

**MINISTRY OF EDUCATION AND SCIENCE OF THE KYRGYZ REPUBLIC
MINISTRY OF AGRICULTURE, FOOD INDUSTRY AND RECLAMATION OF THE
KYRGYZ REPUBLIC**

К.И.Скрябин атындагы кыргыз улуттук агрардык университетинин

ЖАРЧЫСЫ



VESTNIK

Kyrgyz National Agrarian University named after K.I. Scriabin

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SECTION I. Economy

UDC: 656(575.2)

Chortonbaev T.Dj., Amatov Sh.B., Chortombaev U.T., Ibraeva N.M., Temirbekov J.T.

Kyrgyz National Agricultural University under named K.I. Skryabin

THE ECONOMIC IMPORTANCE OF TRANSPORT LOGISTICS IN THE TRANSPORT OF AGRICULTURAL GOODS IN MARKET CONDITIONS

Annotation. This article discusses the economic importance of transport logistics in the transport of agricultural goods in market conditions. Its impact on the economy of the national economy as a whole.

Keywords: transport and logistics, economic importance, agricultural cargoes, efficiency of use of transport and logistics system, remote sensing of land, unmanned aerial vehicles.

The current political and socio-economic situation around the world also could not help but address the issues of transport logistics when transporting agricultural goods in the conditions of market relations in the Kyrgyz Republic.

To date, problems and all possible issues concerning transport logistics in the transport of agricultural goods in market conditions remain still an open problem. In particular, the supply of quality and quantitative agricultural products during the pandemic to provide basic food to the population has led to rather difficult circumstances that have had a direct impact on the food security of the country as a whole. Most large and medium-sized enterprises engaged in the transport of agricultural goods in the country were unprepared for such

unexpected fates. First of all, the lack of additional conditions for the long-term storage of agricultural goods, and this in turn has significantly affected the economy of enterprises engaged in the transport and logistics of agricultural goods throughout the country and beyond. Secondly, there is a shortage of highly skilled transport logistics specialists in the transport of agricultural goods in the face of a pandemic and a number of other reasons. That is, it should be noted that the situation on viral diseases, namely covid-19 and atypical pneumonia strongly affected the health of all mankind. This, in turn, affected staff and high-quality specialists in all work fields, as well as in the field of transport logistics.

All these circumstances have significantly affected the economic growth and development of enterprises and the country's economy as a whole in all sectors of the national economy.

Therefore, we believe that the economic importance of transport logistics in the transport of agricultural goods in the conditions of market relations and other situations is of great importance in the food security of the country as a whole.

Everyone knows that the agricultural industry is one of the strategic areas on food

security issues and has quite a large number of items of various cargoes of plant and animal production, which are part of the general range of goods. Thus, most agricultural goods have a tendency to damage when transporting in bulk, in addition, wet agricultural products are prone to freezing. In this regard, it is necessary to focus on the current state of the common transport logistics system throughout the country during the pandemic, which will significantly affect the efficiency of all agricultural transport.

In our view, in order to make better use of the transport and logistics system in the transport of agricultural goods in market conditions, as well as the current difficult situation in the country and around the world from the viral infection of covid-19 and atypical pneumonia, it is necessary to use all sorts of modern technical and technological methods to obtain an effective result. As at the moment the level of multimodal transport has almost decreased. Therefore, we believe that the economic importance of transport logistics in the transportation of agricultural goods in the conditions of market relations is

that in every region of our republic we need logistics centers.

Scientific research aimed at improving the efficiency of the use of transport logistics services in the transport of agricultural goods in the conditions of the Kyrgyz Republic is certainly of great national and economic importance.

We analyzed the general condition of the existing trade and logistics centers located in the country. For this purpose, we planned to travel to two trade and logistics centers, engaged directly in the transportation of agricultural goods.

On July 27, 2018, there was a visit to the Oberon Shopping and Logistics Center in The Balykchi Issyk-Kul region. This shopping and logistics center has been operating since 2016. The project and equipment is entirely German-made by Omega. The storage facility consists of 12 chambers each with 200 tons of capacity. Total capacity of 2,400 tons. It is engaged in storage, storage and transportation only apples, pears of various sustainable and quality varieties, as well as curms.



Picture.1. The «Oberon» Shopping and Logistics Center in The Balykchi Issyk-Kul region.

On July 2, 2018, the company also traveled to the Agroproduct Asia shopping and logistics center located in the Sokuluk district of Chui Oblast, p.2. This shopping and logistics center has been operating since 2015 and is engaged in the transportation of fruits and

vegetables. The storage room consists of 32 cameras each of 120 tons, 6 cameras of 180 tons, 4 cameras of 500 tons. The total capacity is 700,000 tons. The project and equipment are entirely Dutch-made.



Picture.2. «Agroproduct Asia» Shopping and Logistics Center located in the Sokuluk district of Chui region.

The construction of trade and logistics centers in the regions can significantly reduce the monetary costs of cargo supply and save time for cargo movements.

