesses to encourage employment
- The "Loan Guarantee" program is a program aimed at allocating state guarantees for the repayment of loans taken by small businesses for up to three years.

Commercial banks in the UK are also actively involved in investing in small businesses. In particular, the country's commercial bank Barslays Bank provides loans to small businesses for a period of 2 to 20 years at a rate of 5,000 to 500,000 thousand pounds at the refinancing rate of the Bank of England. [7]

East Asian countries are also among the countries in the world with unique experience in investing in small business. In particular, Japan is one of the first countries to develop and implement programs to support small business and private entrepreneurship.

There are special organizations investing in small and medium-sized business. The analysis showed that Japan has special institutions that invest in small companies. The State Corporation has been established to provide support for small and medium-sized companies that have difficulties with the fulfillment of credit requirements by state, which provides working capital and cash for small enterprises. During the long term, loans to increase are issued at interest rates below the refinancing rate. The company will guarantee small business loan payments, as well as reduce the level of risk. [9]

According to the research, the components of investment activity of small enterprises can be: investment activity, investment culture, investment information, investment object, investment capital sources, investment resources, investment environment, investment sector and region, government government agencies, small business (SB) support organizations, investors, customers, etc. (Figure 1).

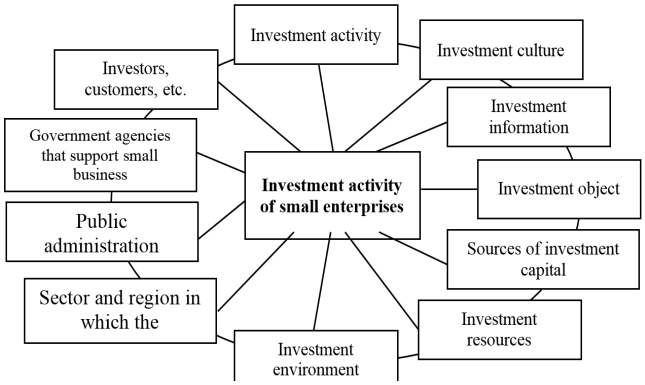

Figure 1. Investment activity of small enterprises and its components [9]

After an analysis of the facts, it is possible to invest in small business by creating social relations that emerge from components who make up the investment activities. The system of socio-economic relations that emerges with the components made up the investment activities mentioned above is also considered as mechanism for investing in Small Business. On the basis of a comparative analysis of the world practice of investing in small businesses, it was found that in these countries, state-guarantees are more important than investment. According to our opinion, in recent years, the improvement of the mechanism for investing in small businesses in our country can be used creatively:

- establishment of regional centers to support the investment activities of small businesses in the regions of the country. Reducing the level of risk by guaranteeing bank loans for small businesses in the regions through the establishment of these centers;
- starting from 2018, preferential loans are provided to small businesses in our country within the programs "Every family is an entrepreneur", "Development of handicrafts", "Our future of youth", "Businesswoman". Improving the effectiveness of financial support for small businesses by increasing the amount of these types of soft loans and their repayment terms;
- setting interest rates on loans based on the volume and direction of loans provided by commercial banks to small businesses. In particular, the introduction of state guarantees for investments to attract innovative activities of small businesses;
- encourage foreign investors to make foreign direct investment in small businesses. Priority should be given to ensuring the implementation of modern techniques and technologies;
- encouragement of small businesses through the use of government procurement (US) in the development of investment activities of small businesses, etc.

In addition, in improving the economic mechanism for investing in small business and private entrepreneurship in our country, the state will have to guarantee the investment of small businesses. At the same time, it is necessary to use the mechanism of investment in the activities of small enterprises in our country, saturated

with components of a market economy (Figure 2).

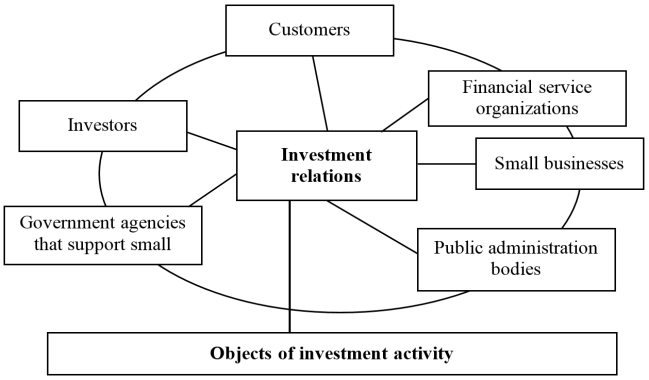

Figure 2. A mechanism for investing in the activities of small enterprises, saturated with components of a market economy [13].

At the same time, investments in small businesses are focused on the importance of the investment object. That is, if the object of investment corresponds to the priorities of the reforms implemented by the state at the time of investment, investment in a small enterprise on the basis of government intervention is encouraged. For example, the provision of state guarantees for borrowed funds, the provision of loans from commercial banks at preferential interest rates, or the allocation of subsidies from the budget, etc.

Conclusions and suggestions.

Within the framework of this project, by improving the mechanism for investing in small business companies at all times on long terms, there is an important need to improve it. The role of Small Businesses in the National Economic Development will be strengthened, the business environment will be improved, and investment attractiveness from small businesses can grow.

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REVIEW OF THE THEORETICAL AND ORGANIZATIONAL-ECONOMIC FOUNDATIONS OF THE PROCESS OF ENCOURAGING LAND USE IN AGRICULTURE

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Abstract

Global climate change in the world in the 21st century, the reduction of biodiversity, poses a serious threat not only to the development of economic sectors, but also to the prosperous future of mankind. This is due to the fact that the economic and political security of any country is measured primarily by the level of food security of its population. This process is directly related to the effective solution of land use issues in agriculture. However, in many countries around the world, land-use decisions that do not take into account their environmental impacts lead to a decrease in the natural fertility of the soil. That is why, in world practice, the implementation of existing agricultural land is becoming increasingly important, in particular, on the basis of stimulating measures to maintain and restore soil fertility.

Key words: *climate change, land, land reforms, organizational-economic bases, soil properties, stimulation, regulations.*

Introduction. As a result of the land reform carried out in our country, has been ensured a fundamental change in the relations of ownership of land and other means of production. However, the existing mechanism of land use, ownership, disposal in a certain sense limits the possibilities of distribution, redistribution and promotion of land resources in the network. Therefore, as President Sh. Mirziyoyev noted, "... due to the lack of strict control in the field of sales, the unauthorized seizure and looting of irrigated lands by farmers and other officials, unfortunately, continues...". Therefore, as President Sh. Mirziyoyev noted, "... due to the lack of strict control in the field of sales, the unauthorized seizure and looting of irrigated lands by farmers and other officials, unfortunately, continues ..."

"On additional measures to improve the system for the use and protection of agricultural land" and other regulatory legal acts related to this activity such as, No. PF-4947 of the President of the Republic of Uzbekistan dated February 7, 2017 "On the Action Strategy for the Further Development of the Republic of Uzbekistan", No. PF-5853 dated October 23, 2019 "On approval of the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030" and so on.

It is known that the earth has a number of properties that distinguish it from other means. Most of the studied studies are devoted to the productive properties of the land in the production process. The works of these authors describe in detail the properties of land as a means of production. It is advisable to divide these features into two groups: features associated with the land as a spatial basis (a piece of land) and features associated with a highly fertile layer (soil). (figure 1).

Discussion and results. It should be noted that the efficiency increase of the land resources use, as for the theoretical aspects of the problem, which are an indispensable main tool and subject of labor in agriculture, as well as the use of irrigated lands, which ensure its most active and high efficiency, is due to many factors. In particular, it is important to preserve and improve soil fertility, increase the area of arable land through the development of new agricultural land, develop production in accordance with market requirements, and improve reclamation and economic incentives for the effective use of agricultural land. Based on the foregoing, we consider that it is appropriate to divide the system of indicators of land use efficiency in agriculture to the following groups: (Figure 2).

Land resources and their valuation include, soil quality score, soil technological features, location, productivity (yield), cost recovery rate, rent revenue,

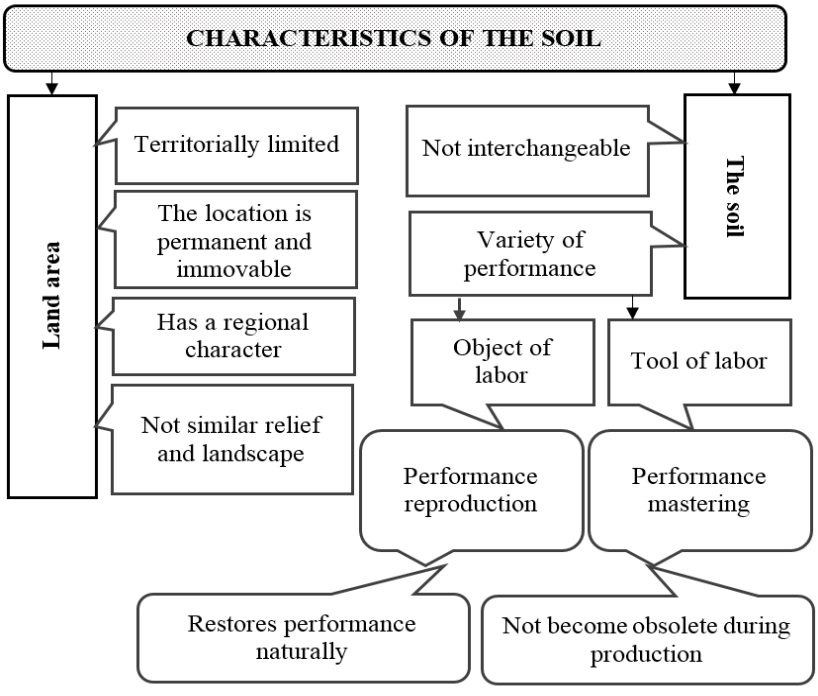

Figure 1. Soil properties as a means of production

cadastre value, market value, normative average yield and production cost. Each indicator, in turn, includes a number of component indicators, without which it will be difficult to improve land relations between agricultural entities.

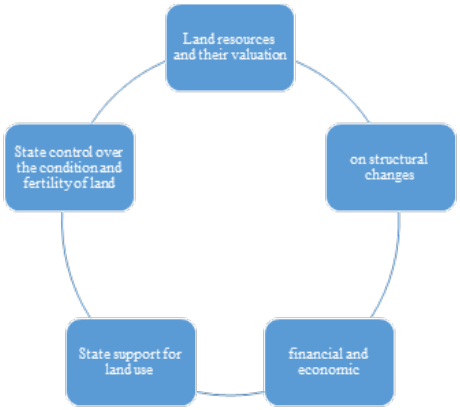

Figure 2. Grouping the system of indicators of efficiency of land use in agriculture

The production and economic efficiency of land use in agriculture is a relatively broad concept with a broad and complex content. The efficiency of land use in agriculture is included in a set of measures aimed at achieving high productivity of arable land, their intended use, determining the optimal size of land use, restoring, maintaining and increasing soil fertility, taking into account environmental requirements.

In general, land users should be interested in ensuring their efficient use, maintaining and improving soil fertility and attracting their own funds for these purposes.

Practical regulation allows for a rational approach in solving organizational problems related to the knowledge of the natural properties of the land and organizing the rational use of land. At the same time are considered, such issues as classification of land use, zoning, land use regimes, zoning, including sanitary protection of industrial and other facilities, distribution and regulation of land protection and security zones. The organization of the zone ensures the rational use of land, which is especially important in the conditions of different land use in agricultural production. (figure 3).

Organizational activity should include qualitative monitoring of land for timely detection of changes in the state of land, assessment of these changes, development of recommendations for the prevention and mitigation of negative processes..

Economic conditions include the availability of material, technical and labor resources, the attitude of workers to work, etc. At the same time, economic and financial opportunities for improving the efficiency of land use are determined, which requires rational use and protection.

Table 1

Detailed system of indicators of efficiency of land use in agriculture

Indicators group	*Indicators*
Land resources and their valuation	*- soil quality score;* *- technological features of the soil;* *- location;* *- performance and productivity;*
Structural changes	*- the share of agricultural land in the total amount of agricultural land;* *- the share of arable land in the area of agricultural crops;* *- percentage of forage area;* *- share of arable land;*
Financial and economic	*-proceeds from the sale of products;* *-expenses associated with the sale of products.;* *-profit;* *-level of profitability.*
State support for land use	*-increase or decrease in agricultural production;* *-growth rates of goods due to state support ;* *-Increasing the production and productivity of agricultural products;* *-increase or decrease in the productivity of livestock and poultry*
State control over the condition and fertility of land	*-general indicators (soil type, humus level, inclination level)* *-physical and chemical parameters;* *-level of soil pollution* *-indicators of negative processes.*

"Organizational and environmental economic conditions include mechanisms and methods of state regulation of agricultural development, stimulation of production and labor, etc." . In systemic terms, the set of key factors that determine the development of agricultural land management can be expressed in two ways - traditional and innovative (table 2).

It should be noted that incentives are a key factor in organizing the efficient use of land resources. By regulating this procedure, the state ensures its implementation through its own mechanisms.

In our research work on economic incentives for land use in the country, most agricultural economists made proposals and recommendations for improving the tax system, that is, for providing agricultural enterprises with various tax benefits or for improving existing taxation mechanisms.

Conclusion. The concept of land use in the broadest sense refers to the relationship between individuals and legal entities, developing as a place of residence and life, a territory that provides the process of human life and natural geosystems. Land use efficiency is an integral part of a set of measures aimed at ensuring high productivity of arable land, their intended use, determining the optimal size of land use, maintaining and increasing soil fertility in accordance with environmental requirements and expanding reproduction in the industry.

2. "Promotion" of land use means an interest in the rational, orderly use of land and the improvement of its quality. It is necessary to

improve the methods of promoting the unity of interests of the state and agricultural enterprises in promoting land use, scientific and practical justification.

3. Factors affecting the efficiency of land use in agriculture can be systematized into two groups (options): inertial (traditional) and innovative groups. Both of these factors are important in terms of content and conditions of application and should be taken into account in the process of promoting land use and improving efficiency. In addition, we consider it appropriate to approach groups of social, economic and environmental indicators, taking into account structural changes in the agricultural sector in recent years, the demographic situation, global climate change, and etc.

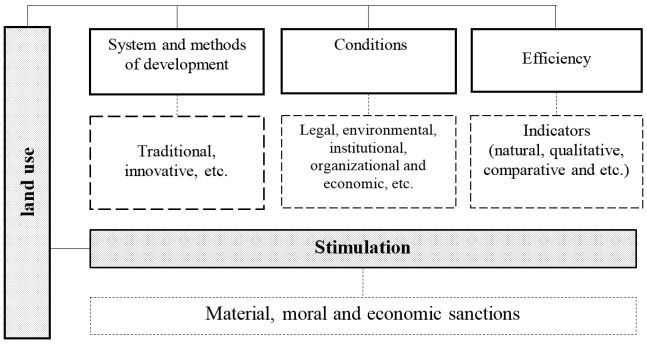

Figure 3. Structural structure of the organization of rational land use

4. In developed countries, the methodology of land use and state regulation is studied in individual regions, taking into account the natural, climatic and soil conditions of each region, and network support measures are based on an integrated approach within the same regions. There are three such regions in the country. However, these regions are mainly formed taking into account the specifics of the location and development of the cotton industry.

Table 2

The main factors determining the efficiency of land use

Traditional	***Innovative***
Use of traditional technologies	*Use of innovative technologies*
Increasing the efficiency of land potential use	*Improving regional farming systems*
State support of agricultural producers at the modern level and in traditional forms	*Improving the mechanisms for supporting agricultural producers to ensure expanded reproduction using forms that stimulate the growth of efficiency in the use of state lands.*
Preventing the decline of fertile land	*Loss prevention and involvement of unused land in production*
Increasing the use of mineral fertilizers to increase yields and increase the proportion of land occupied by high-yielding crop varieties	*The application of mineral fertilizers based on scientific requirements, the use of the natural fertility of the soil in exchange for the reproduction of high-yielding crop varieties.*
Preservation of soil fertility	*Increasing soil fertility*
Implementation of land reclamation works in existing volumes	*Development of reclamation measures on agricultural lands*
Updating the material and technical base	*Technical modernization*
Use of traditional methods in land use monitoring	*Monitoring of agricultural land use based on GIS technologies and Earth remote sensing technologies*

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WORLD EXPERIENCE AND PROBLEMS SOLVING IN LOGISTICS

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Abstract

This article examines the world experience in solving problems in logistics processes using the example of countries such as Uzbekistan, Germany, Russia and Kazakhstan, as well as an interactive benchmarking tool created to help countries identify the problems and opportunities they face in their activities in the field of trade logistics, and what they can do to improve their efficiency.
Key words: *logistics, integration, benchmarking tool, logistics services, lack of specialists.*

Introduction. The creation of a single transport market of the Republic of Uzbekistan is one of the main tasks of the transport strategy. The geographic location of a country's transit routes is a key driver of the logistics management approach to ensure the smooth development of the national transport infrastructure.

The importance of the transport system necessitates the implementation of a targeted program of economic development, the implementation of a comprehensive program aimed at the development of various modes of transport. Modern transport problems are based on a systematic approach and require special software development.

Large transport and forwarding organizations in Uzbekistan have begun to create their own terminal systems, so there is a need to create computer information systems that support freight logistics and logistics services. The implementation of the concept of logistics is one of the main activities to reduce the overall costs of the business.

In Uzbekistan, we can solve the following problems, which are reason for the slow development of logistics:

-lack of qualified specialists in Uzbekistan who are able to organize or improve the efficiency of existing logistics processes.

-lack of appropriate conditions for the implementation of the principles of logistics in organizations. Many companies experience difficulties in the formation of a logistics service.

-lack of good relations with foreign logistics organizations. The solution of this problem is facilitated by the establishment of interstate legal relations by international logistics associations.

One of the most important and main goals of Uzbekistan is quality service and certification of services for entering the foreign market.

Germany is located in the center of Europe and occupies the place of both a transit country and a leading country in the economy and, in particular, having adequate communication routes, communication networks and the necessary transport hubs for this. They must fill both a special mode of transport and crucial needs. German freight logistics has become a leader in Europe. In 2006, its turnover amounted to more than 170 billion euros. This represents about 7 percent of the German gross domestic product (GDP). Whereas within Germany it is possible to supply customers with a 24-hour Delivery Service with 1-stage distribution via truck transport, this is not possible in Europe due to the long time required for shipping. The competitiveness of German business has a decisive influence on the experience of local logistics of the industry, and the effectiveness of interaction is ensured by transport: road, rail, water, air, as well as their significant link in logistics hubs as cargo centers, airports, sea and inland ports .

German exporters, as a rule, use the services of domestic forwarding companies. Therefore, the expansion of manufacturers led to the expansion of freight forwarders.

The challenge that German freight forwarders have yet to solve is to increase the energy efficiency and environmental friendliness of transportation. Uniform environmental standards for the transportation of goods do not yet exist.

The processes of cargo transportation can and should be optimized. Another problem in German logistics is the lack of highly qualified personnel. According to industry associations, about 2.7 million people are employed in this sector in Germany. However, there is a shortage of experienced staff.

For the leaders of most Russian companies, logistical management methods are quite well known. At the same time, they are used only in individual cases and at the level of intuition. This poses an urgent task for representatives of Russian science to develop a fundamental scientific and methodological basis for the effective use of the logistics concept in business. In recent years, modern logistics concepts have been successfully applied by leading Russian companies in the strategic and operational management of the main business areas. The use of the concept of logistics is one of the main reserves to reduce the level of the overall cost of the company's resources. With the development of market relations, consumers have more and more opportunities to compare and choose the best service. Specialists of the functional divisions of the company must speak the same language, operate with similar terms and understand each other. One of the most important resources that determine the degree of efficiency of the company's activities are people. One of the important conditions for the penetration of the logistics idea into all areas of the company's business is the availability of highly qualified logistics specialists. Currently, there is a certain lack of specialists who not only have practical experience, but also have fundamental theoretical knowledge in the field of logistics. Good logistics professionals need to have knowledge from various areas, as well as to know the general relationships between the functional areas of the business. It should be noted that in

modern global conditions, logistics plays a key role in the industrial development of states. In a number of countries, the government first relied on the development of logistics as the main factor in stimulating industrial development.