Thus, we believe that it is necessary to improve the methods of multimodal and animated transport of agricultural goods through the use of modern technical means, such as the creation of optimal computer programs for tracking and remote alert, a preliminary forecast for the storage of agricultural cargo for a long or short period of time, in addition, the creation of a special computer program of customs activities for the passage of an unhindered procedure, namely, to link customs borders with logistics centers for tracking vehicles using

global positional navigation systems (GPS) in order to reduce the time of customs passage. Boundaries. All these activities in the conditions of market relations, as well as in this difficult situation around the world will reduce all sorts of costs not only for the transportation of agricultural goods, but also for other vital products for humans.

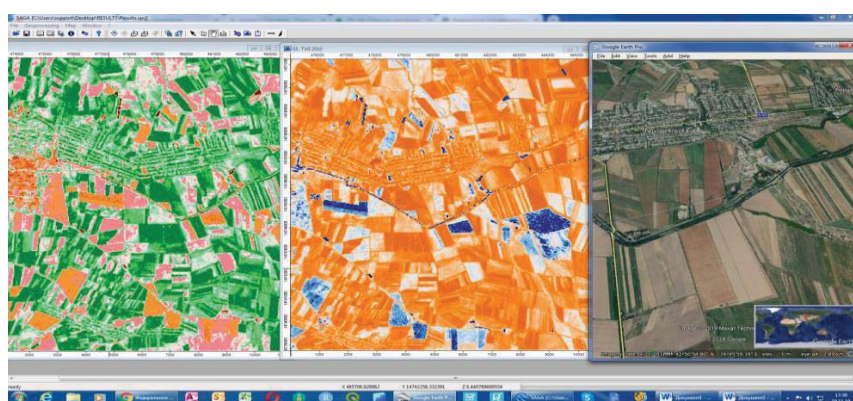
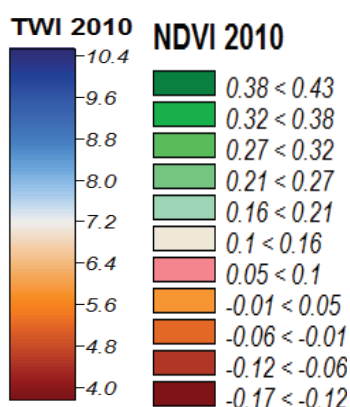
In addition, the introduction of remote sensing of the Earth is necessary. This method will allow the use of Earth surface observation technologies by aircraft and space vehicles equipped with different types of surveillance equipment. Remote sensing of the Earth will allow to receive different information on photographic images of the Earth's surface, that is, where and how

changes of natural resources occur. In our case, this method will allow you to get information about the rate of the growing index (NDVI). That is, when growing agricultural products, we will be able to determine soil moisture and approximate level of moisture of agricultural products, which can be prepared in advance for storage at transshipment and logistics points, as everyone knows, wet agricultural products are prone to rapid freezing. This will reduce the cost of storing and transporting agricultural goods. The introduction of the remote sensing function of special capital investments will not be required, nor will the

construction of space sites and satellites be required. To do this, you need to purchase software that will process the resulting file data of geo-image of a given land. Picture 3. NDVI (the rate of the growing index) and the change in land configuration are shown.

All geo-images from Landsat 8 satellites are publicly available through registration on the USGIS website, and from aerial drones with the ability to release survey information up to 2.5 km².

The price of drones ranges from 2,000 and above U.S. dollars depending on their quality characteristics for tracking conditions, flying drones up to 1 million som.



4

1

Picture 3.

2

3

1. NDVI 2010 year.
2. Topographic Wetness Index 2010 year.
3. Picture Google Earth 2018 year.
4. Indicators.

It should be noted that the way of remote sensing of the Earth tracking geo-image images of aerial photographs, namely land configuration through satellite positioning systems will allow monitoring of various indices, such as (NDVI) - the rate of the growing index. Vegetation indices are used to highlight vegetation in the image using the reflectivity of the near-infrared (IC) and red-range earth covers. The main hypothesis for the use of vegetative indices is that individual mathematical operations with data from

different channels can provide useful information about vegetation. That is, these operations can be timely determined the level of the growing vegetation index, and when collecting crops will be stored at transshipment points and trade and logistics centers with minimal moisture content for a long period of storage.

Output

Thus, we believe that for the efficiency of transport logistics in the transportation of agricultural goods in market conditions, the use of modern technological and technical means is necessary, which will increase the productive capacity of transport logistics of both oil and multimodal transport. In addition, the use of modern programmes to track the growing index will allow you to obtain the necessary information in advance on the moisture content of agricultural cargo and prepare in advance transshipment and logistics storage points for the long or short term.

All activities should be carried out on the basis of contracts signed by cooperatives, indicating the timing, volume and quality parameters of the supply of products. At the same time, the economic and legal independence of the partners is maintained. Deliveries of the finished harvest, products to make orders.

Meanwhile, according to foreign data, the use of sound methods of logistics allows to reduce the level of circulation costs by 20%, inventories - by 30-70%, reduce the time of circulation of goods by 20-50%. In this regard, logical methods of reducing the cost of conversion in its resource supply, refusal to spontaneously form the level and structure of these costs, which are causing great damage to the agricultural economy, are of particular importance for agriculture.

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UDC: 338.001.36

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ECONOMIC EVALUATION SERVICES OF THE KARATAL-JAPYRYK RESERVE.

Abstract: This article considers the economic assessment of ecosystem services of the Karatal-Japyryk reserve. Based on the estimates obtained, conclusions can be drawn about the feasibility of various types of use of territories in the long term, taking into account both the economic development of society and the ecological sustainability of the planet. The article presents in detail these characteristics of the Karatal-Zhapyryk reserve, provides the results of a survey of the reserve staff; a list of medicinal and technical plants, and limits for their procurement by legal entities and individuals; the forecast income from ecotourism of the reserve is calculated, as well as the forecast calculation of the potential capacity of ecotourism of the reserve.

Key words: economic assessment, natural resources, ecosystem services, natural capital, assessment stages, methodology of the total economic value of eco-services, assessment analysis, integral indicators for ecosystems, data from the Karatal-Japyryk reserve, projected income, calculation of the potential capacity of ecotourism.

The analysis of studies carried out by foreign and domestic scientists shows the complexity and versatility of the economic assessment of natural capital from the standpoint of the value interpretation of its main functions. The most used in economics rent and cost-rent concepts of economic assessment of natural resources cannot determine the entire spectrum of value

relations that take place during the functioning of natural capital and its ecological effect.

The meaning of the economic valuation of ecosystem services is to determine the value, and therefore the importance for humans of various kinds of benefits derived from nature. In another way, such an assessment can be called natural or natural capital. Based on the estimates obtained, conclusions can be drawn about the feasibility of various types of use of territories in the long term, taking into account both the economic development of society and the ecological sustainability of the planet.

The economic valuation of ecosystem services and its use in the real economy is carried out in at least four stages:

- identification of ecosystem services;
- determination of its economic value;
- determination of the recipient of benefits from the service;
- formation of a mechanism of payments (compensation) for eco-services.

The growing recognition of the importance of ecosystem services and the use of economic valuation is primarily related to understanding the dependence of human existence not only on the products of nature, but also on the key functions that ensure the uninterrupted supply of these products and support of vital natural systems. The document "Assessment of Ecosystems on the Threshold of the Millennium", developed by more than 1000 experts from all over the

world, one of the main conclusions is the essential dependence of human existence on ecosystem services. The document recognizes that insufficient accounting for the benefits of biodiversity is leading to the current high rate of loss of biodiversity (MEA, 2005). Improving the quality of ecosystem services lowers the cost of providing these services from alternative sources. For example, protected forests growing in river basins that run over large areas significantly reduce the cost of water treatment services for water supply to the

population and industry (Brauman et.al., 2007).

The most complete from the point of view of an integrated approach to the assessment of ecosystem services is the method for determining the total economic value of eco-services, proposed by D. W. Pearce [28], which allows calculating the economic assessment of the value of biodiversity and protected areas. According to the methodology, the value of the total economic value of eco-services (TEV of eco-services) is the sum of two complex indicators - the cost of their use and non-use:

TEV_{eco-services} = Usage cost + Non-use cost = Usage cost + Usage cost + Indirect cost + Deferred cost + Non-use cost + Substantial cost + Other cost

Currently, there are two points of view regarding the value of economic valuations of ecosystem services. The first implies the need to constantly improve the methodology of economic assessments, determine the value of ecosystem services, and create mechanisms for including these assessments in the economic policy of the state.

This concept forms the basis of the works of D. W. Pearce, R. K. Turner. [7], as well as a group of economists of the World Bank [8]. The second point of view, which is adhered to by W. E. Rees [5], I. Ropke [8], M. Wackernagel [9], denies the value of economic assessments of eco-services, explaining that the value of ecosystems is infinite, and it is impractical to assess their individual elements.

Analyzing the presented points of view, we note that in our opinion, the economic assessment of eco-services is important for improving the situation in the field of environmental protection, serving as the basis for making informed management decisions. It is economic assessments that make it possible to determine losses from

the irrational use of eco-services, substantiate the economic efficiency of investments in the environmental complex, compare the costs and benefits of the provided eco-services, and also calculate the amount of compensation payments.

The traditional approach to the assessment of ecosystem services in nature conservation is the assessment of the cost of biodiversity conservation in specially protected natural areas (SPNA). The advantage of this approach is not only the ability to characterize the uniqueness and biological diversity of ecological services of protected areas, to give them an economic assessment, to determine the benefits and possible losses, but also to develop principles for the conservation of services provided by ecosystems. The main disadvantage of the approach is that the effectiveness of protected areas is limited by isolation and a small area of territories, thus it is impossible to assess the full range of ecosystem services. In this regard, the main focus is on the conservation of biodiversity outside the protected areas.