Materials and analysis. Systematic work is being carried out in the Republic of Kazakhstan to improve the quality of transport services. First of all, this is the reduction of transport time, reduction of transportation costs, optimization of tariffs, safety of goods and, most importantly, the training of high-quality human resources, which is designed to ensure the normal functioning of the entire logistics system. At present, the market of logistics services in the Republic of Kazakhstan is young. The freight forwarding and warehousing services sectors are represented by a large number of companies providing "traditional" transportation and warehousing services, while the integration and supply chain management services sector is underdeveloped. One of the main factors hindering the development of logistics companies in the Republic of Kazakhstan is the acute shortage of modern warehouse terminals. The nature of today's business requires fast inventory turnover and fast order fulfillment. To meet these requirements, the logistics system must be flexible.

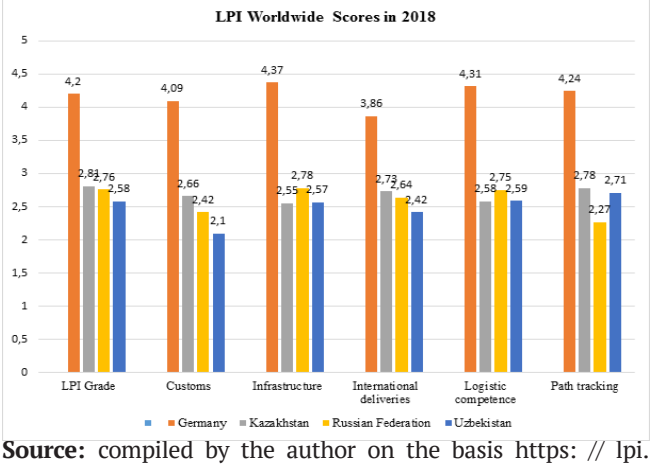
Table 1 and diagram show the 2018 global LPI scores for Germany, Kazakhstan, Russia and Uzbekistan. In turn, LPI is an interactive benchmarking tool designed to help countries identify the challenges and opportunities they face in their trade logistics operations and what they can do to improve their performance.

Table 1

LPI Worldwide Scores in 2018

Country	*LPI rating*	*Grade LPI*	*Customs*	*Infrastructure*	*International deliveries _*	*Logistic competence*	*Path tracking*
Germany	*1*	*4,20*	*4,09*	*4,37*	*3,86*	*4,31*	*4,24*
Kazakhstan	*71*	*2,81*	*2,66*	*2,55*	*2,73*	*2,58*	*2,78*
Russian Federation	*75*	*2,76*	*2,42*	*2,78*	*2,64*	*2,75*	*2,27*
Uzbekistan	*99*	*2,58*	*2,10*	*2,57*	*2,42*	*2,59*	*2,71*

Source: compiled by the author on the basis https :// lpi . worldbank . org / international / global



Source: compiled by the author on the basis https: // lpi. worldbank. org/international/global

Figure 1. LPI Worldwide Scores

We see Germany in the first place in the presented rating, Kazakhstan in the second, the Russian Federation in the third, and Uzbekistan in the fourth. In terms of logistics competence, Germany ranks first, Russia ranks second, Uzbekistan ranks third and Kazakhstan ranks fourth. In terms of tracking the path, Germany is in first place, Kazakhstan is in second, Uzbekistan is in third and Russia is in fourth.

Conclusion. It can be noted that the countries of Uzbekistan, Russia, Kazakhstan and Germany have common problems such as the lack of qualified personnel. Despite the fact that Germany is in first place in the LPI world rankings, this country also has personnel problems. An equally important common problem is the introduction of the latest technological processes in logistics, as well as the lack of storage facilities in Kazakhstan, Uzbekistan and Russia.

To solve the problem of a lack of qualified personnel, it is necessary to completely revise the personnel policy, it is necessary to establish an exchange of experience between specialists from foreign countries.

To increase productivity and productivity in the logistics supply chain, you need to implement the latest technologies that will help you efficiently track and deliver cargo to the right place.

In addition, it is necessary to invest in higher education institutions, that is, to give students the opportunity to study and train in foreign countries.

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METHODS OF IMPROVING CUCUMBER GROWING TECHNOLOGIES

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Abstract

The article describes the effect of bio stimulants "Uchkun", "Super Uchkun", "Gossipren" and "Verva" on cucumber varieties ("Orzu") in the Andijan region. It was revealed that the pre-sowing treatment of cucumber seeds with bio stimulants promoted a significant increase in seed germination and growth processes.

Key words: *bio stimulants, Uchkun, Super Uchkun, Gossipren, Verva, "Orzu", parthenocarpy plant.*

Introduction. Uzbekistan government tries to develop new policy for improving food security of the population. By means improving quality of food staff's production it is expecting to enforce the social-economic progress in Uzbekistan and ameliorate the wellbeing of the population. Fast increasing the number of population conditions a necessity of improving a technology of horticulture plants like cucumber and learning problems technology improving in versatile scope and to developing new suggestions.

An aim of the paper is study problems of improving cucumber growing technology in the conditions of Uzbekistan and explaining new conclusions developed as results of field experiment. Coming of the aim of study the next tasks were defined for discussing:

- describing a technology of cucumber growing and to comment an increase of productivity by means of using bio stimulants;
- regulation biosintes process in field experiments of cucumber and how to intensify bio stimulants' an effect on cucumber growth.

The object of the study is the biometric parameters of the cucumber plant, its' yield, and the biochemical composition of the cucumber. The subject of the study is a parthenocarpy hybrid of cucumber variety of "Orzu". In conducting research, we used standard methods of setting up experiments with vegetable crops [1, 2]; the tests were performed with bio stimulants Gossiprin, Verva, and local bio stimulants "Uchkun", "Super Uchkun".

Accompanying observations of cucumber plants in the process of research included an account for the germinating energy and seed germination, biometric parameters of seedlings, and the rate of passage of phenological phases. The weight of the crop and its marketability were taken into account by the gravimetric method according to the plot variants of the experiment on a pilot basis. As cucumber is a crop of multiple harvesting, early productivity is determined by the yield for the first period of fruit formation (10, 15, 20, 30 days) [3]. In our studies, this period consisted of 20 days.

Product quality was assessed by the standard requirements [2,3,4]. The biochemical composition of the product was determined according to standard methods: the dry matter content - by the thermostat-weight method, the sugar content - by the Bertrand method, the vitamin C content - by the I.K. Murri method. The results obtained were processed by the method of analysis of variance using the statistical program STRAZ (version 2.1) and by the method of B.A. Dospekhov [3]. The economic efficiency was calculated by generally accepted methods [2, 3].

Material and methods. The family squash (Cucurbitaceous) is very various. It includes more than hundred sorts (labors) and over thousand kinds. The greatest diffusion was obtained) by such squash cultures, as a cucumber, a vegetable marrow, a bush pumpkin, a water-melon, a melon and a pumpkin. The ancestor of this family – is a pumpkin. Sowing campaign cucumber (Curcumas sativa L.) belongs to family Squash (Cucurbitaceous) (Tkachenko, 1963; Heywood et al., 2007; Judd et al., 2008). In family - 2 subfamilies also include 118 sorts and 825 kinds (Judd et al., 2008). The majority of kinds are - perennial grasses. The big economic value reckons with edible fruits and seeds, and as the basic food culture cultivate in tropical, subtropical and moderate regions (Heywood et al., 2007; Judd et al., 2008). Seeds of the cucumber has prolonged - elliptic form, white or light-yellow color, mass 1000 pieces of 16-35 normal germinating capacity is may be stored till 5-6 years (Balashev, Zeman, 1972). Qualitative characteristics of the cucumber has such signs - color light and dark green, flowers short-wave blue – light pink. Beams in sunlight accelerate development of plants of short day; promote the best blooming, formation of a considerable quantity of pistil- late flowers and reception of a high early yield of fruits (Sheveluha, 1992; Persen, 1996).

The experiment studied hybrids of cucumber variety of "Orzu". The area of the registration plot was 8.6 m^2, the experiment was repeated 3 times, and the placement of the variants was randomized. Cucumber variety "Orzu" is a parthenocarpy, mid-early variety, it begins to bear fruit on the 46th – 47th day after planting, the plant is growing, of medium branching, female flowering type, it has dark green leaves. The fruit is 12-15 cm long, of cylindrical form, dark green. The base of the fruit is obtuse, the neck is weak, and the peduncle is long. Bitterness is genetically absent. Plants are resistant to gummosis, brown leaf spot, and are tolerant to powdery mildew. It tolerates ambient temperature fluctuations well. The effectiveness of bio stimulants was studied by soaking cucumber variety of Orzu seeds for an hour before sowing in drug solutions and subsequent plant treatments [10-20]. Seed sowing was done on April 20 in the open field. The holes were dug in a 70 x 40 two-row scheme with a distance of 35-40 cm between holes.

The planting density was 4.2 plants per 1m2. Plants were formed into 1 stem, tied by a string to 2 m high espaliers. Vegetative plants were treated three times: the first - in the phase of 2-4 true leaves, the second - at the beginning of the flowering phase, and the third - in the phase of mass flowering. The drugs used have a wide spectrum of action and were intended for use in agriculture. They belong to safe chemicals, do not hurt humans and animals, and do not accumulate in soil and fruits. They are designed for seed treatment before sowing to increase the germinating energy and seed germination and to increase the adaptive

capabilities of plants under unfavorable growing conditions. Below is a brief description of these preparations.

The data given in Table 1 show that all phases of development: budding, mass flowering, and fruit formation, when treated with plant growth stimulants, occurred 2-4 days earlier, than in the control variant. The budding phase with the bio stimulant "Uchkun" treatment came 1 day earlier, with the "Super Uchkun" - 2 days earlier, and in the case of "Gossipren", it was at the level of the reference drug.

Figure 1. Photo of flower and fruit of cucumber variety "Orzu"

Table 1

The influence of plant growth stimulants on the germination and growth dynamics and development of cucumber variety of "Orzu" (2019)

Development phases	*Control*	*Gossipren*	*Uchkun*	*Super Uchkun*	*Verva*
Sowing seeds	*20.04*	*20.04*	*20.04*	*20.04*	*20.04*
Germination rate	*30.04.*	*28.04.*	*27.04.*	*26.04*	*28.04.*
Budding	*20.05*	*18.05*	*17.05.*	*16.05*	*18.05*
Mass flowering	*01.06.*	*29.05.*	*27.05.*	*26.05*	*29.05.*

Accordingly, the onset of mass flowering with the "Uchkun" and "Super Uchkun" bio stimulants variants was 2-4 days earlier than with "Gossipren" bio stimulant and 2 days earlier than treated with "Verva" bio stimulant. Consequently, in these variants, fruit formation began earlier. On average, the yield of cucumbers when treated with bio stimulants increased by 10.28%; 23.8%; 24.27%; 14.29%; the yield increase was 1.3; 2.3; 2.7; 0.9 t/ha, respectively.

According to table 1 data, the time of sowing of cucumber in all types of stimulants is fixed that is 20 March of the year. But, if look at the time of the germination period, cucumber began growth early after processing with stimulant "Super Uchqun" that is on 26 March, "Uchqun"- on 27 March, "Gossiprin" and "Verva" ones – on 28 March. In control variance, cucumber growth began – on 30 March. The budding period has the same specific features. That is first budding was observed in the variance of cucumber processed with "Super Uchkun" stimulant – on 16 May, "Uchkun" stimulant – on 17 May, and "Gossiprin" and "Verva" stimulant on 18 May, control variance - on 20 May. The mass flowering process began in the variance of "Super Uchkun" stimulant on the 26 May, "Uchkun" – on the 27 May, "Gossiprin" and "Verva" – on the 29 May, and control variance on the 1 June. The fruit formation process had the same ordinary – first – "Super Uchkun" stimulant on the 4 June, "Uchkun" stimulant on the 5 June, "Gossiprin" and "Verva" – 9 June, and control variance – 11 June. If to compare time of germination rate, budding and mass flowering time difference between 1 – 4 days. Fruit formation times have the difference between 1-7 days. What does mean these differences? Among stimulants, "Super Uchkun"s' an effect on the growth of cucumber was very strong and after 6-8 days, a cucumber began to show results of the influence of a stimulant. A stimulant "Uchkun" took second place on the rate of affecting the cucumber growth stages. The time difference of on influence on cucumber growth was longer for 1day with comparing stimulant "Super Uchkun". Other stimulants' time of influence on cucumber growth was longer for 2-3 days with comparing stimulant "Super Uchkun".

Findings. To assess the effect of stimulants on the cucumber yield volume we should consider the volume of the fruit obtained in each variance of the field experiment. In the table 2, had been illustrated the influence of bio stimulants on yield. If to compare yield volume (t/ha) per hectare, "Super Uchkun" bio stimulant increased harvest significantly that is 15.6-ton fruit per hectare. But other bio stimulant's yield volume is less than the "Super Uchkun" bio stimulant one. This fact confirms by the number of fruits per plant – 6 pieces. The second place occupies bio stimulant "Uchkun", third place Gossiprin and fourth place Verva. Besides, Super Uchkun bio stimulant fruit exceed other fruits by weigh – 120 grams. It means that the economic efficiency of using bio stimulant "Super Uchkun" very significant and bio stimulant may ameliorate the financial position of the farm facilities. The biochemical composition of the "Orzu" cucumber had been changed by the influence of bio stimulant "Super Uchkun" positively. According to the data table 2, sugar level consisted 2.52 %, vitamin C level 5.2 mg %, and NO3 mg/kg rate was equal to 189. Other bio stimulants, like "Verva" and "Uchkun", have relatively close meanings.

"Verva" bio stimulant has 2.16% sugar, 6.7 % vitamin C and 195 NO3 mg / kg. It means that "Verva" bio stimulant has the advantages of comparing it "Uchkun" and "Super Uchkun" bio stimulants using variances. Among considered bio stimulants, "Gossiprin" has the lowest variables and planting cucumber variety "Orzu" after processing with bio stimulant maybe not effective from point of view productivity

Table 2

Influence of bio stimulants on yield volume

Variants	*Number of fruits/plants*	*Average weight of fruit, g*	*Yield (t/ha)*
Control	*3*	*100*	*12,9*
Gossiprene 0.1% (200 ml/ha)	*4*	*110*	*13,9*
Uchkun 0.1% (200 ml/ha)	*5*	*120*	*15,2*
Super Uchkun 0.1% (200 ml/ha)	*6*	*120*	*15,6*
Verva 0.1% (200 ml/ha)	*4*	*110*	*13,7*
**HCP0,5=4,4*		***Sx=0,6*	

Table 3

Influence of bio stimulants on the biochemical composition of "Orzu" cucumber

Variants	*substance, %*	*Sugar, %*	*Vitamin C, mg /%*	*NO3 mg / kg*
Control	*5.0*	*2.16*	*4.0*	*165*
Gossiprene 0.1% (200 ml/ha)	*4.4*	*2.28*	*5.1*	*170*
Uchkun 0.1% (200 ml/ha)	*6.5*	*2.34*	*4.9*	*182*
Super Uchkun 0.1% (200 ml/ha)	*4.9*	*2.52*	*5.2*	*189*
Verva 0.1% (200 ml/ha)	*5.1*	*2.16*	*6.7*	*195*

and quality of fruit.

Root feeding of cucumber plants with bio stimulants "Uchkun" and "Super Uchkun" significantly increased the content of vitamin C in fruits (5.3-5.5 mg%). At the same time, there was a slight decrease in sugars in fruits in comparison with the control (Table 3). The content of nitrate-nitrogen in the products in all variants of the experiment was significantly less than the MPC value, which is 400 mg/kg of fresh weight for a greenhouse cucumber. The effect of the aforementioned bio stimulants was also observed on other crops of the "Cucurbitaceous" family, on cucumber varieties "Orzu" and "Spanish", in which the acceleration of phenophases and an increase in yield were also observed [10,11,12,13].

Thus, coming of the above-described data of field observations, it was obtained the next results:

- a technology of using bio stimulants for intensifying growth of cucumber plant may be useful if a time of sown is appropriate that is April month;
- on the day of sowing a grade of air better to observe +20 +22 0C and soil grade by +18 +20 0C;
- before sowing pumpkin seeds should be processed with bio stimulants during 3 days;
- cucumber seedlings on the experimental field necessary watering 6-7 times till the last days of growing;
- experimental field soil should be processed with ammonia with a proportion of 300 kg/he and potassium mineral fertilize 100 kg/he;
- for sowing of cucumber seeds preferable using of chart 330x70)x100;
- better to allocate 6600 cucumber seedlings in each hectare and a depth of sowing of seeds 5-6sm;
- during the period of vegetation, plants should be feed up with a proportion of 300 kg/he with saltpeter ammonia;
- against of an insect, Aphid use a preparation "Mospilan" in the proportion 300 gr/he with 300-liter water after mixed up 2 times;
- against Necroz and Xlores diseases use Entolikur fungicide in proportion 0,5 l/ga 1 time and Ridomil Gold fungicide in proportion 2,5 kg/he after mixing up with 300-liter water;
-processing seedlings within pitchblende fodder prepared by using 2-liter plant oil, 2 kg Clorophos chemical preparation, and 40 kg oilcake per hectare against such insects as rootworm, short wire maggot, and calf head allows to save all seedlings;
- in the accordance with seed-growing methods, an isolated zone has to create in the size of 1000 meters around the experimental field.

Literature analysis. The word "method" is Greek for "methods" - a way of research, theory, or teaching. In other words, a method is a set of methods and operations that attempt to achieve a specific goal, find a solution to a specific theoretical task, or solve a specific theoretical problem related to the study of an event. In other words, a method is a sequence and appearance of these actions, which implies a generalization of ways to solve a specific practical task to achieve any goal. Based on these considerations, we can make the following logical conclusion: a research method is a set of ready-made "guidelines" that are considered to be algorithms, procedures for research that must be conducted using available data to achieve a goal. Methodology, on the other hand, is a generalized approach to solving a problem of one kind or another. Today, the development and improvement of existing technologies of cucumber nutrition in our country is a requirement of the times. We will explain the term yield below as we have identified wrapping as the main task of wrapping the effect of organic fertilizers on the yield of cucumber cultivation in this paragraph. The essence of the question is how to enhance the effect of bio stimulants on the growth of cucumbers?

According to L.Jiani, V. Ovshinsky, and T. Zaychenko, productivity is the amount of raw material phytomass,

which indicates the gross yield per 1 hectare of land, or its amount per 1 square meter. Productivity depends on the type of practice of the plants and it depends on many factors. Productivity is determined based on three approaches:

- based on the method of land use;
- based on the method of samples and specimens;
- based on the project coverage method.

L.Jiani, V. Ovshinsky, and T. Zaychenko's approach to technology efficiency is very simple and takes into account the effects of biosynthesis processes and the use of organic fertilizers and bio-stimulants. M.Baratova, N.Khidirova and Sh.Kasimova notes that the choice of method depends on the following reasons:

- the characteristics of plants and the choice of their method of feeding;
- the amount of plant selected for use as a raw material.

However, G. Belodubrivskaya, K. Blinova, and V. Vandishev proposed the following approach: for plants and trees with small bodies, it is preferable to use the criterion "yield per hectare" used to determine the yield, the amount of fruit harvested from their body parts as raw material they show. This method is one of the most accurate methods in science because it does not require additional calculations and does not complicate the data. However, if the product is used as raw material, for example, underground fruits or shrubs with large bodies, the above method is inconvenient due to the need for large labour costs, and in such a situation a "model copy" approach is more convenient. For short-stemmed plants and shrubs, the criterion of "projected yield" should be used as the measurement criteria, as this method assumes that the plants cover the surface of the plant thickly and its density directly affects the yield volume. Most of the field experiments are conducted in the fields of farms located in a particular administrative area, and it is assumed that the field surface of that area has a precise dimension. If the amount of raw material grown is measured in large tons, then the crop is planted in large fields and comparative checks are carried out. The approaches described above reflect the general directions of the study of technical efficiency in terms of quantitative analysis. However, to study the effectiveness of cucumber plant cultivation technology, it is necessary to collect and group information on additional methodological tools, i.e., factors, and make systematic and qualitative calculations. To do this, the use of the method of phenomenological observation of quality gives good results. We show this in this section based on the results of field experiments on cucumber cultivation in 2017-2018.

The main role in conducting field research on the technology of growing cucumber plant belongs to the methods of quantitative observation. In our opinion, the choice of methods in the development of research methodology can be based on the philosophical theory of "positivism" for quantitative observation of field experiments. According to the theory of positivism, a clear positive result is based on any natural phenomenon and its properties and relations. The received information is interpreted as the basic principles of knowledge and results. And the results obtained are considered to be the results obtained due to observations.

Several hypotheses need to be developed in quantitative observations to validate research results. The researcher explores the interrelationships between independent and related variables as a database for conducting quantitative observations. Also, the researcher finds out by examining how important the interrelationships between variables are. Upon verification, this degree of interdependence is confirmed or denied. However, rapid scientific and technological progress and the growth of factors influencing climate change indicate the need to use the method of "qualitative phenomenological observations" in scientific research on the technology of growing cucumbers. There is no pre-determined hypothesis in this approach. As a postulate, the researcher forms an idea that can emerge in the process of observation. A postulate is a form of a research problem. This means that there is a direct correlation between the variables studied in the study. These relationships consider the factors that affect the success of the technology. Based on these considerations, all the factors influencing the plant development of technology are observed in the following order: environment of application of new technologies in agriculture, paradigm, analytical approach, object selection approach, systematic approach, and comparative analysis approach. Below we explain why we need to focus on qualitative phenomenological observations.

First, it is taken as a necessary consideration of the number of resources. To do this, it is necessary to calculate its volume in terms of yield per square meter of land or in areas where plants grow. Its' role in calculating the harvest area is similar to that of any geometric figure. (Four squares, three squares or rhombuses), then its covering surface is. Sometimes, if the growing plant does not grow evenly in the field, the total area and the area covered by the growing plant are first calculated and the difference is determined. The next step is to harvest and calculate the volume. At the same time, the indicators differ in terms of "harvest result" and "yield density". However, many scientists studying plant growing technologies consider these indicators as synonymous.

Based on the above data, the field of "Biotechnology" is a very important approach to the study of methods of fertilization in the cultivation of cucumber to increase its productivity. In the study of biotechnology, in addition to theoretical data on the cultivation of cucumber plants, it is important to consider practical recommendations, to compare them with each other. At the same time, it is necessary to identify the object and methods of research to develop a research approach and enrich it with the necessary methodological methods. In this context, the methodological approach of this study includes the following three areas:

-study of recommendations for the use of fertilizers in the cultivation of cucumber plants based on cabinet research to study the theoretical data on the study of international experience in the process of using of fertilizers;

-to study the climatic conditions and soil requirements of international experience in the cultivation of cucumbers, to compare them with each other, and to explain the influence of time and temperature factors in preparation of seed for planting;

- describe the conditions and results of 3 field experiments conducted in the Andijan region and develop proposals for the practical application of bio stimulants.

Conclusions. The study of the effect of the complex preparation "Uchkun plus" showed that it has a significant effect on the growth, development, and productivity of cucumber plants of the "Orzu" variety during the pre-sowing seed treatment. Under its' influence, the acceleration of the main phases of development was observed. There was also a significant increase in the yield of crops, the average increase in the yield of cucumber variety "Orzu" with pre-sowing seed treatment with Super Uchkun was 2.5 t / ha compared to control, and under the influence of Uchkun - 2.3 t / ha. Thus, as a result of the experiments carried out, the positive effect of bio stimulants Uchkun and Super Uchkun on the growth

and development of cucumber plants, yield, and product quality was established. Considering the high efficiency of the use of bio stimulants Uchkun and Super Uchkun to increase the early and general yield of cucumber in the open field, agrochemicals can be recommended for root fertilization of plants. The regulations for application are as follows: 1st top dressing (application with irrigation) - in the phase of 2-3 leaves, 2nd, 3rd, and 4th with an interval of 20 days, the consumption of the agrochemical 200 ml/ha, the consumption of the working solution - depending on from the watering rate.

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CHAIN OF SURPLUSAGE VALUE IN AGRICULTURAL INTEGRATION

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Abstract

The article examines the process of formation of a "chain of surplusage value" in the activities of clusters, a modern entrepreneurial representative of agro-industrial integration. Accordingly, the importance of primary, intermediate and final products of agro-industrial production, the mechanism of creation of " chain of surplusage value" in the economic relations of the following enterprises is described and this concept is approached as an economic category. At the same time, it was explained that this process is becoming a trend in the economic relations of entrepreneurs in our country, its current state was assessed and recommendations were made to address a number of identified problems.

Key words: *Agriculture, raw materials, agro-industrial complex, primary product, intermediate product, final product, agro-industrial integration, agrocluster, technological chain, chain of surplusage value.*

Introduction. At present, a special place in the acceleration of economic reforms in our country is played by further reform and modernization of the agricultural sector. Accordingly, in recent years, with the introduction of a new form of entrepreneurship in the integration of agro-industry - cluster activities, the concept of "chain of surplusage value" has entered the economic life of our country and has become commonplace in both legislation and practice. We think that this term did not appear spontaneously, but due to the demands of the situation, it became a necessity in the economic life of our country and found its place in the economic relations of social reproduction. Consequently, today "... we consider the creation of a favorable agribusiness environment and chain of surplusage value as a priority" [1]. "The development of the chain of surplusage value is an important factor in ensuring the competitiveness of agriculture" [2].

However, given the current urgency of such priorities in our country, we have set ourselves the goal of studying this topic.

Analysis of the relevant literature. In our country, the comprehensive development of the agricultural sector, the mechanism of state support is being improved. Historical decisions and other legal normative documents of the head of our state aimed at defining the agricultural strategy have been adopted. Of these, the Decree of the President of the Republic of Uzbekistan dated October 23, 2019 PD-85853 "On approval of the Strategy of agricultural development of the Republic of Uzbekistan for 2020-2030" [2] and the goals and objectives set in accordance with this "Strategy": The main goal of this Strategy is to radically improve public policy to further deepen reforms aimed at increasing the competitiveness of the agricultural and food sectors, which is theoretically based on one of the priorities - "creating a favorable agribusiness environment and chain of surplusage value."

Also, the study of the Decree of the President of the Republic of Uzbekistan dated January 28, 2022 "On the Development Strategy of New Uzbekistan for 2022 - 2026" revealed that one of the priorities of the "Development Strategy for rapid development of the national economy and high growth" The value-added tax rate is set to be reduced to 12 percent."[3]

Therefore, the primary product of the agricultural sector, as a basis for the development of other sectors of the agro-industrial complex, is the complete processing of its raw materials in the country, ie in the process of modernization and diversification of the sector, aimed at the transition to a full cluster system in the cotton industry and the development of cooperative relations on the practical implementation of the principles of the economy.

A review of the scientific literature on the selected topic revealed the following. The first group of authors: - Zoxidov G.E. (Methods of organization and management of production by cluster method./Monograph.- T .: "Fan" Publishing House, 2016) [4]; - Murodov Ch., Hasanov Sh., Murodova M. (Agrocluster: theoretical bases of organization.//Economy and finance. 2014. №2.19-25 pages) [5]; - Murodov Ch., Hasanov Sh., Murodova M. (Directions of these authors (the use of the experience of South Korea in the organization of agro-clusters.//Economy and Finance. 2014.№3.39-44 pages) [6]; - Mamatkobulov Sh., Jalilov Sh. (Issues of quality and economic efficiency in the cluster system.//Agro ilm - Agriculture and Water Management of Uzbekistan. 2021.№1. Pp. 95-97) [7]; - Djabbarov S. (Priorities for the development of cotton and textile production in Uzbekistan.//Agro ilm - Agriculture and Water Management of Uzbekistan. 2021.№2. Pp. 103-105) [8] The essence and organizational features of clusters in research illuminated.

The second group of authors: - Toshboltaev M. (The essence and prospects of development of innovation clusters.//Agro ilm - Agriculture and Water Management of Uzbekistan. 2019.№3. 3,4 pages) [9]; - Burkhonov A., Abduvoxidov A., Toshboev B. (Peculiarities of the organization of cluster activities in Uzbekistan.//Agro ilm - Agriculture and Water Management of Uzbekistan. 2019.№3. Pages 107-109) [10] ; - Radjabov K., Erkaeva B. (Features of formation and organizational model of regional interlayer clusters in textile industry. // Agro ilm - Agriculture and water management of Uzbekistan. 2019.№5. Pages 119-120) [11]; - Uljabaev K., Yarashova V. (Logistics aspects of agro-cluster development.//Economic Bulletin of Uzbekistan.2019.№2. Pp. 28-30) [12] The Asian model was recommended to Uzbekistan.

The third group of authors: - Abdukodirova S., Minasipov B. (Effectiveness of the formation of agro-clusters in the conditions of Uzbekistan.//Agro ilm - Agriculture and Water Management of Uzbekistan. 2022.№4. 44 p.) [13]; - Abdukadirova S. (Features of the organization of cotton agro-clusters in the Lower Chirchik district of Tashkent region.// Agro ilm - Agriculture and Water Management of Uzbekistan. 2022.№2. 95.96 pages) [14]; - Mirzaev K.J., Rakhimova Z.K. (Clustering of agricultural services.//Economy and finance. 2020.№3.38-44 pages) [15] approach the organizational

aspects of the activities of agro-clusters (as well as the term economic agro-clusters).

These sources do not address the essence of the "chain of surplusage value" in the broadest sense. In addition, in our study, the scientific approaches of Arkhipova O. (Glubokaya pererabotka syrya - osnovnoy rezerv razvitiya tekstilnoy promыshlennosti Uzbekistana.// Market, money and credit.2017.№10. Pp. 18-25) [16] are directly noteworthy. At the same time, it is proved that the value increases at each link, depending on the economic process of the formation of the "chain of surplusage value".

Also, the most significant of the studied sources – Rakhmatov M.A., Zaripov B.Z. (Cluster - integration, innovation and economic growth. - T.: Zamin Nashr, 2018) [17]. The issues of integration of innovations are described in detail and its necessity and prospects are shown in the context of the conditions of our country. It also indicates the formation of a "chain of surplusage value". Therefore, we have relied in part on this and previous source coverage of the topic. However, in studying the sources on the subject, it was acknowledged that in none of these and other scientific literatures did the "chain of surplusage value" be studied and defined as an economic category. Even "Economic Theory" (Shodmonov Sh., Rakhmatov M.A. "Economic Theory" - T .: "Zamin Nashr", 2021-856 p.) Textbooks [18] and relevant textbooks ("Clustering of the economy of the agro-industrial complex" .- T .: "Classic" Publishing House, 2022) [19] belongs to.

At the same time, the sources on the development of entrepreneurship in Uzbekistan, published abroad in recent years, were studied. These are: - Margianti E.S. ets. (Entrepreneurship in Uzbekistan: trends, competitiveness, efficiency.- Indonesia, Jakarta, Gunadarma Publisher. 2016) [20]; - Kurpayanidi K.I. (Otsenka effektivnosti razvitiya predprinimatelstva v Uzbekistane.- International Book Market Servict Ltd., Germany, 2018) [21]; - Kurpayanidi K.I., Ashurov M.S. (Assessment of the current state of the business environment in Uzbekistan and the problems of its effective development. Monograph.-GlobEdit Academic Publishing, European Union, 2019) [22]; - Aripov O.A. (Prioritetnыe napravleniya razvitiya malogo biznesa i predprinimatelstva v Uzbekistane.//Rossiyskoe predprinimatelstvo, 2017, vol.18, № 24) [23] In the scientific views of [23], the current period of entrepreneurial activity in Uzbekistan is critical, but we do not find in these scientific literatures the study of "chain of surplusage value" as an economic category.

However, it should be noted that the topic is little studied in the scientific literature, or rather almost unstudied. Therefore, in determining the composition of agro-industrial products, our initial scientific conclusions were applied [24] and in approaching the tariff to the category of "chain of surplusage value", Janonova S. (Terminology in rural economy.// Agriculture and water management of Uzbekistan. 2021.№8) [25] based on the principles of creating intersectoral terminology.

The aim of the research is to explain the essence of the concept of "chain of surplusage value" as an economic category and to develop a tariff for copyright.

Materials and Methods. In the article, we have examined the business relations in modern agro-industrial integration in terms of historical, economic, logical principles, deterministic approach and discourse analysis. In studying the concept of "chain of surplusage value" as a category and trend in economic relations, we used research methods such as the unity of historical and logical methods, scientific abstraction, systematic analysis, statistical grouping and comparison. These are: - According to the unity of historical and logical methods, the economic events of the last five years in our country are considered as a historical process, the chain of surplusage value is studied as a necessary internal law for the formation and development of new types of market economy relations; - According to the method of scientific abstraction, during the analysis we excluded the second level of events and happenings from the whole market production relations, focusing only on the methodologically determined facts and figures related to the research topic, ie the process of chain of surplusage value formation; - According to the method of systematic analysis, the study of the chain of surplusage value process began with agriculture and then focused on the integration of the agricultural sector with industry; - According to the method of statistical grouping, the products of the agricultural sector of modern Uzbekistan are divided into groups: the economic viability of the integration process into primary, intermediate and final products is studied and the current state of business structures in this chain is summarized. Accordingly, the ratio between these products was compared, the main emphasis was placed on the intermediate product, and recommendations were developed for the transformation of raw materials into final products, ie the complete processing of raw materials within the country. As a result, it was found that the chain of surplusage value is becoming a trend.

Research results. It turns out that today in the activities of business structures "chain of surplusage value" is involved as an economic relationship, and as the term is used both theoretically and practically, it is important to define the meaning of this concept. However, we do not believe that the desired result can be achieved in scientific and practical life without knowing and understanding the full essence of it. So, what is a "chain of surplusage value"? What does he mean? We approach the concept as an economic category and try to interpret it in detail. We think that it would be appropriate to begin with the correct solution of this transverse task, the study of its fundamentals, that is, the relevant moments of production relations from the first stage of agro-industrial integration to the final point.

"Agriculture is one of the oldest and most important sectors of the economy that never loses its place and importance" [1.159p.]. The primary product of an agro-industrial complex is the consumption value obtained by man from nature, created only in agriculture, and then intended to be included in the process of agro-industrial production as material elements of circulating production. As a natural raw material resource of the economy, it constitutes the products of mining and agriculture (so-called primary sectors of social production) and is strictly defined by the scope of these sectors. In addition, its distribution in agriculture, for example, has its own characteristics compared to the mining industry: the primary product produced here then requires processing in other industries, and it is this raw material that serves as the source of the next sequence of cycles.

If we pay attention to the specific features of the agro-industrial complex, it has the properties of forming and distributing the final results. Unlike industry, there is no regular production of the product, although the labor activity is carried out throughout the year, which in essence incurs specific costs. Determining the final results is therefore complex and can be done conditionally approximately. It is known that the end result of any sector included in the agro-industrial complex is an intermediate process in terms of this

system.

Consequently, once agricultural products are produced, they go through a number of subsequent steps before reaching the consumer. At the final stage of the movement and use of agricultural products, that is, at the stage of consumption, the results obtained by society are of paramount importance. In the operation of the whole agro-industrial complex, the final results achieved in the national economy depend not only on the agricultural sector, but also on the final result of all the links associated with the delivery of agricultural products to the consumer.

Therefore, the primary product is distributed as a primary result of agricultural production as follows: part remains in the agricultural sector farms for domestic purposes, i.e. to establish a new production cycle. For example, grains as seeds, young animals to replenish cattle, etc .; the rest is sold to other sectors of the agro-industrial complex as raw materials. This means that from the point of view of the agro-industrial complex, the formation of the final product has two directions: part of the first product returns to the previous places of production for the new cycle, and the second completely leaves the place of production. It is this orientation that is the first link in agro-industrial integrati on.

In addition, part of the initial product takes the form of the final product. Thus, small amounts of food enter domestic (private and public) consumption without being processed in the industry. For example, some of it is used in children's and public institutions, public catering establishments. By the way, our statistical collections do not have such data.

All this suggests that the primary product can be considered in the unity of the two parties: the agro-industrial complex in terms of its functional role in the process of social reproduction as the most important component of the overall product, and the latter reveals the dialectical relationship with the intermediate and final product.

However, regardless of the social system, people try to absorb the material blessings bestowed by nature, adapting them to meet their needs in different ways. In turn, the intensification of production on the basis of new equipment and technology will lead to an increase in the output ratio of the final product unit. As a result, the ratio between the volumes of the initial, intermediate, and final products varies significantly in favor of the latter. Many factors affect the ratio between the growth elements in this process, i.e. the volume and quality of the initial (raw) and final products.

It will be necessary to take into account the trends in the distribution of primary products, and as an example let us refer to grain, which occupies the main substance in the import of agricultural products. According to some calculations out there, the loss of an already harvested crop may not be less than what we bought. How much grain is lost in the wheat field due to the lack and imperfection of harvesting techniques? Is it really cheaper to import grain than to regulate the production of the country's economy? Another example. The bulk of the grain is spent on fodder, including about half on animal feed. But this is clearly mismanagement, perhaps wasteful! After all, we all know that it can be more productive if it is reproduced on the farm. Nevertheless, in low-yielding crops, the use of coarse and succulent fodder in the diet of cattle is more economically and physiologically feasible.

Consequently, the fact that a significant portion of grain is spent on feed in unprocessed form rather than through mixed fodder cannot be an excuse for the fact that the absolute majority of mixed fodder is not balanced in terms of essential nutrients. This is the first. Second, the economic efficiency of the finished product in any form depends primarily on the volume and quality of agricultural raw materials. Therefore, the parameters of agricultural raw materials, as well as costs depend on the extent to which the factors of intensification of production of the final product of the agro-industrial complex.

For example, if the delivery weight of young cattle is increased from 350 kg to 400 kg, the average daily weight gain is 800 g, beef production will increase by 36% with the same number of livestock, and by 52% with a delivery weight of 500 kg. However, by reducing the cost of meat, the profitability of its production can be increased from 30 to 54%, or vice versa. Reducing the sugar content of beets by only 1% leads to a loss of 830-850 thousand tons of sugar per year. Reducing the fat content of milk by 1% is equivalent to the amount of dairy products produced by 1 million cows. At present, the existing indicators for assessing the performance of agricultural enterprises do not fully take into account and encourage the quality of products.

Third, the level and quality of processing of agricultural products is important in the ratio of raw materials and final product production. The point is to reduce the loss of agricultural products, increase safety, deep, low-waste and waste-free production. For example, the yield of the highest grade flour from a ton of wheat in a conventional mill is 250-300 kg, while in mills equipped with modern equipment this figure is 2.5 times higher. Cooling of products during storage also has a great effect: in this case the shelf life of grain increases by 5-6 times; loss of fruits and vegetables is reduced by 5-10 times. The single-phase method of freezing meat allows to reduce its natural loss during storage by 35-40%. In addition, polymer packaging materials maintain the quality of meat and reduce its loss during storage by another 2-3%. Storage of vegetables in containers increases the yield of standard products compared to storage in the hive: carrots - by 5%, cabbage - by 15%, table beets - by 5-6%.

Practice shows that at the junction of the second (agricultural) and third (processing industry) sectors of the agro-industrial complex, as well as in these sectors themselves, significant losses of agricultural products occur. According to experts, up to 30% of it will disappear without becoming the final product. However, this indicates not only a large difference in the volume of production of primary (raw) and final products of the agro-industrial complex, but also significant reserves for increasing the production of final products with the same volumes of supplied raw materials. In addition, the cost of eliminating the causes of loss is 2-3 times less than the additional production of products of the same size. Experts' calculations show that reducing losses during processing and storage will increase the final yield of meat and milk by 10-15 percent, grain - by 20-25 percent, fruits and vegetables - by 30-40 percent.

From the above, it is known that modern methods of processing agricultural raw materials not only reduce losses, but also allow to fully meet the needs of society in equal amounts through the use of low-waste and waste-free technologies, expanding the range (diversification). However, in the technological chain of modern agro-clusters, the above-mentioned intermediate in agricultural production - a balanced ratio of the conversion of valuable raw materials into cost-effective final commodities. Therefore, in accordance with the economic policy pursued in our country, the main goal is to prevent the inefficient export of primary

and intermediate products of the agricultural sector.

Based on the above considerations, we believe that the next "fate" of various primary products of the agricultural sector will be set in the right direction by agro-clusters and agricultural cooperatives established and operating in our country. However, agro-industrial integration is reflected in the activities of clusters in this area. Thus, the functioning of the "chain of surplusage value" in the economy of our country is inextricably linked with the activities of modern clusters. Therefore, it is necessary to dwell on the activities of clusters.