Ecosystem services are consonant with the functions of natural capital, which often cannot do by monitored. Assessment in a broad sense gives an idea of how far the current state deviates from the desired or planned [4]. Therefore, along with economic assessment, alternative approaches are used (for example, to assess cultural or spiritual values) [5, 6]. In relation to ecosystem services, three types of assessment are distinguished: ecological (the ability of ecosystems to perform their functions), economic (integrated into decision-making mechanisms and customary for the market) and social (ensuring agreed decisions for society and resolving conflicts) [3, 4].

The best integral indicators for terrestrial ecosystems are considered to be bioproductivity, biodiversity parameters, and carbon stocks in the soil. Non-consumptive ecosystem services (primarily biosphere / habitat) are important for assessing conflict situations.

Finally, the economic valuation of ecosystem services is an important element in the implementation of mechanisms to ensure the conservation and sustainable use of these services and products. These mechanisms include payments for ecosystem services, a balanced approach to the use of natural resources, where resource users pay for the consumption of limited or renewable sources of ecosystem services. Economic analysis helps to more clearly define flows from “sellers” to “buyers”, including in monetary terms.

Karatal-Zhapyryk State Reserve is a specially protected natural territory of Kyrgyzstan, located in the Naryn region of the country. Currently, the total area of the state reserve is 21016 hectares. The reserve consists of 3 protected areas: Karatal-Achatash, Son-Kul and Chatyr-Kul.

The reserve represents an important component of the Inner Tien Shan

ecosystem of Central Asia, where unique biodiversity is concentrated, the spectrum of biodiversity includes high-mountain alpine, sub-alpine and mid-mountain communities.

Since the establishment of the reserve, employees have been conducting comprehensive studies of natural ecosystems. For this purpose, a system of reference sample plots, phenological and zoological registration routes was laid. Lists of flora and fauna were compiled, rare, endemic and endangered main species of flora and fauna were identified, places of growth and distribution of medicinal plants were identified and described, habitats of wild animals and birds included in the Red Book of the Kyrgyz Republic.

The presence of animals and plants. An increase in their number is also a qualitative indicator of the valuation of ecosystem services. Since 2015, the study of mycobiota has been carried out, 87 species of fungi have been identified. According to preliminary data obtained, more than 600 species of higher plants grow on the territory of the reserve, of which 2 species are listed in the Red Book of the Kyrgyz Republic: Semenov's onion *Allium semenovii*, four-leaf tulip *Tulipa tetraphylla*, more than 50 species of medicinal plants were identified [2]. The most important objects of protection are rare and disappearing representatives of the fauna - snow leopard, stone marten, Turkestan lynx, mountain sheep, jerboa - jumper. According to the data of the Karatal-Zhapyryk State Reserve, more than 130 species of birds have been established. Of these, 18 bird species are listed in the Red Book of the Kyrgyz Republic: whooper swan, mountain goose, spoonbill, white-eyed duck, long-nosed merganser, black-headed gull, demoiselle crane, cormorant, black stork, sicklebeak, steppe harrier, golden eagle, saker falcon,

steppe harrier kestrel, black vulture, bearded vulture, steppe harrier, owl.

From the entomofauna on the territory of the reserve, more than 580 representatives of 186 families from 19 orders have been registered, 274 have been identified to a species or subspecies. *Sphingonotus pamiricus* (Acrididae), *Agonopterix kaekeritziana* (Depressariidae) and *Catoptria lythargyrella* (Crambidae) are first reported for Kyrgyzstan. Potentially, the entomofauna of this territory includes 1400–1800 species [10]. On the territory of the reserve, 174 species of vertebrates were studied, of which fish are represented by 6 species from 3 families. This represents 3.5% of the total number of vertebrates. *Osman Severtsova Diptychus maculatus sewerzowi Turdakow* is found in the Kek-Argyn River. It is considered a rare endemic

species. In the Karatal River, the Tien Shan char *Triplophysa stoliczkae elegans* *Nemachilus Tianshanica*, the naked osman *Diptychus dybowskii* Kessler *Diptychus dybovskii* and the common marinka *Schizothorax intermedius* Mc Clelland *Schizothorax intermedius* are found. In the Son-Kul Lake Sig-Ludoga *Coredonus Lavaretus*, Peled *Coredonus Peled*. *Chir Coredonus nasus* met on Son-Kul Lake until 2006, but has not been recorded since this year. Amphibians are represented by 1 species - the Danatnian toad *Bufo danatensis*, which accounts for 0.6% of the total number of vertebrates, from the class of reptiles there are 3 species: Pallas cormorant *Ancistrodon pallus*, Alai golglaz *Ablepharus alaicus*, ocellated lizard *Eremias multiocellata*, which is 1.8% [1,2].

According to the results of the questionnaire survey of the staff of the Karatal-Zhapyryk reserve, the following results were obtained:

	Questions	excellent	good	satisfactory	unsatisfactory
1	What is the general state of the Karatal-Japyryk nature reserve?			✓	
2	What is the level of biodiversity conservation in the reserve?			✓	
3	What is the level of safety of animals?			✓	
4	What is the level of government funding for the protection of the Karatal-Zhapyryk reserve?			✓	
5	How do you assess the transition to partial self-financing through ecotourism and the sale of medicinal herbs that are not listed in the Red Book?	✓			

According to the results of a survey through interviews with employees, at present the state of the reserve is assessed as satisfactory, due to the fact that the financial resources from the state are insufficient for

conducting scientific research, as well as for improving technical base.

Therefore, it is necessary to introduce partial self-financing through the development of ecotourism, collection and

sale of medicinal herbs not listed in the Red Book.

In the Kyrgyz Republic, in addition to protected areas, the Decree of the Kyrgyz

Republic dated May 3, 2013 № 224

approved the list of medicinal herbs allowed for collection.

List of medicinal and technical plants permitted for picking on the territory of the republic, and limits on their picking by legal entities and individuals.

№	Name of the species (s) of plants	Allowable volume (kg)	Market price for 100 g (som)
1	Rosehip	5	43
2	Hawthorn fruit	Not limited	37
3	Sage leaves	3	32
4	Peppermint	5	35
5	Wormwood bitter	10	25
6	Barberry fruits (except for endemics and berries listed in the Red Book)	5	23
7	Oregano herb	5	25
8	Shepherd's bag	3	30
9	Bur-marigold	3	32
10	Chamomile	3	62
11	Nettle leaves	5	30
12	Burdock	Not limited	31
13	Elecampane root	3	26
14	Hypericum herb	5	38
15	Tansy flowers	3	25
16	Valeriana Turkestanskaya	3	38

Due to the insufficient level of state funding for the conservation of biodiversity, it is necessary to switch to partial self-financing. If specially protected natural areas would have the opportunity to collect and sell medicinal herbs not included in the Red Book, then the Karatal-Japyryk reserve would have an additional source of funding. For example, let's calculate the average income from the sale of 4 kg of raw medicinal herbs after drying, the mass will be 3 kg. The market price for 100 g of grass is 33.25 soms.

Thus, the income from sales will amount to 133,000 soms:

$$4000 \cdot 33,25 = 133000$$

In addition, ecotourism is another source of funding for maintaining the ecosystem of the reserve. The State Antimonopoly Agency and the State Agency for Environmental Protection and Forestry agreed and established a price list for services rendered to tourists dated March 21, 2016.

№	Services	Price for 1 hour, som
1	Acquaintance on a special route with the natural environment Karatal-Japyryk for 1 person	50
2	Guide services	50
3	Providing a yurt with all the decorations	150
4	Providing utensils and other things	50
5	Overnight in a yurt for 1 person	200

6	Providing a car	30
7	Provision of buses	60
8	Observation deck	200
9	Horse rental	100

At the moment, tourism is a highly profitable activity in the Kyrgyz Republic. In this regard, ecological tourism is less disadvantageous for nature reserves, since a strict guided route is defined for tourists. Also, this type of activity brings a certain income for the maintenance of the ecosystem

on the territory of the reserve. Let's calculate the annual income from ecotourism. It should be noted that the level of income depends on the seasonality. The largest peak in tourist inflow occurs in the 3 months from June to August.

Table 1 - Projected income from ecotourism of the Karatal-Zhapyryk reserve

Services	Total number of tourists per season	Price list	Amount
Acquaintance on a special route with the natural environment Karatal-Japyryk for 1 person	150	50	7500
Guide services	100	50	5000
Providing a yurt with all the decorations	100	150	15000
Providing utensils and other things	100	50	5000
Overnight in a yurt for 1 person	80	200	16000
Providing a car	70	30	2100
Provision of buses	50	60	3000
Observation deck	150	200	30000
Horse rental	60	100	6000
Total income			89600

Thus, the forecasted income will be 89,600 soms. The income received from ecotourism is used for the needs of the reserve. Further development of this type of

tourism will ensure timely protection of the reserve in the future. Therefore, it is necessary to pay great attention to the transition to self-financing.

Table 2- Forecast calculation of income for the year

Expenses related to the protection of the reserve, som	Ecotourism income	Income from the collection and sale of medicinal herbs	Estimated income
5 000 000	89600	133000	222600

Using a capitalization ratio of 0.01, we calculate the cost of the recreational potential of the Karatal-Zhapyryk reserve:

$$222600 \cdot 0,01 = 2226 \text{ soms}$$

For the predictive calculation of visits to the natural park, the authors compiled the following formula:

$$AV_{\text{cost}} = F_{\text{visit}} \cdot C$$

where,

AV_{cost} - average cost of a visit per year

F_{visit} - frequency of visits per year

C - average cost per visit

$$P_{\text{capacity}} = AV_{\text{cost}} \cdot EN_{\text{visitors}}$$

where,

P_{capacity} - potential reserve capacity
 AV_{cost} - average cost of a visit per year

EN_{visitors} - Estimated number of
 visitors, people / year.

Table 3 - Forecast calculation of the potential capacity of ecotourism of the Karatal-Zhapyryk reserve

Number of tourists	Frequency of visits per year	Average cost of one visit in soms	Average cost of visit per year	Estimated number of visitors, people / year	Potential capacity of the natural park in soms
300	1	98,8	1185	150	177750

If the share of the cost that can be attributed to visiting the Karatal-Zhapyryksy reserve is considered equal to 40%, then the total annual economic value of the park is equal to:

$$177750 \cdot 40\% = 71100 \text{ soms.}$$

An analysis of the recipients of income from the use of these services is very valuable in the economic assessment of ecosystem services, with the help of which the effectiveness of the recreational territory is revealed.