A cluster - is a complex of agricultural, industrial and other related enterprises integrated into a single technological chain. If we look at the cluster project [17], according to which, along with the integration of different industries into a single technological chain, the cluster has established and operates a scientific and technical council, a research center and training councils. According to the project, a total of 8 companies are operating in this cluster system. These are: cotton planting complex (including 5 companies), cotton processing and ginning plant, textile complex (including 5 factories), oil and gas plant, livestock complex for 12,000 head of cattle, biogas plant, 20 hectares of modern greenhouses, enterprises producing more than 25 types of dairy and meat products.

At present, there are 125 cotton-textile clusters in the country. Here, raw cotton is grown by them, goes through all stages of processing and is transformed into export-oriented finished products. For example, according to the Resolution of the President of the Republic of Uzbekistan dated May 19, 2017 № PP-2978 "On measures to create a modern cotton-textile cluster in Bukhara region": The Cotton-Textile Cluster was formed and operates with the participation of the Uzbek-British joint venture Bukhara Cotton Textile, Paraglide LTD and Petromaruz (Russia) with foreign investment of $ 123.1 million.

The investment in this cluster, managed by the General Coordinator of the project (UK) and the Local Government, is mainly aimed at on-site expansion and modernization of existing spinning, weaving and sewing-knitting facilities. According to the structure of this cluster, which ensures the socio-economic development of Bukhara region, gradually increasing employment and real incomes of various segments of the population, our national wealth begins with the planting of cotton, its deep processing, ie through all technological stages to the production of finished products for export. system is formed.

This cluster complex has the capacity to supply 1.5 million finished products, 2.5 thousand tons of yarn, about 4 million pogono meters of fabric per year to the domestic and foreign markets. Its performance for 2018-2021 was as follows: The cluster farm in this project increased its exports of products from the 2018 harvest to $ 45 million, in 2020 to $ 100 million, and in 2021 to $ 150 million.

Cluster economy, integrated into a single technological chain, seeks to expand the use of innovations. Cooperation in the field of innovation is an exchange of experience between strategic partners and suppliers, as well as the growth and renewal, which strengthens the innovation process, creating a harmonious active innovation environment. It can be seen that this system represents a broad layer of agro-industrial integration, and this integration in the form of a cluster combines technological processes into a single chain, creating a "chain of surplusage value" in the provard..

As for the cost-effectiveness of the chain of surplusage value, today this issue is of interest to many. "In the world market, 1 kilogram of cotton fiber is priced at 1-1.5 US dollars. It costs $ 7-8 if it is collected and spun, and if the fabric is woven from it to make, say, 3 men's jackets, the added value increases to $ 100. Or, a 1-pound piece of woven fabric recycled in a cluster system is enough to sew a single Denim-indigo jeans. However, such a finished product can be sold on the world market for $ 500-1,000 "[19.130 p]. Another example. Experts estimate that the export of 1 ton of cotton as a raw material is less expensive than the processing of finished products: garments - 28 times, knitwear - 6-7 times less [16.21 b].

Discussion. It can be seen how much the weight of profit in the form of a chain of surplusage value is added.

Following this principle, a number of foreign countries: China, Bangladesh, India, Turkey have managed to develop their textile industry in a short time [16.21 p]. Currently, European, North American and Asian models of cluster activity are widespread in the world [10]. However, in the ongoing economic reforms in our country, this is the main reason why the cluster method is gaining ground in all regions.

Based on the above considerations, if we define the concept of "chain of surplusage value", it seems that the term has not yet been sufficiently interpreted, as it has not been long since it entered economic life. Therefore, we have not found a definition of this term in economic dictionaries, as well as in encyclopedias, or even in the latest textbooks [18].

Therefore, first of all, in determining the lexical meaning of the term, comparing it with the principles of scientifically developed agricultural terminology [25], it was found that "chain of surplusage value" is a special - three-tiered concept, derived from a combination of terms "value added", "value" and "chain". formed. As already mentioned, this term is new and, by its origin, is inextricably linked with the formation of cluster activities in our country. It is the sum of the interconnections of economic relations in agro-industrial integration, which can be found today in the complex activities of more clusters, as discussed above.

The concept of value added is known, if we first look at the National Encyclopedia of Uzbekistan: "Value added is the value added to the previous value of a product by a particular firm, enterprise, newly created, directly grown in the process of production (rendering of services)" [27]. In other words, value added is a surplus of newly created value in microeconomics over the initial capital spent on the activities, production and services of various economic entities.. The word "chain", according to this popular understanding, means a connection, that is, it is not only a simple connection, but also made of iron - a strong connection. It consists of several rings that are tightly connected. Each ring in it is inextricably linked with its predecessor and successor. Rather, the chain - which is organically connected to each other - consists of a combination of connecting rings. According to the National Encyclopedia of Uzbekistan: "Chain - 1) a flexible item made of metal rings attached one after the other. "2) A flexible part of a machine or structure consisting of a series of connected links" [27. 3 vols. (Gidr.-zeb.) 669 p.].

Therefore, if we apply this concept to the technological process of agro-industrial integration, we think that from the sum of the final results of each of the links involved, we will have the concept of "chain of surplusage value". For example, in cotton-textile clusters: cultivation of raw cotton, primary processing (separation of cotton from seeds) and cleaning, spinning, weaving, dyeing, sewing - the conversion of various finished products and the creation of new value in each of

the other processes. This serves as a raw material for the next (intermediate) product produced by each joint, and on this basis a new value is created. In other words, if we imagine the added value generated at each link in the agro-industrial integration as a single loop, it is clear that their combination in the technological sequence forms a chain. Therefore, we have the concept of "chain of surplusage value".

So, it would not be wrong to say that the concept of "chain of surplusage value" is the sum of the newly created value added in a series of enterprises, integrated into the agro-industrial integration. We believe that such a creation of a "chain of surplusage value" will inevitably take place not only in the agro-industry, but also in other areas. However, if we look at the issue from the point of view of the science of economic theory, the concept of "chain of surplusage value" is an economic category, as it is established in science and practice, as well as in essence. However, with the development of a market economy, it is possible to observe a trend of the existence and development of a "chain of surplusage value" in its various sectors, and thus it is becoming an economic law. In particular, the fact that our country plays an important role in ensuring economic development is a clear example of this.

Looking back over the past five years, the idea of the President to use the cluster method to increase the share of value added in agriculture of our country is bearing fruit. During these years, 466 agro-clusters have been established in the country. These are: 125 cotton and textile, 157 grain, 146 fruit and vegetable, 29 rice, 9 pharmaceutical. Agro-clusters process 100% of cotton, 91,7% of grain and 7,2% of fruits and vegetables. Today, more than 100 types of agricultural and food products are exported to more than 90 countries around the world.

Nevertheless, we are at the starting level in the development of the chain of surplusage value. According to media reports, the share of agricultural products in the country's GDP does not exceed 17%. The volume of processing of agricultural products is less than 10%. However, this figure is more than 50 percent in developed countries. Consequently, the economy of our country is still dominated by raw materials. The share of Uzbek raw materials in exports is 74%, and the production of high-tech products is only 1,7%. It is obvious that this situation shows that Uzbekistan has a low position in the world division of labor.

Therefore, the economic policy pursued in our country today is aimed at "creating a favorable agribusiness environment and chain of surplusage value."

Measures are being developed to make effective use of existing opportunities. "One of the priorities of the Development Strategy is to accelerate the development of the national economy and ensure high growth rates - to reduce the value added tax rate to 12% from 2023" [3].

Therefore, if we look at the key indicators to be achieved as a result of the implementation of the Strategy, the share of products produced in partnership with agricultural enterprises and associations in exports in 2025 - 23% compared to 2018 - due to the formation of a favorable agribusiness environment and the desired chain of surplusage value model. and by 2030 - 30%. It is also expected that the share of processed products in total exports will reach 35-40% in these years. As a result, the most important indicator is the improvement of Uzbekistan's position in the World Bank's Global Logistics Performance Index (Logistics Performance Index), which by 2025 will increase by 10 points and by 2030 - by 20 points [2].

Of course, the opportunity to achieve such a great goal is at the expense of developing a chain of surplusage value.

Conclusions and suggestions. 1. The first conclusion of the study of the topic is that if we compare the stages of development of entrepreneurship, in this case, the most notable change is that in our country we remember cotton growing, which has been a direct object of entrepreneurship. If the economy of Uzbekistan was the main raw material base before independence, both in the era of capitalism and socialism, at a new stage the situation has changed radically. The Uzbek economy is slowly getting rid of its raw material base. Therefore, it is well known that it was not easy for Uzbekistan to get out of this situation during independence. However, recently, due to the main entrepreneurship of the government, the "Action Strategy" was adopted, a system of clusters was established in the country, and due to their complex activities, a chain of surplusage value mechanism was established, and the production of finished products began. Therefore, the export potential of our country is growing.

2. At the same time, the improvement of transportation and storage, the introduction of waste-free processing of primary agricultural products requires a significant modernization of the production infrastructure of the agro-industrial complex. It should also be noted that the growth rates of the final product volume should be at least equal to the production rates of the initial product. An increase in the rate of production of the final product indicates a decrease in the loss of agricultural raw materials and their rational use, and this creates opportunities for the development of the chain of surplusage value.

3. The distribution of balanced production capacity of the agro-industrial complex on the territory of the Republic is equally important. Evidence shows that there are serious shortcomings in the practice of strategic planning and their regional distribution, which negatively affect the volume and quality of the final product, its production efficiency. Often the concentration of enterprises in the processing industry exceeds the concentration of production of agricultural raw materials. When production capacity fails in one place due to lack of raw materials, it deteriorates elsewhere, agricultural raw materials perish, because in this area there is a lack of processing capacity, irrational transportation occurs. The characteristics of agricultural products are not always taken into account in the placement of enterprises in the processing industry. It is well known that many types of agricultural raw materials are perishable products, while others require faster shipment for processing and storage. Therefore, in the agro-industrial complex, it is often (in terms of consumption value and cost of the final product) that it is more economically viable to have small but close processing enterprises to sources of raw materials. As for the packaging of agricultural products, as a rule, it should be noted that the packaging and transportation of finished or processed products is much more economical than agricultural raw materials.

All this indicates that the priority development of processing, storage and other areas related to the delivery of agricultural products to the consumer will play an important role in structural changes. In our opinion, they play a crucial role in improving the final results of the agro-industrial complex.

4. Based on the above, it can be concluded that entrepreneurship in our country has become a leading force not only in the agricultural sector, but also in other areas, ensuring the intended Development Strategy of New Uzbekistan. However, we believe that it is necessary to carry out reforms aimed at improving the business environment and further increase the freedom of entrepreneurship to stimulate competition, to eliminate existing barriers to the development of small and medium-sized businesses.

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USING ONLINE TECHNOLOGIES IN STUDENTS' EDUCATION IN THE SPHERE OF AGRICULTURE

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Abstract

Currently, Uzbekistan is rapidly implementing measures to develop digital technologies in all spheres of the economy, as well as to widely introduce information and communication technologies in public administration, education, healthcare and agriculture and other areas of public life. The country needs specialists with systems thinking, who can make informed decisions, who are able to think outside the box and modern, who are able to search for and use useful information, and learn innovative technologies. Internet technologies play an important role in solving these problems in the educational system. In particular, the implementation of priority projects has begun, which provide for the improvement of the e-government system, the development of the market for software products and information technologies, the organization of IT parks in all regions of the republic, and the provision of this area with qualified personnel. The article presents a model for organizing students' independent work using online technologies. Detailed instructions are given for completing a specific task in computer science using an electronic educational resource developed by the authors of this article

Key words: *model, informatization of education, means of information and telecommunication technologies, teaching electronic educational resources, online technologies.*

Introduction. The adoption of digital technologies is faster than any other innovation in the history of mankind: in just two decades, digital technologies have managed to reach about 50 percent of the population of developing countries and transform societies with their help. The use of technologies that enhance connectivity and access to financial, commercial and government services can lead to a significant reduction in population inequality.

The population of Uzbekistan as of September 7, 2021, according to the State Statistics Committee of the Republic of Uzbekistan, was 35,270,000 people, of which 17,900,000 urban residents (50.8%) and 17,350,000 rural residents (49.2%). It should be noted that in Uzbekistan the average total age is 28.6 years. The age structure is such that children under 14 years old make up 23.88%, the working-age population - 70.86%, over 65 years old - 5.25%.

In Uzbekistan, more than 60% of the population are young people, the average age of the country's inhabitants is 25 years. Therefore, there is a great need to support young people by modernizing the educational system, creating additional jobs and opportunities to improve the quality of life.

UNICEF international organization within the framework of a joint project with the Youth Union of Uzbekistan and the Yuksalish National Movement for 2018–2020. conducted a study "Youth of Uzbekistan: Challenges and Prospects". The key objectives of this youth survey were: to provide a comprehensive overview of the situation of young people in Uzbekistan, with a focus on the most important areas of their daily lives, and to inform government and public organizations involved in the development of national youth policy, to improve the effectiveness of decisions taken on issues affecting the well-being of youth. This study found the following:

1. Throughout Uzbekistan, students from various educational institutions express overall satisfaction with the existing educational system (created environment, teaching, learning materials). However, they portray the situation in rural areas as less favorable than in urban centers.

2. With regard to the learning environment, students express a desire that it be more motivating, practice-oriented and provide a better education. In particular, students want to improve their language skills, increase business literacy and be better prepared for the transition to professional life. Among young people aged 19-30 years, the share of those who do not continue education, training and work (NEET) after completing compulsory secondary education is 54.6%. For young women, the NEET rate is consistently higher at 74.0%, while for young men in this age group it is 24.8%. With regard to choosing a future place of work, it is important for young people in Uzbekistan that the scope of their professional activity is their "personal choice" (and not the choice of their parents). In addition, the job should provide a "decent income" and allow the person to be surrounded by a positive "collective" of colleagues that support youth and allow continuous learning.

3. Compared to their peers living in urban centres, young people in rural areas have fewer opportunities to continue their education or get a job and are therefore interested in entrepreneurship. In general, young people throughout the country note the importance of existing ties (and nepotism), the economic opportunities of the family in increasing their social mobility.

4. Although young people in Uzbekistan show a very strong interest in learning more about computers (86.9%), there is still a significant group (37.8%), consisting in particular of women and rural youth, who do not have any computer skills. In addition, there is a gap between a large number of young people (53.9%) who "never" use the Internet (mostly young people in rural areas and women) and a smaller number who use it "daily" (25.4%) (mainly city dwellers and young people). The Internet itself is equally seen by young people as a "useful" tool for maintaining social contacts, study or work, and as a potentially dangerous place where they "waste time" or are "badly influenced" (which disproportionately limits women who fear stigmatization) [1].

Present, Uzbekistan is rapidly implementing measures at

the state level to develop digital technologies in all spheres of the economy, as well as the widespread introduction of information and communication technologies in public administration, education, healthcare and agriculture and other areas of public life [2-3].

The country needs specialists with systems thinking, who can make informed decisions, who are able to think outside the box and modern, who are able to search for and use useful information, and learn new technologies. The Internet plays an important role in solving these problems in the educational system.

In particular, the implementation of priority projects has begun, which provide for the improvement of the e-government system, the development of the market for software products and information technologies, the organization of IT parks in all regions of the republic, and the provision of this area with qualified personnel. Therefore, at present, there is a need to develop the Internet and the information space, create a communication and information infrastructure for young people living in rural areas.

In this direction, important tasks can be identified: the formation of basic knowledge, based on online learning; the formation of skills to independently learn and professionally improve. The task of the national policy of Uzbekistan in the field of education is to create a national cultural and information space. This will save our culture for the new generation, which will receive more and more information and knowledge from the Internet.

Materials and methods.

The traditional education system [4], as is known, includes the following participants:

1. The teacher is a source of information and knowledge; the student is the recipient and accumulator of information and knowledge. Online teaching methods offer a new approach that provides an integrated mechanism for interaction between the teacher and students. In this case, the roles of the latter are distributed in a different way:

2. The teacher is the producer and pointer of information; the student is the accumulator of information and the shaper of knowledge.

Here the teacher plays the role of an "organizer", creating motivational factors for studying disciplines and acquiring the necessary knowledge and skills. Thus, from all of the above, the most important methodological aspect of online learning follows, namely, its focus on the widespread use of Internet technologies by students at various levels.

It should be noted that online learning should correspond to the education of a student of a higher educational institution according to the established state educational standards in academic disciplines with a check of the quality of assimilation. Purposeful and strictly controlled initiative individual work of students forms the basis of the educational process in online learning.

To do this, it is necessary to include a certain set of learning tools in the online learning environment [5]. Both traditional (non-digital) and electronic learning materials, as well as computer learning systems and the Internet, serve as teaching aids in higher education institutions.

Model for organizing students' independent work based on online learning. The role and importance of using electronic learning materials (educational resources) for organizing students' independent work is undeniable. Consolidation, expansion and deepening of the acquired knowledge, skills, independent study and assimilation of new material without the help of a teacher is the main goal of extracurricular independent work [6].

Such characteristic features of extracurricular independent work as: availability of a bank of practical tasks in the discipline under study; the absence of a teacher in the process of completing the task; time specially allotted for the task; teacher's monitoring of the student's cognitive activity with the help of the latest information technologies (Figure 1).

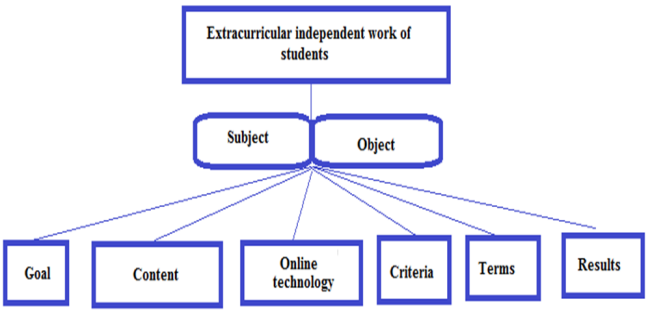

Figure 1. Model of organization of independent work of students.

Using online technologies. We offer a system of independent work of students, implemented with the help of online technologies, which includes the following elements: purpose, content, online technology, object, subject, criteria, conditions and result. Thus, the model of organizing students' independent work based on online learning can be represented as follows.

Here:

The object is a student of a higher educational institution.

The subject is a teacher of a higher educational institution (who knows how to use online technologies).

The purpose of a student's individual work based on online technologies is to acquire knowledge, skills and abilities, which should be formed in accordance with the model of a specialist and the requirements of the employer.

The content (determined by the teacher) includes topics for the student's individual work: a course of lectures, a workshop on problem solving, a glossary of terms, tests.

Online technology is a technique aimed at student independence in the process of cognitive activity. This technology is an educational process that includes the acquisition of new knowledge and skills using Internet technologies, feedback and monitoring [7].

The criteria for the formation of students to use online technologies in the structure of individual work are: motivational and theoretical and practical [8].

The conditions for the effective use of online technologies in the process of teaching students are:

- use of individual tasks as the main forms of learning;
- use of creative tasks built on the principle of increasing complexity;
- dynamic monitoring to track and analysis learning performance;
- use of mechanisms to increase the responsibility of students for self-control and self-analysis of their activities.

The result of the student's individual work using online technologies is, firstly, the development of analytical thinking, and secondly, the development of knowledge, skills and abilities in the discipline under study and the willingness to use them in educational and professional activities.

As mentioned above, one of the elements of online technologies used in independent work of students is the development and use of special teaching aids, in other words, such electronic educational resources, the basic principles of which are the establishment of interactive communication between the student and the teacher (in this case, a computer) and independent development of a certain body of knowledge, the acquisition of skills and abilities in the chosen course and its program.

Below are the methodological recommendations for self-fulfilment of tasks in informatics using the electronic educational resource developed by the authors [9-13].

The organization of independent work using an electronic educational resource includes the following steps:

• development and issuance of assignments for independent work;
• formulation of the purpose of the assignment;
• drawing up a work plan;
• instructions for completing the task;
• management and control over the progress of extracurricular independent work of the student;
• evaluation of the obtained results.

Results of research. We will consider the implementation of the above steps using the example of learning the Delphi programming language.

Task: to study the types of properties of objects of the Delphi programming language.

Purpose: to acquire knowledge, skills and abilities to work with components and their properties in the Delphi environment.

Student's independent work plan:

1. Study of data types assigned to simple properties of components.
2. Definition of enumerated properties.
3. Study of sets and combined values of nested properties.
4. Managing the properties of visual components in the graphical execution mode (run time). Development of the SHAPE DEMO program.