Thus, the forecast calculation of the potential capacity of the Karatal-Zhapyryk reserve was 222600 soms. The actual capacity of the nature reserve according to the data of 2019 was 40,000 soms. Therefore, it is necessary to pay great attention to the development of ecotourism, the collection and sale of medicinal herbs to maintain the ecosystem of the Karatal-Japyryk reserve.

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«SMALL BUSINESS DEVELOPMENT PROBLEMS IN THE KYRGYZ REPUBLIC»

Summary: The article discusses the problems faced by SME, proposes and substantiates the need to improve the business environment.

Аннотациясы: Макалада чакан жана орто ишканалар туш болгон көйгөйлөр ачылып, ишкердик чөйрөнү жакшыртуу зарылдыгы айтылган жана негизделген.

Аннотация: В статье раскрываются проблемы с которыми сталкивается МСБ, предлагается и обосновывается необходимость в улучшении условий предпринимательства.

Keywords: Small Medium-Sized Business, Entrepreneurship, Employment, Shadow Economy, Problems of Entrepreneurship.

Ачык сөздөр: Чакан жана орто бизнес, ишкердүүлүк, жумуш менен камсыз кылуу, көмүскө экономика, бизнес көйгөйлөрү.

Ключевые слова: малый средний бизнес, предпринимательство, занятость, теневая экономика, проблемы предпринимательства.

Introduction: Small business is a complex and diverse mechanism, and its development or decline has a significant impact on the economy of any modern state.

Small and medium-sized businesses (small and medium-sized businesses) are defined as a set of economic units: small and medium-sized enterprises, peasant (farmer) households and individual entrepreneurs.

The role of small businesses is determined by the classical challenges faced by small businesses in developed countries. These are, first of all, smoothing the economy, developing a healthy competitive environment, which in turn allows for greater development and utilization of available resources

Materials and methods. The article used publicly available statistical data on small and medium-sized enterprises, as well as materials of foreign authors on problems hindering business development. We have carried out a comparative analysis of the dynamics of the number of actors and employment in them. An overview of the legal framework of the business environment led to certain conclusions. The location of the country according to the level of business favorability, according to foreign estimates, was presented.

In 2018, there were 15,300 enterprises operating in the territory of the Kyrgyz Republic. Of these, 14,500 were small enterprises and 0,800 were medium-sized enterprises. The number of enterprises operating in the territory of the Kyrgyz Republic was 10,000. More than 26% of the active enterprises were engaged in wholesale

and retail trade, 15.3% in industry, 11.9% in construction.

Research results. On 1 January 2019, the number of registered individual

entrepreneurs in the territory of the Kyrgyz Republic was 401.7, which is 3.1 per cent more than in 2018 and 5.9 per cent more since 2017 (Table 1).

Table 1. Changes in the number of entities, the number of Small business employees in Kyrgyzstan (at the beginning of the year)

INDICATORS	2017 y.	2018 y.	2019 y.	Compared 2019y. in% with	
				2017y.	2018y.
Number of entities, units	808437	833161	856549	106,0	102,8
small businesses	13 592	13 858	14 520	106,8	104,8
medium-sized enterprises	776	795	769	99,1	96,7
individual entrepreneurs 1	379 150	389 778	401 658	105,9	103,1
Peasant (farm) farms 2	414 919	428 730	439 602	106,0	102,5
Number of persons employed. Number of persons employed	466,6	479,2	492,7	105,6	102,8
small businesses	52,2	53,2	56,6	108,4	106,4
medium-sized enterprises	35,2	36,2	34,4	97,7	95,0
individual entrepreneurs	379,2	389,8	401,7	105,9	103,1

Thus, SMEs provide employment for the population and constitute the core of the economy of Kyrgyzstan, as well as throughout the world.

The basis of the legal norms that regulate business activities is the constitutional establishment of private property, as well as individual rights and freedoms. The relevant legal framework has been established. The content of the Act of 1991 adopted by the Supreme Council of the Kyrgyz Republic entitled "General principles

for denationalization, privatization and entrepreneurship in the Kyrgyz Republic" served as the basis for the adoption of more than thirty-five legislative acts in the field of enterprise development.

The National Development Strategy of the Kyrgyz Republic for 2018-2040 sets the goal of ensuring that small and medium-sized businesses are stable and thriving in the country's economy, and sets ambitious goals to protect entrepreneurs from administrative pressure, Partnerships between government

and business have been established, and regulations have been adopted to promote self-regulation.

Consider the world's measure of favorable business conditions of a country, it is generally measured on a scale of 0 to 100, where 0 is the worst result and 100 is the best.

Example: The business environment score of 75 in 2018 means that the country was 25 per cent below the best practices set by the results of countries over time. An estimate of 80 in the next year, 2019, would mean that the country has improved the indicator.