Instructions for completing the task using an electronic educational resource.

1. Since the electronic educational resource is located on the Internet, any user can access it. However, they can view public information. In order to use the capabilities of an electronic educational resource to perform independent work, the user must be registered, in other words, perform authentication, i.e. get a username and password.

2. The student, using an individual login and password, enters the electronic educational resource as a registered user. A list of sections of the discipline intended for study (curriculum) will appear on the computer screen.

3. The section of the discipline necessary for completing the task is selected (in this case, the section "Programming Language Delphi"). The contents of the specified section will appear on the computer screen, from which the topic necessary for studying is selected - "Properties in Delphi."

4. The student studies the theoretical material relevant to the topic.

5. To complete the assigned task, the user prepares the material according to the plan of independent work in the WORD text editor. At the same time, he can copy the necessary parts of the theoretical material.

6.The prepared file is sent by e-mail to the teacher:

6.1 the user enters the mail embedded in the electronic educational resource;

6.2 selects the address of the teacher or other registered users;

6.3 in the field "subject" writes the name of the task;

6.4 in the field "file" writes the prepared file with theoretical material;

6.5 sends the material to the teacher.

7. The user performs practical work - develops the SHAPE DEMO program in the Delphi environment.

8. The user sends to the teacher by E-mail the composite files of the project, i.e. *.dpr, *.pas, *.dfm, *.res, *i.e.:

8.1 enters the mail embedded in the electronic educational resource;

8.2 selects the address of the teacher or other registered users;

8.3 in the "subject" field, writes the name of the practical task "Managing the properties of graphical visual components in run time". Development of the SHAPE DEMO program.

8.4 in the "file" field, in order of priority, selects the components of the project *.dpr, *.pas, *.dfm, *.res, *;

8.5 sends the completed task to the teacher by E-mail.

Management and control over the progress of the student's independent work. The completion of tasks by the student is managed by e-mail through various forms of control and training:

• consultations (installation, thematic). During these consultations, students should comprehend the information received, and the teacher should determine the degree of understanding of the topic and provide the necessary assistance;
• follow-up control, during which the teacher conducts an interview with the student, reviews the performance of practical tasks and exercises;
• current control is carried out during the verification and analysis of certain types of independent work of students, performed according to an individual plan;

The final control is carried out through a system of tests and examinations provided for by the curriculum. Forms of control should be adequate to the levels of assimilation: the level of understanding, reproduction, reconstruction, creativity.

We recommend to use test forms of the final control more widely. Test control of students' knowledge and skills differs from other forms of control in its objectivity, saves the time of the student and teacher, has a high degree of differentiation of the subjects in terms of knowledge and skills and is very effective in the implementation of rating systems, makes it possible to greatly individualize the learning process by selecting tasks for independent work, allows you to predict the pace and effectiveness of each student's learning.

Testing helps the teacher to identify the structure of students' knowledge and, on this basis, to reevaluate the methodological approaches to teaching in the discipline, to individualize the learning process. It is very effective to use tests when a student performs independent work.

Our electronic educational resource provides for self-control carried out by the student in the process of studying the discipline "Computer Science". The student tests his knowledge and skills until he receives the maximum score that satisfies him.

Evaluation of the results of the student's independent work.

The teacher evaluates, according to the criterion

developed by him, the work performed by the user (student) and the assessment is sent by e-mail to the student.

The criteria for evaluating the results of extracurricular independent work of a student can be:

• the level of mastering the educational material by the student;

• the student's ability to use theoretical knowledge in the performance of practical tasks;

• the validity and clarity of the presentation of answers.

Conclusions. Online learning has long ceased to be a set of lectures that can be viewed on a computer. Today it is an effective tool for gaining knowledge. Distance learning technologies have reached a new level and become more accessible. The article proposes a model for organizing extracurricular independent work of students in an agricultural area using online technologies. A form of organizing independent work using electronic educational resources is proposed, including the following stages: development and issuance of assignments for independent work; statement of the purpose of the task; drawing up a work plan; instructions for completing the task; guidance and control over the course of independent work of the student; evaluation of results. Detailed instructions are given for performing a specific task in computer science using an electronic educational resource developed by the authors of this article.

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GROWING SWEET PEPPER PLANTS BASED ON EFFECTIVE ELECTRICAL TECHNOLOGY

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Abstract

In recent years, a number of biologically and physically stimulating stimulants have been developed and are being applied to seeds and plants, resulting in some positive results.

The article provides information on the use of ultraviolet light in hydroponic greenhouses to increase productivity through the use of advanced electrical technologies in the cultivation of agricultural products and to achieve resource and energy savings in plant growth. Provides information on the cultivation of vegetable seedlings for open and protected areas, the use of resource-efficient innovative technologies in the regulation and maintenance of microclimate conditions in the cultivation of seedlings.

Key words: *Sweet pepper, seedlings, resources, energy saving, innovative technology, phyto LED lights, food.*

Introduction. In recent years, the area under crops has been significantly expanded in order to provide the domestic market with quality products and increase the country's export potential by increasing food production. Practical measures are also being taken, such as specializing the districts in fruit and vegetable growing, uniting producers into fruit and vegetable clusters and cooperatives.

It shows that specialization of regions is the right way to grow competitive agricultural products that can meet the requirements of world markets.

Therefore, in the Resolution of the President of the Republic of Uzbekistan dated May 11, 2020 No. PP-4709 on additional measures to specialize the regions of the republic in the cultivation of agricultural products, at the initial stage 55 the district specialized in fruit and vegetable growing. However, despite the measures taken in this direction, the system of effective use of the potential of the regions has not been established, the diversification of agriculture, horticulture, viticulture, In order to increase the production of competitive products that meet the requirements of domestic and foreign markets by specializing in the cultivation of vegetables, potatoes and other food products, as well as the widespread introduction of scientific innovations and increase the material interest of producers: The Coordinating Council for the Implementation of the Development Strategy for 2020-2030 has been instructed to:

- Gradual specialization of the regions of the republic in the cultivation of certain types of agricultural products;
- In order to effectively organize the work of specialization of the regions of the republic to certain types of agricultural products, as an experiment to develop proposals for the specialization of a total of 116.3 thousand hectares of additional land in Jizzakh region for agricultural production in 2020-2022 tickle [1,5,18].

On the State Program of the President of the Republic of Uzbekistan "On the implementation of the Action Strategy for the five priority areas of development of the Republic of Uzbekistan in 2017-2021 in the" Year of Youth Support and Public Health " In order to ensure the implementation of the Decree No. PF-6155 of February 3, 2021, as well as the effective regulation of the field of agricultural seed production, the Cabinet of Ministers of October 12, 2021 "On some regulations on agricultural seed production" Appendix 6 in paragraph b: in cooperation with the Agency for the Development of Horticulture and Greenhouses, the Agency for the Development of Viticulture and Enology and the Research Institute of Vegetables, Melons and Potatoes " Scientific and practical research in the field of fruit and vegetable growing, viticulture, melons and potatoes in 2020-2023 and innovative scientific and technical projects "will be submitted to the Ministry of Innovation Development in due time. [15,17].

In Uzbekistan, about 60 percent of vegetable crops are grown from seedlings. In our sunny country, there is an opportunity to grow seedlings 2-3 times a year and make efficient use of protected land. This opportunity is important in meeting the demand of the population of our country for vegetables and preventing the global food crisis. In order to provide the population with cheap, high-quality food products, to increase the production of greenhouses in the country and the use of modern methods of growing seedlings of vegetable crops, it is important today. In horticulture, seedlings grown from seedlings are more advanced in growth and development than similar plants grown without seedlings [1,9]. This progress leads to faster ripening of the plant, better sales of the product in the market and higher economic efficiency. That's why many of our farmers know the benefits of growing vegetables in the open field and in greenhouses. However, some farmers and landowners lack the knowledge and experience to grow vegetable seedlings. [4,8,12].

To ensure the rapid development of modern production and social infrastructure, and on this basis to develop measures to create favorable conditions for the consistent and sustainable growth of the economy. It is also one of the most important issues today to conduct research in all areas of agriculture in order to increase the efficiency of production through the use of the latest achievements of science and technology in the economy. Nowadays, there is another way to increase the productivity of agricultural crops. This is the use of electric heaters in agriculture. [6,7,8].

The topic is devoted to the application of new environmentally friendly electrical technologies in the production of crops (sweet peppers, tomatoes, cucumbers, etc.) in the autumn-winter and spring-autumn seasons in closed heated rooms. The introduction of this agro-electrical technology in agriculture is a topical issue today. It is a scientifically advanced new technology aimed at increasing the productivity of agricultural crops in indoor heated rooms, disease prevention and environmental cleanliness. [10,13].

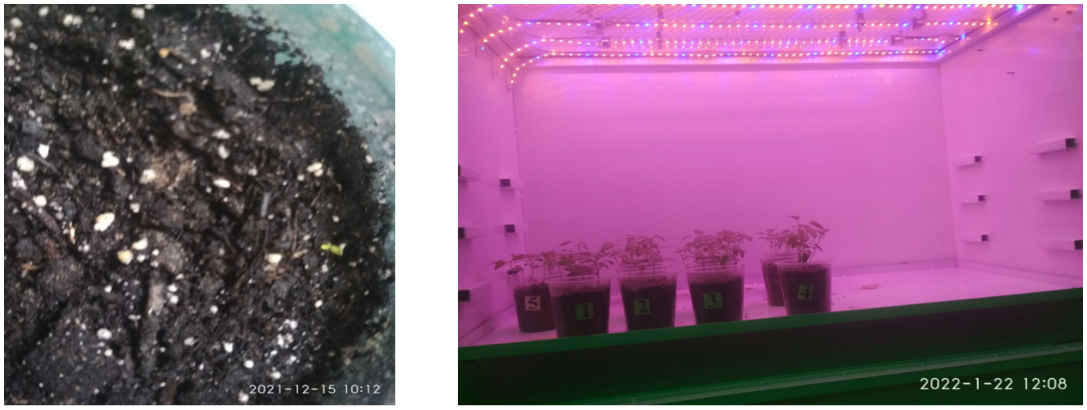

Figure 1. Irradiation of sweet pepper seedlings in the growing chamber.

In recent years, a number of biologically and physically stimulating stimulants have been developed and are being applied to seeds and plants, resulting in some positive results. But these methods are not widely used in production.

A variety of machines and mechanisms are used in crop production. But few of them are machines based on electrical processing technology, and almost all of them are stationary. [1,3,6]. In this study, it is important to note that for the first time in hydroponic special greenhouses using an electric accelerator designed to treat plants with ultraviolet light, the task of determining the optimal method of ultraviolet irradiation of sweet pepper plants was assigned (Figure 1).

Materials and Methods. It is important to improve the environment by increasing the productivity of plants and reducing the use of chemicals as a result of the use of electrification.

The use of lighting devices is an important task of irradiating plants, the second chapter of which discusses their main technical and economic indicators. The efficiency coefficient determined from the light intensity curve of the irradiator, the coefficient of luminous flux utilization, i.e., the change in the light intensity curve when irradiating the lighting medium and plants, the concentration of the luminous flux on the irradiated surface should be increased by adjusting. [8,9,11].

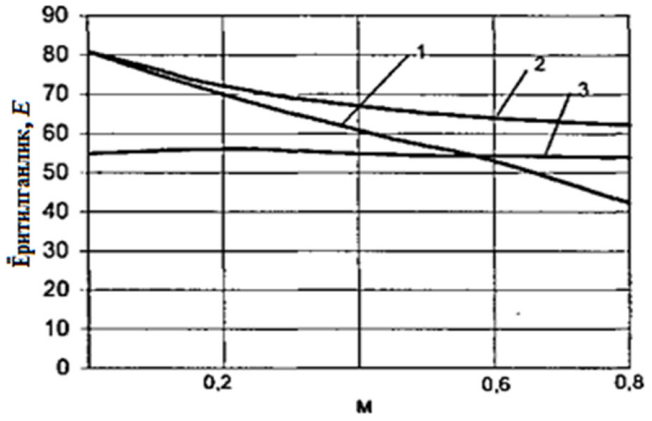

Figure 2. Graph of the effect of artificial radiation on plants with lighting devices.

1-LED phyto-strip lamps Intensity of the light distribution curve, 2- Intensity of light distribution curve of DNaT type lamps, 3- Intensity of the light distribution curve of incandescent lamps.

The light intensity curves for each type of luminaire were determined on an experimental stand for the five positions of the side-reflecting surfaces and the three positions of the light source relative to the horizontal axis (shown in Figure 2). [6,7,11,12,13].

The light intensity is determined as follows:

$$I_\alpha = \frac{E_\alpha * l^2}{\cos \beta} \quad (1)$$

Where: E_α -is the illumination or phytonurization of the plane perpendicular to the direction under consideration, lk or fit / m^2;

l -is the distance from the light source to the measuring point, m;

β- is the angle of incidence of the radiation flux on the photocell (this angle is taken as 0°).

In order to calculate the parameters of the micro-climate chamber for growing sweet pepper seedlings, we need to pay attention to the agrotechnology of growing sweet pepper seedlings. According to agrotechnology, sweet peppers are just as demanding on fertile land as tomatoes, and sweet peppers love moisture and heat. Crops: grasses are planted when 5-6 true leaves appear. Seedlings need 55-60 days for the autumn-winter season, 50 days for the winter-spring season and 35-40 days for the summer-autumn season. After planting, when the plant reaches a height of 20-25 cm, the water point is removed to develop the side branches. When forming a plant, 2-3 strong side branches are left. Sweet pepper is a light-loving plant, so it can not be planted in the greenhouse. When planted thick, the flower does not pollinate and the yield decreases. Care should be taken to irrigate the area during the sweet pepper harvest. No reservations are required. Sweet pepper seedlings should usually be planted 70x40, with a row spacing of 70 cm and a spacing of 40 cm. Therefore, it is recommended to take deep watering during this period and water less frequently, often every 5-6 days.

As can be seen from Figure 2, the minimum point of intersection of the light scattering curves is close to 60 cm, so we can set the height of the camera to be adjusted every 10 cm to 70 cm, width 50 cm, length 1 m we define as We can place 6 of 48 cell cassettes with 4x4 cm in 0.5 m2 area. The total number of cells is 288. If we grow 4 seedlings in each cell, we can grow 1152 seedlings. According to the standard, 36-40 thousand seedlings can be planted on 1 hectare of land, and 1080-1200 seedlings can be planted on 3 hundred square meters. Given the large number of 2-3-storey private greenhouses in our conditions, it is a

Figure 3. A device for irradiating sweet pepper seeds and irradiating seedlings and controlling the irradiation process.

very convenient device for small farms (Figure 3). It can be designed as a two- or three-story for large greenhouses.

Sweet pepper seedling plant Minimum dimensions 50x100x70 cm Radiation power R_{max} = 112 W, if you need to control the temperature of the chamber, use an additional infrared incandescent lamp R_{max} = 100 W and up to R_{max} = 212 W increases. The total installed power of the irradiator is Rmax = 212 W, which means that in areas where centralized electricity is not available, seedlings can be grown using non-traditional renewable energy sources.

The device is automatically controlled by the control switch via 2 automatic circuit breakers. FS-2 time relay from the first automaton with the command 1 second to 1 hour, UV-S 20 W 2 ultraviolet λ = 200-250 nm wavelength fluorescent lamps for ultraviolet irradiation treatment of plant seeds and co. 'chats are used and controlled for processing for 10 seconds when they start to grow 4 ... 5 leaves. The second machine controls the temperature of the chamber through the SMD5050 series LED phytolent irradiation process and the thermal relay to illuminate the plants through the ALION TB388 24-hour time relay. The SMD5050 series LED phytolent can be used to illuminate the plants, the characteristics of which are given in Table 1.

Table 1

Characteristics of SMD5050 series LED phytolent

Technical characteristics of SMD 5050 series LED phytolent tape	*Technical units characteristics of phytolenta*
Voltage	*12 V*
Power	*14.4 W/m*
Can be cut at a distance	*5 sm*
The width of the belt	*10 mm*
The length of the belt	*5 m*
The number of diodes	*60 pcs / m*
The diode placement sequence	*3: 1, 4: 1 and 5: 1*
Protected IP20, IP67.	*IP20, IP67.*
Radiation flux strength	*620 lm/m*
The colors of the light spectrum	*Red (600-780nm), Blue (430-490nm)*

Phytolenta is an LED strip that can be used to provide additional lighting and to continue the process of photosynthesis in greenhouses, special cameras or individual or home-grown vegetable seedlings, flowers and similar plants. Ideal for both growing and flowering plants. The diodes in the phyto-band are arranged in such a way that they can transmit the spectrum of light needed for plants to grow. [4,6,16,17].

Several studies have been conducted to develop effective electrical technologies for growing sweet pepper seedlings.

Results and Discussion. On December 9, 2021, in order to increase the germination of sweet pepper seeds and ensure faster germination, UV-S ultraviolet radiation intensity with lamps with wavelength l = 200-250 nm and duration t = 1 min; 5 min; 10 min; For 15 minutes, the illumination and irradiated surface area (distance to the seed) h = 0.3 m; 0.45 m; Cultivated at 0.6 m ditches and planted with control (table 2). Sweet pepper seeds were planted in numbered pots on December 9, 2021 and monitored. The observations were irradiated with SMD5050 series LED phytolents for 5 hours after 1700 to

Table 2

Illumination and irradiated surface area

Illumination Site Location	*Duration*			
	1min	*5 min*	*10 min*	*15 min*
0.3 metr	*1*	*2*	*3*	*4*
0.45 metr	*5*	*6*	*7*	*8*
0.6 metr	*9*	*10*	*11*	*12*

artificially extend the daylight hours during the winter to accelerate photosynthesis from the day the sweet pepper seedlings began to germinate, and the following results were obtained. The experimental results obtained were placed in Table 3 and processed.

Table 3

Experimental results

		15	16	17	18	19	20	21	22	23	24	5.01	22.01.22
		c	c	c	s	s	s	s	s	s	s	c	
0.3 meters	Experimental samples serial numbers												
1minut	1	0	0	0.1	0.8_4	1.9_7	2.7	3.4	3.9	4.4	4.4	6.8	$9.2_6{}^6$
5minutes	2	0	0	0.1	0.9_4	1.9_6	2.6	3.3	3.9	4.3	4.5	7.4	$10.3_6{}^5$
10 minutes	3	0.1	0.2	0.3	1.1_5	1.8_7	2.6	3.3	3.8	4.2	4.4	6.9	$9.6_7{}^5$
15 minutes	4	0	0	0.1	0.8_4	1.6_7	2.4	3.1	3.7	4.4	4.9	9	$10.4_7{}^6$
0.45 meters													
1minut	5	0	0	0.1	0.8_5	1.7_8	2.3	3.1	3.8	4.3	4.6	8.2	$8.9_6{}^5$
5minut	6	0.2	0.5	0.8	1.6_6	2.1_9	2.7	3.3	3.9	4.4	4.8	7.98	$9.8_8{}^6$
10 minutes	7	0	0.1	0.2	1.3_5	2.0_9	2.9	3.6	3.9	4.2	4.5	7.2	$11.3_8{}^6$
15 minutes	8	0.2	0.5	0.8	1.4_6	2.0_8	2.8	3.4	3.8	4.2	4.6	7.5	$10.2_7{}^6$
0.6 meters													
1minut	9	0	0.1	0.2	1.1_6	1.8_7	2.6	3.1	3.7	4	4.2	6.8	$8.9_6{}^5$
5minut	10	0.1	0.3	0.5	1.4_6	2.0_7	2.7	3.3	3.8	4.3	4.7	7.5	$9.3_7{}^6$
10 minutes	11	0	0.2	0.4	1.2_5	1.9_9	2.6	3.4	3.8	4.1	4.4	7.2	$9.5_7{}^6$
15 minutes	12	0	0.1	0.3	1.1_5	1.8_6	2.5	3.1	3.6	4.0	4.3	7.2	$8.6_6{}^6$
Control	13	0	0	0	0	0.1	0.5	1.2	1.9	2.5	2.9_2	3.9_4	$4.8_3{}^2$
Soaked in salt water	14	0	0	0	0	0.1	0.3	0.8	1.2	1.7	2.4_2	3.8_3	Qurid i
Soaked for 24 hours in plain water	15	0	0	0	0.1	0.3	0.6	1	1.6	2.0	2.6_3	4.1_4	$5_3{}^3$

The Xx-index x is the number of seedlings germinated from 10 seeds in each pot.
Xy -is the number of leaves on each seedling.
c, s - cloudy or sunny days.