Table 2. Favourable business environment for neighbouring and advanced economies.

Economy	DB 2019	DB 2020
Europe and Central Asia	71,8	73,1
OECD	78,2	78,4
Kazakhstan	78	79,6
China	74	77,9
Kyrgyzstan	65,4	67,8
Russian Federation	77,4	78,2
Tajikistan	55,4	61,3
Uzbekistan	67,8	69,9

The business environment at the beginning of 2020 was 67.8 points, down by 10.6 points compared to OECD countries, and 5 points compared to neighbouring countries.

More than 65 per cent of small and medium-sized enterprises are located in Bishkek. In Chui oblast, 11 per cent are concentrated. In Osh, 6.2 per cent of small and medium-sized enterprises are located. Interestingly, microenterprises are mainly concentrated in Osh (19.4 per cent), followed by Bishkek (12 per cent) and Issyk-Kul (11.9 per cent).

Some of the problems faced by SME, including agricultural enterprises, have forced employers to operate a shadow economy, maintain double-entry books, avoid paying taxes and contributions.

The high level of social security contributions significantly increases the cost of labour: influences the rise in product prices and overall inflation, and limits the competitiveness of enterprises.

The rates of insurance premiums for legal entities, irrespective of their organizational and legal form, are determined by:

1. For employers:

a) Monthly: 17.25 per cent.

This provision does not in any way encourage small business managers to ensure transparency in the recruitment and remuneration of workers.

Premiums are apportioned by fund as follows:

Pension Fund - 15 per cent;

Compulsory Health Insurance Fund - 2 per cent;

Workers' Health Fund - 0.25 per cent.

The small business workers' health fund is virtually non-existent.

Another perennial problem in the Republic is the conditions under which banks grant loans to enterprises. They constitute a major barrier to the development of small and medium-sized enterprises (hereinafter - Smes).

**Table 3. National Bank discount rate comparison
and commercial banks of the Kyrgyz Republic**

Date	Discount rate, per cent	Interest rate, commercial banks	Effective interest rate in commercial banks
31.03.2020	5.00	in soms from 18%,	som 28% to 41.00%,
26.03.2019	4.50	in US dollars - from 12%	dollar / euro: 25.30%
27.03.2018	5.00		

Consider the discount rate of the NBKR, the cost of funds in the money market has been holding at the level of 5% for the last three years. But at the same time, the cost of funds in commercial banks is 28-41%. That cannot make life easier for small businesses in the real sector.

Moreover, for a number of indicators, even these loans are inaccessible to small businesses. Moreover, for a number of indicators, even these loans are not available to small businesses, if we consider the conditions for granting a loan.

Table 4. Conditions for granting a loan in commercial banks of the Kyrgyz Republic

№п/п	Currency:	som / US dollar
1	Amount:	from 10,000 to 100 million soms
2	Interest rate*:	in soms from 18%, in US dollars - from 12%
3	Loan terms	from 3 months to 5 years
4	Repayment schedule:	annuity, individual
5	Collateral:	real estate; mixed (movable + immovable property);
-	Collateral:	for loans up to 200,000 soms inclusive, it is allowed to issue under the guarantee of the 1st person and on the security of movable property.
-	Collateral:	For repeat clients, it is allowed to issue up to 250,000 soms on the security of movable property and the guarantee of the 1st person with a stable income.

The discussion of the results. Thus, the rapid development of small businesses and the increase in the number of employees in the non-State sector of the economy have identified a number of problems that make it difficult to develop large-scale employment in small and medium-sized enterprises in the Republic.

They should include:

1. Lack of experience in self-employment, as entrepreneurship requires a special system of learning and practical skills;
2. Insufficient development of production capacity for small and medium-sized enterprises;
3. Lack of investors in most promising business projects, difficulties in attracting additional finance and obtaining credit;
4. Excessive pressure on the existing taxation system;

5. Weak legal protections for entrepreneurs and investors;
6. Higher level of risk, hence high degree of market volatility;
7. Dependence on large companies;
8. Increased sensitivity to changes in management conditions;
9. Uncertainty and caution of business partners in entering into contracts.
10. Political instability, etc.

Conclusions. In order to achieve the objectives, State policies to support small businesses should focus on the following areas:

1. Improving the business environment in the country;
2. Improvement and streamlining of legislation
3. Security of operations;

4. Building and expanding the necessary productive infrastructure,
5. Promotion of product exports and trade development;
6. Development of digital interaction between the State and private business,
7. Promotion of fair competition.

Those provisions should not remain on paper and should be brought to the attention of political and economic decision-makers.

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MATHEMATICAL ANALYSIS MOISTURE EVAPORATION IN SOIL

Abstract. In our agrarian republic, the water-thermal regime of the soil has not been sufficiently studied. From the point of view of recommendations for hanging and improving work with crop production of farms, the study of the dynamics of moisture evaporation in the soil is very relevant and will directly affect the yield of agricultural crops. This article analyzes soil moisture evaporation using mathematical techniques. Using the differential equations of heat and moisture conductivity, three solutions for the evaporation function are found.