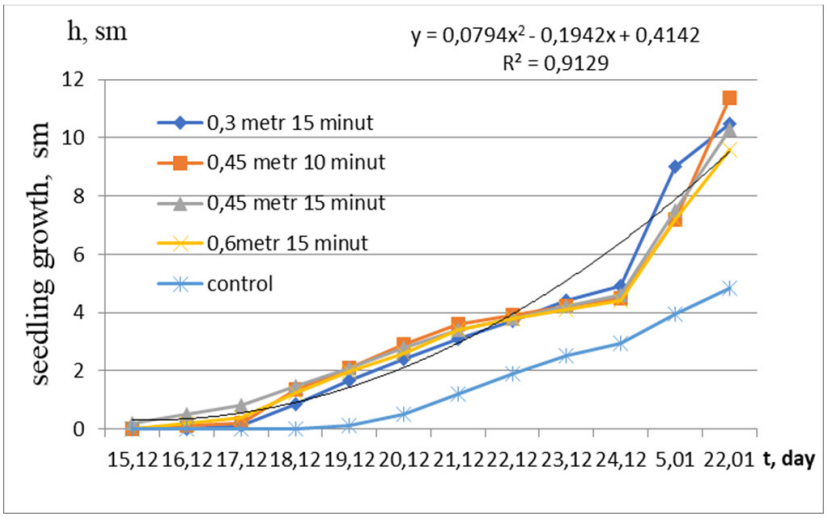

Figure 4. Growth of sweet pepper seedlings over time.

According to the results of the experiments, the most favorable conditions for growing plants were created. The criteria for the optimal regime are the minimum energy consumption, the minimum growth time of the plant, the maximum number of harvested fruits. Studies have shown that the optimal regime for growing plants with minimal energy consumption and minimal loss of radiation flux. The following energy-saving irradiation mode is proposed. In the early stages of growth (green mass formation), 5 strips of light source must be used to maximize irradiation. As the weight of the fruit increases, the radiation dose should be reduced to avoid elongation of the sweet pepper roots.

Analysis of control data showed that there were differences in the qualitative and quantitative indicators of sweet pepper plant growth data and yield data at harvest time. In all variants, the advantage of modified irradiators was observed: an increase in plant height, fruit weight and amount of green mass was observed compared to controlled plants. Irradiation at an altitude of 0.6-0.7 m under the SMD5050 series LED phytoleptic irradiator is 1.5 times higher than the control (up to 8 hours per day under control and 6.7 kilo-lux for 14-15 hours per day when recommended), which allows to increase the yield of seeds and 'is very important in the cultivation of wires. This allows us to draw conclusions about the efficiency of redistribution of the radiation flux.

The ripening period under the proposed irradiator was shortened. In the SMD5050 series LED phyto-tape version, the first 40% of the crop appeared on the 60th day, and

98% - on the 80-85th day. In the control version, the first 40% of the crop appeared on days 90-95, and 96% on days 110-120. The energy saved is reflected in the reduction of the lamp life by 6 days.

Conclusions. The SMD5050 series LED phytolent illuminator is based on a device that has the same luminous illumination sources by redistributing the luminous flux transmitted from above and adjusting the light intensity curve of the light.

When plants are grown using the SMD5050 series LED phyto-strip irradiators, the products are also grown faster due to the acceleration of plant growth in the autumn-winter and winter-autumn seasons. Efficiency is achieved by saving energy sources for heating (gas, coal, electricity), reducing the cost of the product.

At the same installed power, the working area produces a 1.5-fold increase in radiation. Acceleration of ripening of nirin pepper "Tashkent" was observed for 110-120 days. The use of such irradiators increases the cost-effectiveness of growing crops in greenhouses by accelerating the ripening of products and can be easily applied to agriculture.

Figure 5. Irradiation of sweet pepper seedlings in the growing chamber.

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MATHEMATICAL MODELING OF THE INULINE EXTRACTION PROCESS

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Abstract

In this study, a natural extract of Jerusalem artichoke was studied. The physicochemical properties of the concentrate obtained from the Jerusalem artichoke plant were studied. There are experimental statistical modeling methods in mathematical modeling. In this case, the results of experiments obtained at this facility are used to create a mathematical model of the technological process. Flow motion was studied for solution analysis. The importance of studying flow motion is to determine the parameters that need to be considered in modeling.

Key words: *extraction, modeling, inulin, drying, solubility.*

Introduction. Due to the high growth of food industry and pharmaceutical production, many artificial extracts have been synthesized and these extracts are widely used in food products. Compared to natural extracts, their biological activity, taste and vitamins are insufficient [1].

Many natural food extracts contain biologically active substances, vitamins, amino acids, carbohydrates, aromatic substances and mineral salts. Pigments are composed of anthocyanins, carotenoids, chlorophyll and xanthophylls. Natural extracts are obtained mainly from plant raw materials, secondary raw materials from vegetables and fruits. Natural solutions are mainly obtained by extraction methods. Ethyl alcohol solution, water, vegetable oil, etc. are used as extractants [2,3].

Topinambour processing technology for the production of inulin. There are over 2,000 types of products containing inulin and oligofructose worldwide. In particular, in the Russian Federation the common inulin-containing products are: desugared "Russian chocolate", baby food "Heinz", coffee "For slimming" by "Leovit Nutrio", kefir "Biomax effective" by "Wimm-BillDann", drinking yoghurts "Ermigurt prebiotic" by "Ermann", etc. There are only three major inulin producers on the world market: Beneo-Orafti from Belgium has 70% of the market, while Cosucra, also from Belgium, and Sensus from Holland have a roughly equal share [3]. Inulin is predominantly produced in the industry from chicory, which is easier to process due to the regular shape of the root, although its content in topinambur is about the same. The molecular chain of inulin from chicory is longer [8], which is essential for the technological performance of the polysaccharide, for example for fat imitation. The solubility of inulin in water depends on the chain length, which decreases with increasing chain length, with improved gel-forming properties, and increased resistance to hydrolysis. In China, inulin is grown and produced from topinambour with a high maltodextrin content - up to 50%. In the Russian Federation, inulin production, particularly from topinambour, is only beginning to develop for the production of dietary supplements, with dried crushed topinambour or its juice being mainly used.

Promising ways of obtaining extracts from plant raw materials and their drying. In food processing, the main traditional dissolution and leaching methods include closed batch, continuous direct and counterflow, and filtration-flow or percolation processes with a fixed bed [9]. In closed batch processes mechanical or pneumatic agitation is used to intensify the process, in which gas is used not only for agitation but also as an oxidiser. In the case of intensive mixing the disperse particles move with a vector of velocity that changes its direction, and with a numerical value that is lower or higher than that of the washing stream. This is determined by the inertia of the dispersed particles and leads to the possibility of intensification of dissolution 38 and leaching, despite the reduction of the driving force of the processes in striving towards the equilibrium state [10]. In the case of low-intensity mixing, the dispersed particles hover in the fluid while in suspension, moving successively in the upward and downward flows of the fluid phase washing over them at a certain rate determined by gravitational and inertial forces, the latter being superior to the former in the inertial regime [11, 12]. These non-stationary processes are simple to implement but inefficient because of the well-known disadvantages of periodic processes. More common in industry are continuous dissolution and extraction processes. These processes may also be carried out in stirrers with continuous injection and withdrawal of contacting phases into the apparatus. In this method, the intensity is low, due to the contact between solid product and solution with a concentration that, due to agitation, approaches the concentration at saturation, which reduces the driving force and speed of the processes, relative to the average speed of a single batch operation, in which the equilibrium concentration is only reached when it is completed. In addition, it is possible for individual dispersed particles to "overshoot" in a single apparatus [12]. At the same time their residence time in the apparatus may not be sufficient to obtain a high degree of extraction of the extracted components. Therefore for a more significant intensification of the extraction process, the extraction process is conducted in cascade units, where the hydromodule is moved by gravity flow through series-connected apparatuses with agitators. In this organization of the process, the driving force is permanently reduced from one stage to another (the number of stages usually does not exceed 6) and, unlike the process in a single apparatus, when fresh solvent and the final concentrated solution come into contact, a relatively high degree of extraction can be achieved [12]. The effect can be strengthened by organizing countercurrent processes,

where in the countercurrent flow of solids and liquid in the battery apparatus the fresh solvent at the end of the unit is in contact with the leached material, and at the beginning the feed material interacts with the concentrated solution, which makes the unit operation more uniform [7]. With this arrangement of the process flow, fresh solvent is introduced at the end of the unit, which makes it possible to increase the degree of extraction of components from the pores of the solid product, and on the other side of the unit to use the solution for surface extraction more efficiently.

Materials and Methods.

Mathematical modelling of extraction and drying processes. The limiting factor for the extraction rate is the internal mass transfer in the solid phase, which it is advisable to model in order to calculate the concentration distribution in the volume of the starting product during extraction, which determines its duration and compliance with technological limits to ensure the quality of the finished product.

The task of mass transfer modelling is to determine the duration of phase contact determined by extraction kinetics.

Mass transfer is effected by the difference in content of the transferred component on the surface and inside the original product - crushed topinambour, which consists of particles whose shape is close to cylindrical, so the equivalent diameter calculated from the volume of the particle is taken as the characteristic size.

In order to find the unsteady concentration fields, a system of differential equations for heat and mass transfer must be solved.

The mass transfer equation for the one-dimensional problem is as follows:

$$\frac{\partial c}{\partial \tau} = \overline{D}\frac{\partial^2 c}{\partial x^2} \qquad (1)$$

where c - is the concentration of the transferred component in the feed or raffinate, x - is the particle depth coordinate, τ is the current process time, $\overline{D}$- is the average molecular diffusion coefficient in the solid phase.

When building the model, we assume that during the extraction of inulin from topinambour, internal and external mass transfer takes place equally over the entire outer surface of a cylindrical particle of small diameter dэкв = 4 mm internal and external mass transfer.

Hence, as the first coordinate x characterising the particle and on which the desired function depends c (x,τ), one can take its radius r, mm, that is x = 0 ... rэкв.

- The initial value of the x-coordinate corresponding to the surface of the particle: Xn = 0.

- The final value of the x-coordinate corresponding to the centre of the particle: Xk = rэкв

In this simulation option it is not necessary to carry out the calculation in polar coordinates, since the concentration changes in uniform surface mass transfer are not determined by its direction. As another coordinate in the finite-difference grid, when used to solve the mass transfer equation, we take the duration of the extraction process τ,c. Coordinate τ= 0 ...τk

- Initial value of coordinate τ corresponding to the starting point of the process at the initial time at τ= 0.

- End value of coordinate τ, corresponding to the end of the process τ= τk.

Equating the equations of process speed at the interface and in the boundary layer of thickness δwe obtain, similar to heat transfer, boundary conditions of the second kind [58]:

$$-D\frac{dy}{dx} \approx D\frac{(y_{нач}-y_p)}{\delta} = \beta_x(x_p - x_т) \qquad (2)$$

where β_x - is the mass transfer coefficient in the liquid phase; $x_т$, x_p - current and equilibrium concentrations of inulin in the liquid phase, D - molecular diffusion coefficient, x - layer depth coordinate; y, $y_{нач}$, y_p - current, initial and equilibrium concentrations of inulin in the starting product and the raffinate.

In mass transfer processes, given the well-known assumption of dynamic equilibrium at the interface, the concentration at the interface can be identified with the solution concentration at saturation, i.e. the equilibrium concentration x_p in the extract or y_p in the raffinate. This assumption allows to choose boundary conditions of the 1st kind when developing a mathematical model of mass-exchange process of extraction. When determining the initial conditions, the initial concentration is assumed to be a uniform inulin content over the volume of the product before the start of the process.

In order to conduct the drying process in a rational manner, it is necessary to observe temperature limitations related to the hovering time of the particles and the duration of moisture removal, speed and temperature of the heat transfer medium, etc. It should be borne in mind that the results obtained in the experimental setups must be transferred to industrial apparatus, taking into account the principles of scale transition [13, 14].

Since it is difficult to determine experimentally the temperature change in the product volume during the drying process in case of chaotic fine particles with short duration of spray drying, it is advisable to simulate it and solve model equations taking into account the real conditions of dehydration.

In developing a mathematical model for the dewatering of small diameter suspended inulin particles, they can be likened to a "thin layer" characterized by small values of the mass and heat transfer criteria Bio (BiT <<1,BiM <<1).

In extraction and convective spray drying processes the shape of particles and droplets can be assumed to be cylindrical or spherical with a certain accuracy and the energy input to be uniform over the entire phase contact surface. In this regard, one of the coordinates for constructing the temperature functional dependence can be taken as the equivalent particle radius.

As already mentioned, in such modelling there is no need to carry out the calculation in polar coordinates as temperature changes at uniform surface energy input are not determined by its direction [4]. Often desorption shrinkage is neglected to simplify models of the dewatering process [3, 6], which is excluded when drying dispersed high-moisture particles where significant shrinkage is observed. When using numerical methods for solving the heat transfer equation, it is possible to take into account the change of particle size in steps with a given step, which is provided by finite difference method applied in this work, where differentials are replaced by finite differences. Due to the fact that the exact change of the particle size in time cannot be studied experimentally practically, in realization of the model it is assumed to change linearly from the initial to the final equivalent diameter determined empirically by disperse composition

analysis [4, 6]. In the case under consideration, the finite temperature distribution along the particle radius of the previous zone will be the initial for the subsequent one. As another coordinate of the difference grid, instead of dewatering time, the associated current humidity of the treatment object determined in previous studies is used, whose change depending on the duration of the process is also divided into characteristic zones. By sequentially combining the temperature fields of the individual zones, a common temperature field is obtained.

Using a mathematical numerical finite difference method, the concentration and temperature fields for the extraction of inulin from topinambour and convective drying of the inulin solution in a spray state were obtained.

In the one-dimensional formulation of the problem, in its most general form, the energy transfer equation for volumetric energy input is as follows:

$$c_p(x,T,w)\frac{\partial T}{\partial \tau}=\frac{\partial}{\partial x}\left(\lambda(w,x,T)\frac{\partial T}{\partial x}\right)+ \\ +\varepsilon\cdot r(w,x,T)\cdot\rho(w,x,T)\cdot\frac{\partial w}{\partial \tau}+W(w,x,T) \quad (3)$$

Here r is the amount of energy for the vapour formation of 1 kg of moisture when the entropic component is taken into account:

$$r=3118{,}4581\cdot10^3-2286.66\cdot T-55{,}5\cdot \\ \cdot RT\cdot lnA_w+55,(5)T\frac{\partial(\Delta S)}{\partial U_p} \quad (4)$$

In the absence of an internal heat source W(w,x,T)=0, unlike infrared and microwave dehumidification. Let's replace $\frac{\partial w}{\partial \tau}$ to the change in moisture averaged over the diameter $\frac{\partial w}{\partial \tau}$ and assume a phase transformation coefficient of ε= 1, due to the high intensity of moisture transfer mainly in the vapor form at the conditional structural isotropy of the particle [3, 6]. This results in the independence of the thermophysical characteristics from x, which makes it possible to take $\bar{\lambda}$(w T,) over the differential sign.

Dividing all terms of the equation by $c\cdot\bar{\rho}$ (w,T) we obtain:

$$\frac{\partial T}{\partial \tau}=\bar{a}(w,T)\frac{\partial^2 c}{\partial x^2}+\frac{r(w,T)\bar{\rho}(w,T)\partial\bar{w}}{c_{\bar{\rho}}(w,T)}\cdot\frac{\partial\bar{w}}{\partial\tau} \quad (5)$$

where $\bar{a}(w,T)=\frac{\bar{\lambda}(w,T)}{c\cdot\bar{\rho}(w,T)}$ - is the thermal conductivity coefficient.

Knowing $\frac{\partial w}{\partial \tau}$ =f(w) и $\bar{w}=f(\tau)$ and omitting the sign of the mean and the arguments of the functions, we obtain

$$\frac{\partial T}{\partial w}=\frac{a}{\partial w/\partial\tau}\frac{\partial^2 c}{\partial x^2}+\frac{r}{c_p} \quad (6)$$

The initial conditions are given with respect to the uniform temperature distribution at W_H , in the form: at $w=w_H$, $T=T_0$, i.e.

$$T(x,w_H)=T_0$$

Since between surfaces of neighboring particles with the same temperature there is a mutual reflection of thermal energy, the radiant heat transfer between the particles can be neglected with sufficient accuracy. For the heat transfer at the phase contact boundary we assume the boundary conditions of the 2nd kind:

$$-\lambda(w)\frac{\partial T}{\partial x}=\alpha\left(T_{envir.}-T_{x=0\,(sur)}\right) \quad (7)$$

where α- heat transfer coefficient, W/(mK²) x - particle depth, m; $T_{envir.}$ - temperature of drying agent, K; $T_{x=0}$ (sur) - temperature at the surface of the particle, K.

Results and discussion. Solving equation (6) under the above boundary conditions, we obtain the functional dependence t=f(w,x). Then, by substituting in it w=f(τ,W_H,T) we define the function t=f(x,τ,W_H,T). To increase both arguments in the drying process we will carry out the replacement of moisture w into dry matter content c.

Figure 1 shows a graphical interpretation of the concentration fields during inulin extraction.

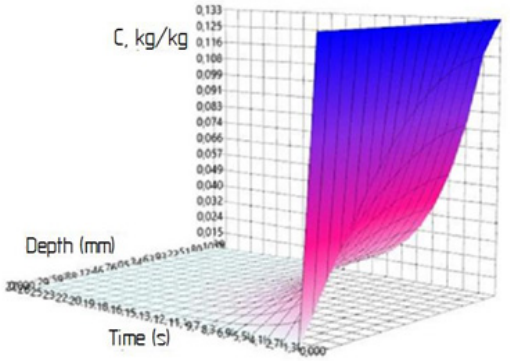

Figure 1. Concentration field using ultrasonic exposure at T = 343 K.

Considering the calculated temperature fields (Fig. 2), it can be concluded that insignificant temperature gradients exist, which result in uniform volumetric heating and 'gentle' moisture removal, as the material temperature during drying did not exceed T= 328 K. Periodic temperature

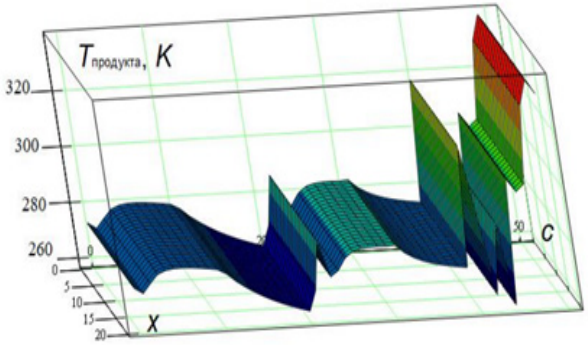

Figure 2. Temperature field at Wn = 0.95 kg/kg; T = 383 K; c, x are the order numbers of the steps (Δc, Δx)

peaks, corresponding to jumps in the drying rate curves, are observed. In sections with approximately constant temperature the removal of free moisture occurs [8, 5]. An increase in temperature is caused by the expansion of structural moisture confined in closed cells and capillaries, blocked by liquid meniscuses, which leads to the so-called "greenhouse" effect and a decrease in the rate of moisture removal.

Conclusions. The adequacy of the developed mathematical model of the drying process was evaluated by the final temperature in the powder layer of the dried inulin extract particles (particle surface temperature). On the basis of comparison of indications of the multimeter during testing with results of modeling it was shown that the average temperature of the powder at the outlet of the dryer at three repetitions made 322 K that guarantees maintenance of quality during drying. The relative error of the model temperature in relation to the experimentally determined temperature of the powder at the outlet of the dryer did not exceed 6%, which indicates the adequacy of the developed model and the possibility of its implementation in industry.

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METHODOLOGY FOR CALCULATION OF THE MULTI-FACTORY RELATIONSHIP OF RIVERS SUSPENDED SEDIMENT RUNOFF WITH CLIMATIC FACTORS

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Abstract

The paper considers a method for calculating a multifactorial relationship with climatic factors of suspended sediment runoff (SSR) factors. The calculations are based on the use of an objective method of alignment and normalization of correlations proposed by G.A. Alekseev. Climatic factors were used as the main arguments - atmospheric precipitation of winter and summer period and air temperature for the summer period. The technique made it possible to evaluate the contributions of each argument to the formation of the SSR.

Key words: *river, river load, climatic factors, winter precipitation, multifactor relationship, summer precipitation equation, air temperature, regressions, contributions of arguments.*

Introduction. The problem of the formation of suspended sediment runoff (SSR) has long attracted the attention of G.I. Shamov, G.V. Lopatin, V.L. Schultz, O.P. Rasulov and other authors, the complexity of studying the process of formation of river sediments lies in the abundance of simultaneously acting factors that make it difficult toμ identify common patterns [3,7].

As O.P. Shcheglova rightly noted, the study of any process in nature, including hydrological, should begin with the identification of its genesis or origination. This is due to the fact that the development of new methods of hydrological calculations and forecasts requires a reliable genetic foundation. The stated position also fully applies to SSR [7].

The study of the genesis of SSR is not an ultimate purpose in itself, but serves as a reliable foundation for solving a number of scientific and practical issues. The division of SSR into genetic components is rational for a number of reasons. First of all, it should be noted that, depending on the genesis, each type of water erosion has its own specific altitudinal distribution area. Taking into account this circumstance, the genetic analysis of the SSR is the key to understanding the altitudinal zonality of the manifestation of water erosion [6,7].

Results and discussion. When establishing a multifactorial relationship between the annual SSR and climatic indicators, as the main arguments for the washout from the watersheds of the mountain rivers of Uzbekistan and surrounding territories, the sums of atmospheric precipitation of different seasons (winter -X_w and summer -X_s) and the average values of air temperature for the warm half-year - ts were applied. Their values will be derived from data selected from representative meteorological stations operating within the studied basins or in their immediate vicinity. The method of joint processing of the main climatic arguments with SSR for the aims of their genetic analysis is based on the use of an objective method of normalizing correlations proposed by G.A. Alekseev [1].

A detailed description of the objective method of alignment and normalization of correlations and its application in various areas of hydrometeorology with specific examples are quite sufficiently set out in the works of G.A. Alekseev [1], V.I. Babkin, N.N. Bobrovitskaya and others. Therefore, we will consider this issue very briefly, in the light of its application to establish a multifactorial relationship between the SSR of the mountain rivers of Uzbekistan and surrounded territories with climatic factors.

According to G.A. Alekseev, normalization begins with the ranking of the observed values of the initial variables in ascending order [1]. In accordance with the rank numbers of the members of the series, the probability of non-exceeding is calculated using the following formula:

$$P_m = \frac{m - 0,25}{N + 0,25} \quad (1)$$

where: m – rank numbers of initial variables in ascending order: N – number of variables.

The empirical values of the normalized variables, in our case SSR - $U_0(R)$, air precipitation - $U_1(Xw)$ and summer - $U_2(Xs)$, although air temperature - $U_3(ts)$ are determined as the known normalized integral distribution function:

$$P_j(X_{ji}) = P_m = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{Um} e^{-\frac{U^2}{2}} \cdot dU = \Phi(U_m) \quad (2)$$

as inverse functions or quantiles

$$U_m = F[P_m] = F[P_j(X_{ji})] = U_j(X_{ji}) \quad (3)$$

where j – number of initial variables, in this case j = 0,1,2,3; i = 1,2,..., N.

The tightness of the links between the pairwise taken initial variables, with the exclusion of the influence of all other considered variables, is characterized by pairwise correlation coefficients. To calculate their value, you first need to determine the sums of pairwise products of the corresponding values, normalized variables:

$U_0(R) \cdot U_1(X_w)$; $U_0(R) \cdot U_2(X_s)$; $U_0(R) \cdot U_3(t_s)$;

$U_1(X_w) \cdot U_2(X_s)$; $U_1(X_w) \cdot U_w(t_s)$; $U_2(X_s) \cdot U_3(t_s)$

Based on the sums of pairwise products, the values of the corresponding empirical covariance coefficients are calculated (μ_{01}, μ_{02}, μ_{03}, μ_{12}, μ_{13}, μ_{23}):

$$\mu_{jj}(N) = \frac{1}{N-1} \sum_{i=1}^{N} U_{ji}(R) \cdot U_{ji}(X_ç) \quad (4)$$

Knowing the values of the covariance coefficients, it is possible to calculate the pairwise correlation coefficients:

$$r_{jj} = \frac{\mu_{ji}(N)}{\sigma_u^2(N)} \quad (5)$$

where σ_u^2 (N) - empirical dispersion, which determines with the following formula:

$$\sigma_u^2(N) = \frac{1}{N-1} \sum_{i-1}^{1} U_{ji}(R) \quad (6)$$

An analysis of the values of paired correlation coefficients calculated according to the above formula between the annual values of the SSR of the studied rivers and three climatic indicators - precipitation in winter, summer and average summer air temperature can be made

Table 1

Limits of change in the values of pair correlation coefficients annual SSR with winter (r01), summer (r02) precipitation and average summer temperature (r03)

Type of nourishment	Number of stations	Limits of change		
		r_{01}	r_{02}	r_{03}
Amudarya River basin				
Snow-rain	17	0,55 ÷ 0,57	0,50 ÷ 0,70	-0,36 ÷-0,10
snow	11	0,60 ÷ 0,81	0,42 ÷ 0,71	-0,32 ÷0,20
Snow-glaciar	7	0,18÷ 0,60	-0,12 ÷ 0,35	0,48÷0,58
glaciar	13	-0,32 ÷ 0,31	-0,39 ÷ 0,29	0,56 ÷ 0,88
Syrdarya River basin				
Snow-rain	19	0,61 ÷ 0,78	0,50 ÷ 0,59	-0,31 ÷ -0,08
snow	17	0,63 ÷ 0,78	0,45 ÷0,59	-0,29 ÷ -0,20
Snow-glaciar	12	0,22 ÷ 0,51	-0,08 ÷ 0,37	0,47 ÷ 0,64
glaciar	2	-0,23 ÷ 0,24	-0,28 ÷ -0,26	0,59 ÷ 0,67

for groups of rivers similar in terms of feeding conditions according to the classification of V.L. Schulz (table. 1). For rivers of snow-rain and snow types of feeding, the pair correlation coefficients of SSR with both winter and summer precipitation have a positive sign and fluctuate, respectively, in the range of 0.337÷0.811 and 0.419÷0.712. It should be noted that for the rivers fed by snow and rain, the annual SSR is more closely related to summer precipitation than to winter precipitation. For snow-fed rivers, in most cases, correlation coefficients with summer precipitation are inferior to correlation coefficients with winter precipitation. For the rivers of both types of feeding, the influence of the summer temperature regime on the SSR is weak, and in most cases it has the opposite character. The values of pair correlation coefficients of SSR with air temperature range from -355 to 0.304.

On the contrary, for rivers of snow-glacial and glacial nourishment types, the values of pair correlation coefficients with precipitation in winter and summer are low, and varying within -0.322 ÷ 0.596 and -0.385 ÷ 0.368, respectively, they are always inferior in absolute value to the values of pair correlation coefficients with air temperature, varying from 0.384 to 0.878. The highest values of pair correlation coefficients correspond to glacier-fed rivers. α

Determining the regression coefficients is one of the main steps in the calculation. Regression coefficients (α_{01}, α_{02}, α_{03}) are calculated by solving a system of three linear (normal) equations:

$$\begin{cases} \alpha_{01} + r_{12}\cdot\alpha_{02} + r_{13}\cdot\alpha_{03} = r_{01} \\ r_{12}\cdot\alpha_{01} + \alpha_{02} + r_{23}\cdot\alpha_{03} = r_{02} \\ r_{13}\cdot\alpha_{01} + r_{23}\cdot\alpha_{02} + \alpha_{03} = r_{03} \end{cases} \quad (7)$$

The solution of the system of equations, in order to determine the regression coefficients, is performed based on the application of the Cramer's method in the following sequence. First, the main minor is determined:

$$\Delta_{00} = \begin{vmatrix} 1 & r_{12} & r_{13} \\ r_{21} & 1 & r_{23} \\ r_{31} & r_{32} & 1 \end{vmatrix} \quad (8)$$

The determinants of the system of linear equations are calculated by the expressions:

$$\Delta_{01} = \begin{vmatrix} r_{01} & r_{12} & r_{13} \\ r_{02} & 1 & r_{23} \\ r_{03} & r_{32} & 1 \end{vmatrix}, \quad \Delta_{02} = \begin{vmatrix} 1 & r_{01} & r_{13} \\ r_{21} & r_{02} & r_{23} \\ r_{31} & r_{03} & 1 \end{vmatrix}, \quad \Delta_{03} = \begin{vmatrix} 1 & r_{12} & r_{01} \\ r_{21} & 1 & r_{02} \\ r_{31} & r_{32} & r_{03} \end{vmatrix} \quad (9)$$

Knowing the values of the main minor and determinants, it is possible to calculate the corresponding regression coefficients taken in pairs of the original variables:

$$\alpha_{0j} = \frac{\Delta_{0j}}{\Delta_{00}} \quad (10)$$

The errors of the regression coefficients are determined by the formula:

$$\sigma_{0j} = \sqrt{\frac{1-r_0^2}{N-\ell}}\cdot\frac{\Delta_{0j}}{\Delta_{00}} \quad (11)$$

where: j=1, 2, 3; - number of arguments; Δ_{00} - determinative minor Δ_{0j}, corresponding to its element of r_{jj} =1.

The limits of change in the calculated values of the regression coefficients for different types of river feeding are presented in Table 2. They are included in the desired normalized regression equation, which has the general form (12).

Using the method described above, for all the studied rivers, normalized regression equations were obtained, which have the general form:

$$U_0(R) = \alpha_{01}\cdot U_1(X_з) + \alpha_{02}\cdot U_2(X_л) + \alpha_{03}U_3(t_л) \quad (12)$$

As can be seen from this expression, the resulting equations differ for different rivers only in the values of the regression coefficients.

The tightness of the relationship between the SSR and the variables that determine it is characterized by the values of the total (or summary) multiple correlation coefficients (r_0). Their values are calculated using the following formula:

$$r_0 = \sqrt{|r_{01}\cdot\alpha_{01}| + |r_{02}\cdot\alpha_{02}| + |r_{03}\cdot\alpha_{03}|} \quad (13)$$

The root mean square errors of the total multiple correlation coefficients are calculated by the expression:

$$\sigma_{r_0} = \frac{1 - r_0^2}{\sqrt{N - \ell}} \quad (14)$$

where l - number of arguments, in our case l= 3.

The normalized regression equations obtained for various rivers are characterized by rather high values of the total correlation coefficients, which range from 0,56±0,12 до 0,94±0,03.

Table 2

Parameters of Normalized Regression Equations

Type of nourishment	The limits of the change			
	Regression coefficient			Full coefficients of correlation, r_0
	α_{01}	α_{02}	α_{03}	
Amudarya River basin				
S – R**	0,52 ÷0,67	0,28 ÷0,70	-0,22 ÷-0,06	0,78 ÷ 0,89
S	0,40 ÷ 0,64	0,25 ÷ 0,51	-0,15 ÷ 0,25	0,71 ÷ 0,84
S – G	0,30 ÷ 0,64	-0,24 ÷ 0,43	0,37 ÷ 0,71	0,69 ÷ 0,77
G	-0,37 ÷ 0,44	-0,30 ÷ 0,38	0,63 ÷ 0,95	0,71 ÷0,94
Syrdarya River basin				
S – R	0,52 ÷ 0,68	0,30 ÷ 0,46	-0,34 ÷ -0,03	0,72 ÷ 0,85
S	0,52 ÷0,68	0,24 ÷ 0,34	-0,10 ÷ -0,03	0,74 ÷ 0,82
S – G	0,22 ÷ 0,45	-0,20 ÷ 0,28	0,56 ÷ 0,72	0,54 ÷0,69
G	0,22 ÷ 0,24	-0,23 ÷-0,16	0,59 ÷0,62	0,68 ÷ 0,72

Conclusions.

1. For rivers of snow-rain and snow types of nourishment, the pair correlation coefficients of SSR with both winter and summer precipitation have a positive sign and fluctuate, respectively, in the interval 0,337-0,811 and 0,419-0,712. It should be noted that for the rivers fed by snow and rain, the annual SSR is more closely related to summer precipitation than to winter precipitation;

2. Primary processing, systematization and generalization of both scientific and source materials on atmospheric precipitation, water runoff, river sediments of the rivers of the study area over a long period have been carried out. A specialized data bank on water runoff, river sediment, atmospheric precipitation and air temperature has been created;

3. A method has been developed for calculating a multifactorial relationship between the water erosion index - SSR of the studied rivers and climatic factors - atmospheric precipitation of different seasons (winter and summer) and air temperature. Here, river sediments are considered as an integral indicator of the intensity of water erosion occurring in river basins as a result of the influence of surface waters formed due to liquid atmospheric precipitation, melted snow and glacial waters.

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DEVELOPMENT OF GEOGRAPHIC INFORMATION SYSTEM (GIS) TO CHANGE THE LEVEL AND LEVEL OF SOIL SALINITY IN JIZZAX REGION

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Abstract

In the Republic, especially in the Jizzax region, the reclamation state of irrigated lands and soil salinization is inextricably linked with the level of groundwater, their salinity and movement. The level of groundwater and its salinity depends largely on the technical condition of the drainage networks and the amount of atmospheric precipitation, the supply of fresh water during the vegetation period, and the movement of groundwater from outside. . Discussed future of using GIS in different sphere. GIS gives possibilities to collect the data, renewing it or use new information in analysis. It requires quick change of GIS information about Earth because procedures in the Earth are dynamically changeable. Periodically changing information in GIS gives us possibility to get new information and analyze it. GIS technologies and techniques started using widely in all sphere of humanity. It is important to know its properties.

Key words: *GIS, water management, Irrigation, Integrated Water Resource Management (IWRM), Uzbekistan, River basin, Agriculture.*

Introduction. Development of Geographic Information System (GIS), occurrence of salinization and water logging, crop extinction, etc. in the agricultural field.For a stable and high yield from agricultural crops, there must be an optimal combination of all the factors that are essential to the life of the plant. For the process of photosynthesis: the necessary moisture and nutrients in the soil; thermal energy of the atmosphere in the upper soil layer; water exchange should be provided to the surface.

The vast majority of irrigated agriculture in Uzbekistan are desert areas, where the lands have a certain amount of natural primary salinity, high mineralization and close to the surface. Irrigated agriculture in these regions can only give us the expected results if it is done with scientifically sound reclamation measures.

The main and effective method of land reclamation is the construction of collector-drainage systems and the maintenance of groundwater level, preventing secondary salinization of land by irrigation and drainage water.

There are many models created in GIS which are successfully used in water management of different countries of the world. Liu (2007) inserted EPIC model, which was suggested by FAO, into GIS and created GEPIC model (J. Liu, 2007; J. Liu, 2009). Stockholm Environmental Institute created WEAP (water evaluation and planning) model by GIS modeling (Assaf and Saadeh, 2008). Fortes et. al. (2005) inserted the existing irrigation scheduling simulation model ISAREG (this model, also, calculates the waste water amount of the area by inserting natural and climatic factors) into GIS, and created a GISAREG model based on the above-mentioned GIS. By this model, they predicted the quality of utilizing the Syr Darya basin water in different climatic scenarios. Creating this model in GIS eases the labour (Fortes, Platonov, and Pereira, 2005). From these models SEBAL is the most widely spread model. Over 30 countries are implementing this model for water resource control.

A number of works are carried out to determine the ameliorative condition of the irrigated lands: - study the movement of groundwater and their impact on natural irrigation factors, determine their impact on natural irrigation factors, soil salinity and other important environmental and saline measures. Development, monitoring of technical condition of collector-drainage networks, repair of collector-drainage networks that require repair z timely repair of Nexis, produced counsel, farms and exploitation activities and controlled by the management of the district reclamation fulfillment.

The GIS (geographic information system) technology is being developed to improve GIS-based data analysis based on field experiments when assessing factors affecting land reclamation. [1]

GIS is currently widely used and implemented in agriculture and water management and land reclamation monitoring not only in Uzbekistan, but also all over the world. Data analysis and transmission and storage within the GIS are addressed in GIS.

Materials and Methods. Therefore, the task of GIS is to receive, collect, analyze, store and transmit data in any format. Being able to access any of these data formats and accessing the program will further enhance GIS capabilities. The ability of GIS to conduct various statistical analyzes, mapping and creation of various databases ensures that it is more relevant and popularized in the area of land and water conservation (Tsihrintzis et al., 1996, Lyon 2003). Therefore, the task of GIS is to receive, collect, analyze, store and transmit data in any format. Being able to access any of these data formats and accessing a meal program will further enhance GIS capabilities. The ability of GIS to conduct various statistical analyzes, mapping and creation of various databases ensures that it is more relevant and popularized in the area of land and water conservation (Tsihrintzis et al., 1996, Lyon 2003).

Using GIS in water management of Central Asia started to develop after 2000, after the implementation of water management in this region. To supply the integrated and regular water management, to create irrigation sets and objects, water users, vegetation type and area database and maps for regional and global scale, and analyze it rapidly was the main problem of water managers. During its long time experiments water management found an answer to this problem. It was using new computer technologies and scientific achievements to water management. This component was added to Central Asian water management plan. As a result the scope of work in this field expands.

GIS Digital Database Analysis and Database Creation Since the 1920s. Improvement of GIS and installation of personal computers started in the 1970s. Since the 1980s,

scientists have begun to use GIS in natural and technical sciences. With each passing year, GIS began to improve and become more widely used in various industries, and the capabilities and content of the community began to grow. Upgrading capabilities and the program has increased its use in various areas. As can be seen from the above, the use of GIS in solving various problems increased 2.5 times from 2000 to 2015 (Tsihrintzis et al., 1996).

GIS has been used for many years in agriculture and water management. Awulachew et al. (2012) note that the use of GIS in these areas enhances the accuracy of data and also provides access to information about difficult-to-reach areas. Another advantage of meliorative hydrogeological monitoring of irrigated lands based on GIS technologies is the achievement of automation and centralization of management, remote data acquisition and management of facilities. Automatic data transmission is achieved. Creating a unified system of water and land surveillance and establishment of a centralized system is currently the main task of the GIS sector.

We have the following advantages when monitoring the reclamation of irrigated lands on the basis of GIS technologies: [1]

Creation of the analysis database to the user in the format he wants (Tsihrintzis et al., 1996);

Creation and use of agricultural and hydrological models (Hu et al., 2001);

Creating Surface Water Models (Bastiaanssen et al., 2005);

Creating models of groundwater and surface water and their delivery systems (Zhang, 2005);

Land use and classification models and maps (Bhaduri et al., 2014);

Formation of water supply system plans (Ames et al., 2009);

Groundwater management modeling;

Water quality monitoring (Banerjee et al., 2013);

Hazardous Material Mapping and Modeling, Natural Hazards or Groundwater Management (Tsang, 2005);

The depth of groundwater level and salinity of groundwater shows that the land reclamation condition worsened compared to 2013. At the beginning of the growing season (1 April), the area less than 2 meters was 168.38 thousand hectares or 59%. During the same period,

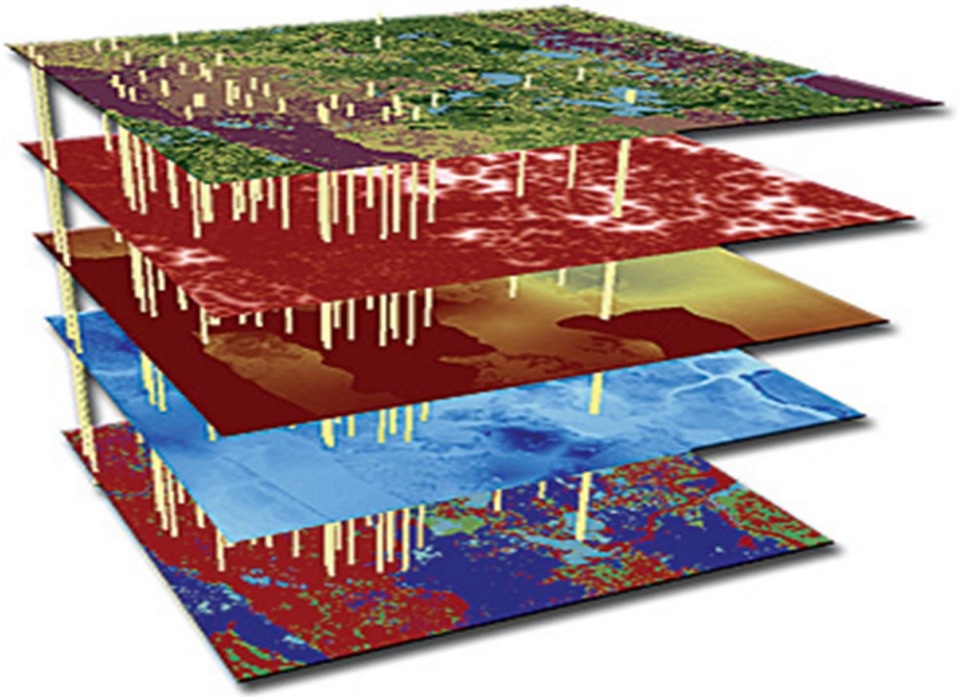

Figure 1. This conceptual model shows the three main components of an aquifer vulnerability assessment: the upper four layers represent soil conductivity; density of sinkhole features, material overlying the aquifer, and estimated aquifer recharge; yellow extruded lines are training points (monitor wells); and the lower layer is the model output, or aquifer vulnerability map.

groundwater salinity was 93.78 thousand hectares, or 32%, in the dense residue up to 3g / l (low salinity). At 118,11 thousand ha or 41% of the irrigated land, the depth of groundwater was at a critical point of more than 2 meters, of which 6.43 thousand or 2% of the irrigated land was up to 1 meter deep. Groundwater salinity was more than 3 g / l (weak, medium and highly saline) at 192,71 thousand, or 67%. The groundwater depth of fewer than 2 meters was reduced to 20.84 thousand hectares, and salinity increased (by more than 3 g / liter) to 18.51 thousand.

At the end of the growing season (October 1) the depth of groundwater less than 2 meters increased the area by 15.78 thousand hectares, with salinity (up to 3 g / liter) reduced by 7.0 thousand hectares.

The dynamics of groundwater salinity continued to change throughout the year. In addition, the above salts also dissolve as a result of precipitation. When the surface water drops, some of the salts pass into the soil and the groundwater is depleted.

Result. Many scientists have created SEBAL models to control the irrigation in the Khorezm region and Fergana valley in central Asia. Here SEBAL models are used with MODIS images (Chemin et al., 2004; Bohovic, 2009; Awan et al., 2011; Bohovic et al, 2012; Awan, 2015). Especially, scientific research of Conrad is very important in this field. He created the SEBAL model using images of RS, MODIS,

Table 1

About categories of soil salinization in Jizzax region farms						
As of 2019-2020						
Information						
The name of the farm`s	Years	Total irrigated - area, ha	Categories of soil salinization %			
			not salinization area ha	less salinization area ha	on average salinization area ha	strong salinization area, ha
1	*2*	*3*	*4*	*5*	*6*	*7*
Arnasoy	2019	33,5	1,4	20,7	10,1	1,3
	2020	33,5	1,4	20,5	10,4	1,2
Baxmal	2019	12,4	12,4			
	2020	12,4	12,4			
Gallaorol	2019	12,0	11,5	0,5		
	2020	12,0	11,5	0,5		
Sh.Rashidov	2019	34,7	6,8	23,1	4,6	0,1
	2020	34,7	7,8	23,0	3,8	0,1
Do`stlik	2019	35,2	5,6	24,3	4,8	0,5
	2020	35,2	3,8	26,0	4,6	0,8
Zomin	2019	20,9	12,9	5,8	2,1	0,1
	2020	20,9	12,8	6,6	1,4	0,1
Zarbdor	2019	53,1	8,6	35,7	7,7	1,0
	2020	53,1	7,0	38,3	6,9	0,9
Zafarobod	2019	28,2	3,9	18,2	5,3	0,8
	2020	28,2	4,0	19,9	3,6	0,7
Mirzacho`l	2019	32,9	2,0	26,5	4,3	0,1
	2020	32,9	1,0	26,2	5,6	0,2
Paxtakor	2019	28,8	3,1	20,5	4,9	0,4
	2020	28,8	3,6	20,3	4,5	0,4
Forish	2019	2,0		1,8	0,2	1,3
	2020	2,0	0,1	1,7	0,2	1,2
Yangiobod	2019	5,5	5,5			
	2020	5,5	5,4	0,1		
Arnasoy	2019	33,5	1,4	20,7	10,1	
	2020	33,5	1,4	20,5	10,4	
By area:	**2019**	**299,2**	**73,8**	**177,1**	**44,1**	**4,27**
	2020	**299,2**	**70,7**	**183,3**	**40,9**	**4,31**

ASTER, SPOT-5 and other satellites for the Amudarya basin and calculated the fertility of utilizing water. Besides, he created several hydrologic models for the very area by using GIS (Christopher Conrad, 2006; Christopher Conrad et al., 2007; Christopher Conrad et al., 2010; C. Conrad et al., 2013).

The use of GIS in agriculture, irrigation networks, and meliorative hydro geological monitoring of irrigated land has a high potential for monitoring the use of irrigation networks and agricultural land (Tsihrintzis et al., 1996). The following features and equipment make GIS the most important program in agriculture (Zhang, 2005)

- Spatial analysis;
- 3D operations
- Network layers;
- Short way to summarize;
- Simple data reception;
- Accessibility options;
- Duration of the process;
- Determining closer distances;
- Visualization.

Conclusion. Introduction of GIS in some arid regions and improve water resource management by this system can be an innovation for some regions. But, GIS is just software and for processing and obtaining solutions one needs to collect data and enter results of analysis, then this program becomes a useful data source for us. Data collection and entering it into GIS are also highly diversified and based on many selections. There are many ways and methods to collect data. Consequently, the types of data are numerous. Filling GIS with unnecessary information causes the user to be lost in a huge information mess. Therefore, it is very essential in research to get only necessary data and choose proper analysis software for it.

There are 286,500 hectares of irrigated land in the region controlled by the Jizzax Amelioration Expedition. Thus, as of October 1, 2017, the soil samples were analyzed by the Dynamic Chemical Experts at a constant dynamic point, and the amount of chlorine ion was determined by the amount of silver nitrate and by the X-express and conductor apparatus. Soil samples were taken from layers 0-0.3 m, 0.3-0.7 m, 0.7-1.0 m. [3]

According to the results, as of October 1, 2017, the area of 7059 saline areas, 223727 low salinity, 50222 moderately saline, and 5486 strong saline areas were identified. The area under saline decreased by 616 hectares compared to 2013, the area of low salinity decreased by 1,036 hectares, the average saline area increased by 211 hectares, and the

saline area increased by 1,441 hectares.

The geographical information system (GIS) has been developed with detailed data on these indicators and maps of soil salinity categories by region, region.

Strongly saline areas have been increased in Sardoba, Havas and Mirzaabad districts. These areas are the areas prone to salinity. The recent establishment of fish farms in Mirzaabad, Havas and Sardoba districts, inadequate water supply during the irrigation season, pumping water from the drainage networks, resulting in increased saline areas. [4]

Current leaching measures for the 2017 crop are set at the low-salinity area of 56,430 ha, moderately saline at 1,095 ha, and heavily saline area at 1,675 ha, and the full-scale leaching has been performed in the designated areas.

An analysis of the autumn 2013 and the spring 2017 shows that the average salinity area in all areas of the region increased due to the decrease in the area of saline and saline areas.

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EVALUATION OF PROCESSES ON THE COAST OF THE WATER RESERVOIR THROUGH SPACE SURVEY (ON THE EXAMPLE OF CHIMKURGAN RESERVOIR)

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Abstract

This article examines the changes in the shores of the reservoir, the geological conditions and the factors influencing it, based on observational data obtained from the shores of the Chimkurgan Reservoir through space surveys of the reservoirs. Based on the study, the geological condition of the coast was determined. Known areas were selected according to the formation of coastal rocks and changes in them were studied.

Key words: *Rock, coastal length, profile, geology, water level.*

Introduction. The purpose of the construction of reservoirs in our country is one of the most important issues in the flow of rivers, the integrated use of available water resources. Therefore, the effective use of existing reservoirs, the gradual supply of water to consumers during the growing season, the establishment of the most optimal operating modes to increase the useful volume lost during operation, the development of improved methods. And most importantly, special attention is paid to high economic efficiency.

Today, the use of modern new information technologies is effective in improving the mode of operation of the reservoir and the timely delivery of the required water supply to the consumer. At the same time, the issues of coastal change over the years and its negative consequences are still relevant today. Based on these factors, the development of an improved mode of operation of reservoirs and the implementation of effective filling and emptying on the basis of this regime, minimizing the loss of useful volume, improving design and calculation methods, constantly monitoring changes in shoreline, changing surface Determining the evaporation that occurs is one of the most pressing issues.

Research method: The research was conducted based on the method of comparative analysis. Comparisons of satellite data were made with comparisons with data obtained from natural observations.

Materials and Methods. As a result of our field research, after the construction of a reservoir in the river valley, its various rocky shores are subject to erosion for a certain period of time, a process that begins to cover all zones of the reservoir. Coasts, where air temperature is strongly influenced by natural climatic factors, are the most prone to landslides.

The geological conditions of the area are of great importance in the process of erosion of the reservoir shores. In particular, the study of the shape structure of rocks formed in the region and their impact on water is evaluated as a factor that gives the greatest results.

As a result of geological studies, the specific gravity of rocks, taking into account the gravitational effect of water γ is calculated by the following formula.

$$\gamma = (\gamma_b - 9810)\frac{\gamma_v}{\gamma_.}$$

where γ_b and γ_v are the specific gravity of rock particles and dry rocks are determined by direct measurements or by standard data taking into account the geological and lithological structure of the coastal slope. [2,5,6,10].

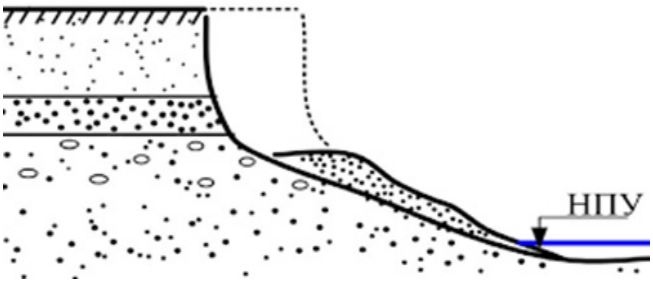

Figure 1. The movement of soils during landslides that occur on the banks of reservoirs

When the banks of the reservoir were surveyed, it was found that landslides occurred as a result of insufficient adhesion of the soils. For this reason, we can see that there are very large landslides on the banks of the reservoir, and in a short time the shoreline of the reservoir has undergone a great deal of change.

Soil analyzes taken from the reservoir shores show that medium sandy and heavy sandy soils have formed in the area, with a high susceptibility to water erosion.

Table 1

Soil composition eroded by water on the banks of the Chimkurgan Reservoir

Sample location	Soil composition %				
	> 0.25	0.1-0.05	0.01-0.005	<0.001	Soil type
1	1.8	35.9	23.7	2.1	sand
2	1, 5	33 , 1	19 , 6	1, 3	middle sand
3	0, 7	15 , 5	7.6	5.2	heavy sand

As a result of the research, the analysis of space surveys taken during the years when the reservoir shoreline was observed was carried out. As a result of the observations, differences in the selected region were compared.

Figure 2. The process of sampling of soils on the banks of the Chimkurgan Reservoir

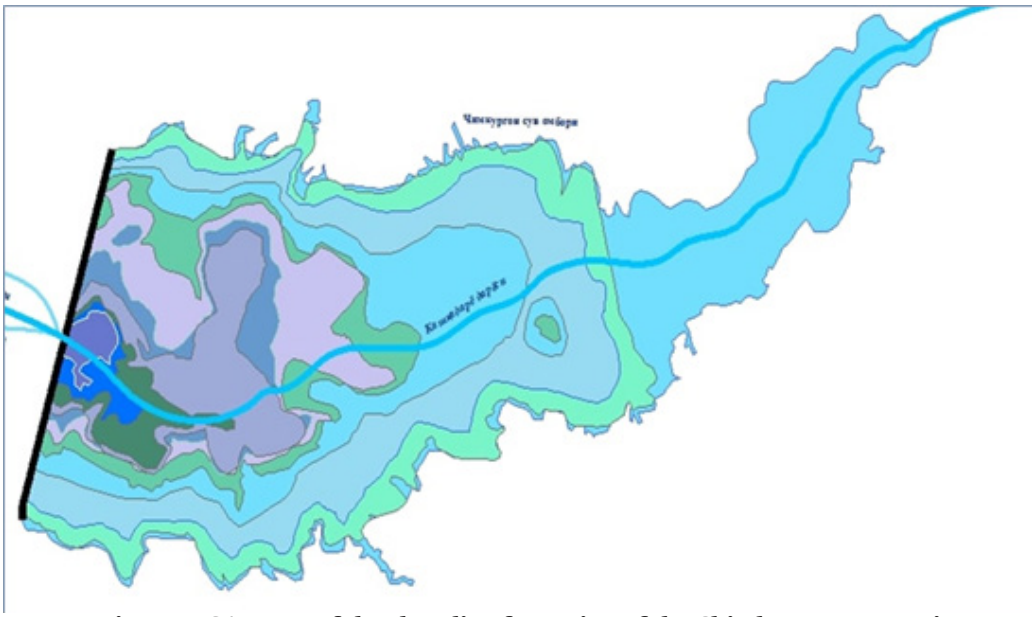

Figure 3. GAT map of the shoreline formation of the Chimkurgan Reservoir.

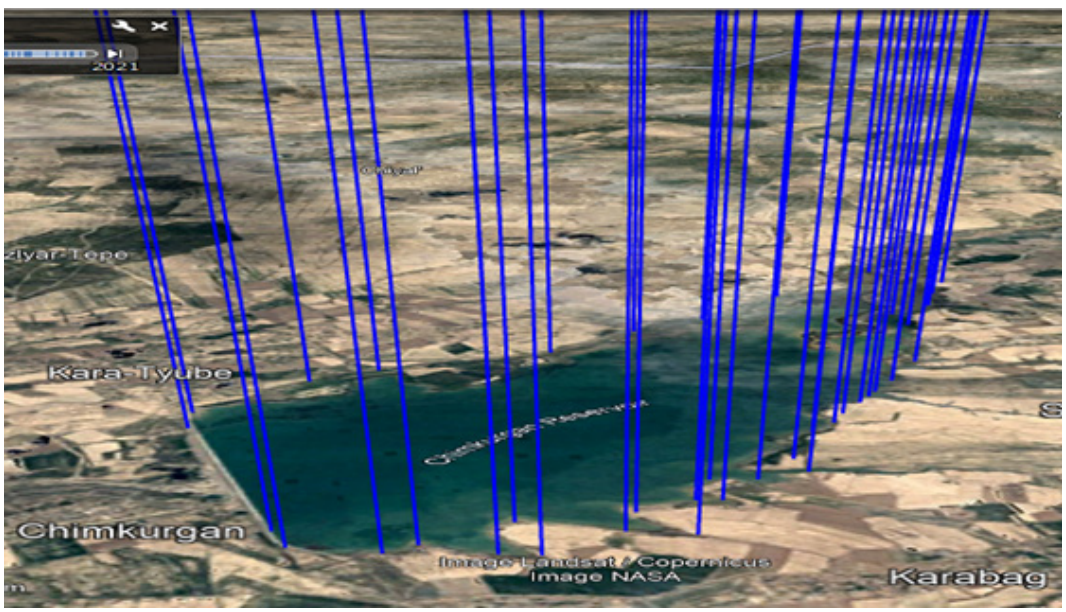

Figure 4. The coastal boundaries of the Chimkurgan Reservoir have been identified

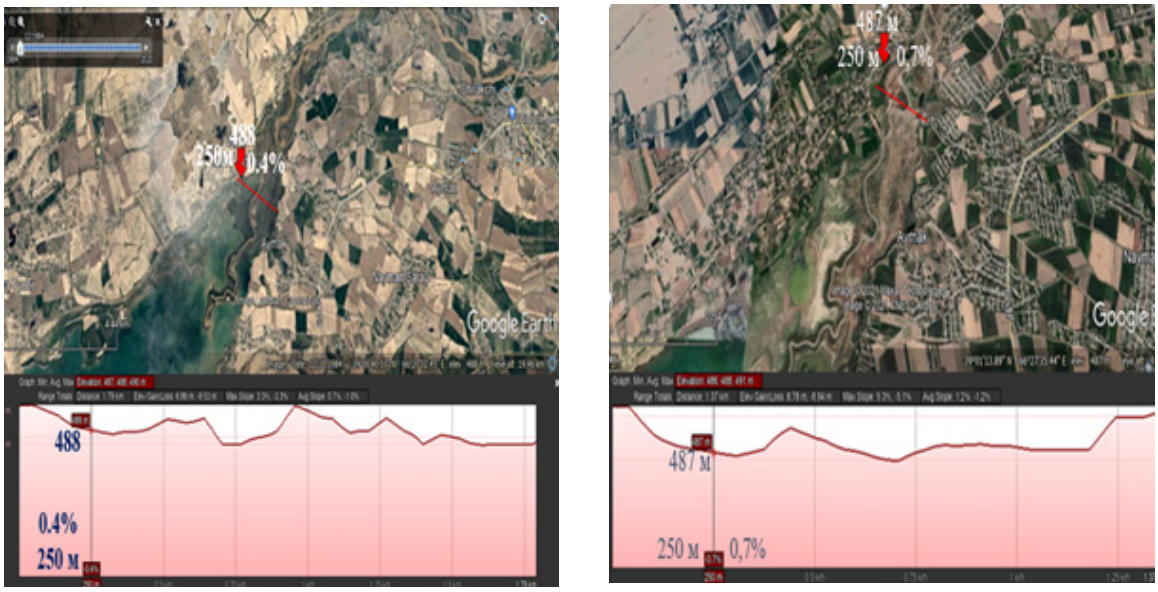

Figure 5. Figure 6 , December 1984. March 2020 coastal shape

Conclusion. The survey showed that the space survey of the Chimkurgan Reservoir was 488 meters above sea level in 1984 and decreased to 487 meters by 2022. During the observation period, there was a deepening and lateral erosion on the bank of the reservoir.

Using the Google Eart database to assess the formation of the shoreline of the Chimkurgan Reservoir, the change profile of the shores at the same altitudes in different years was studied and the difference was determined. According to the study, in order to prevent soil washing processes from the shores and to maintain the volume of the reservoir for some time, it is possible to reduce the problems on the banks of the reservoir by planting trees in coastal areas in cooperation with the Republican Forestry.

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REQUIREMENTS ON REGISTRATION OF ARTICLES FOR PUBLICATION IN THE JOURNAL "SUSTAINABLE AGRICULTURE"

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• Abstract (summary) should not exceed 300 words (1-1.5 pages), it should be used as the standard nomenclature. There are not recommended to use any abbreviations in the title of the article or in the abstract. Keywords should be included.
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• About the text: the introduction should contain the main reasons for research, review and analysis of the appropriate literature on the subject of research and the proposed approach or solution.
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It is necessary to clearly use capital (uppercase) and lowercase letters and also upper and lower indices in formulas, equations, dependencies, etc. This prevents errors. Mathematical formulas are created as separate objects in the formula editor and placed on center. Formulas referenced in the text must have continuous numbering. The formula number is placed in parentheses near the edge of the right margin. The size of the symbols in the formulas is normal is 14 pt, large is 18 pt, small is 7 pt, small index is 5 pt.
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Each table and picture must have a legend. It means the name along with a description that the reader can find useful for understanding the content. The legends for the tables are placed at the top of the table, the legends for the pictures are at the bottom. The headings of the tables and pictures should be completely descriptive, hidden to the left and bold. For the legend of the table, the first letters in each main word are written with the capital letter, for the legend of the picture the capital letters are written only for the first letter of the first word together with own nouns and adjectives. For example Table 1. Total natural river runoff in the Aral Sea basin (average annual runoff, km3 per year is SIC ICWC estimate) from 2001 to 2016. Picture 1. Areas of irrigated land suspended from the South Fergana Channel. In the text, there are used a small letter for the words "table" and "figure" if they do not appear at the beginning of the sentence.
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The parameter "Note" can identify the use of an asterisk (for example, one asterisk (*) is in the Syrdarya region (1970) and a double asterisk (**) is for some notations according to CANIIRI (Central Asian Research Institute of Irrigation), from 1980 to 1983.
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