Аннотация. В нашей аграрной республике, водно-тепловой режим почвы не достаточно исследованы. С точки зрения рекомендации для повешения и улучшения работы с растениеводством фермерского хозяйств, исследование динамики испарения влаги в почве очень актуально и непосредственно повлияют на урожайность сельскохозяйственных культур. В данной статье анализируются испарение влаги в почве с помощью математических приемов. С помощью дифференциальных уравнений теплопроводности и влагопроводности найдены три решения для функции испарения.

Аннотация. Биздин агрардык өлкөдө, топурактын суулуу-нымдуулук абалы жетишээрлик изилденген эмес. Дыйкан чарбаларга сунуштарды берүү үчүн, өсүмдүктөрдү өстүрүүнүн сапатын көтөрүү максатында топурактын нымдуулугунун бууланышынын кыймылын изилдөө актуалдуу жана айыл-

чарба өсүмдүктөрүнүн түшүмдүүлүгүн көтөрүүгө түздөн-түз таасир берет. Бул макалада топурактын нымдуулугунун бууланышын математикалык ыкмалар менен анализ жасалат. Жылуулукту жана нымдуулукту өткөрүүчү дифференциалдык теңдемелердин жардамы менен буулануу функциясынын үч чыгарылышы табылды.

Keywords. Soil, moisture, evaporation, temperature, differential equation, partial derivatives, dynamics.

Ключевые слова. Почва, влага, испарение, температура, дифференциальное уравнение, частные производные, динамика.

Негизги сөздөр. Топурак, нымдуулук, буулануу, температура, дифференциалдык теңдеме, жекече туундулар, кыймыл.

Introduction

In the study and study of the dynamics of the decrease in moisture in the soil, it is necessary to know that this is a rather complex process, which depends on many factors. These are factors that affect the rate of soil drying: temperature, humidity, wind speed, water content in the soil, the physical properties of the soil, the state of its surface, terrain, vegetation cover, etc.

The water-thermal regimes of the soil have a significant effect on the yield. The water regime of soils has a significant effect on changes in the thermal regime, the thermal regime, in turn, significantly affects the evaporation from the soil surface and transpiration. Therefore, the task of studying

the regularities of the drying process is of great practical interest for determining the inter-irrigation period and regulating the water-thermal regime of the soil in order to increase the productivity of agricultural crops. To study the dynamics of the decrease in moisture from the soil surface, it is necessary to solve this problem in a joint setting, i.e. the system of equations for heat and moisture transfer should be solved [1].

Materials and methods

So, the following initial-boundary value problem is formulated. Find solutions of the heat conductivity equations and the modified moisture conductivity equation [2]:

$$C(x, t) \frac{\partial T}{\partial x} = \frac{\partial}{\partial x} \left[\lambda(x, t) \frac{\partial T}{\partial x} \right] \quad (1)$$

$$\frac{\partial W}{\partial t} = \frac{\partial}{\partial x} \left[D(W) \frac{\partial W}{\partial x} + A \frac{\partial^2 W}{\partial t \partial x} \right] + B \frac{\partial}{\partial x} \left[D(T) \frac{\partial T}{\partial x} \right] \quad (2)$$

with the following initial boundary conditions:

$$\text{I. initial conditions: } T(x, 0) = T_0(x) \quad (3)$$

$$W(x, 0) = W_0(x) \quad (4)$$

at the initial moment of time, the values of temperature and humidity are set.

II. Border conditions:

- a) on the border of soil and air ($x = 0$), the flow of moisture and heat is set as a function of time:

$$-\lambda \frac{\partial T}{\partial x} \Big|_{x=0} = f_0(t) \quad (5)$$

$$-\left[D(W) \frac{\partial W}{\partial x} + A \frac{\partial^2 W}{\partial t \partial x} + B D(T) \frac{\partial T}{\partial x} \right] \Big|_{x=0} = f_1(t) \quad (6)$$

- b) at a depth $x = h$:

$$T(h, t) = a_0 \quad (7)$$

$$\frac{\partial W}{\partial x}(h, t) = 0 \quad (8)$$

T_0 - soil temperature, W - soil moisture per unit volume, λ , $D(W)$ - thermal conductivity and diffusion coefficients, C - volumetric heat capacity of moistened soil, $D(T)$ - thermal diffusion coefficient, A and B - some parameters characterizing the physical properties of soils, x - the depth of the soil layer, t - time. The considered system of equations (1) and (2) is nonlinear. Therefore, it is rather difficult to find its particular solutions.

Expanding the coefficients $C(x, t)$, $\lambda(x, t)$, $D(W)$, $D(T)$ in a series in the vicinity of the soil surface, we obtain:

$$\begin{cases} T_\tau = T_{xx} \\ W_\tau = D_1 W_{xx} + A W_{xx\tau} + B_1 T_{xx} \end{cases} \text{ где } \tau = \frac{\lambda_0 t}{c_0} \quad (9)$$

in this case, the initial and boundary conditions do not change structurally. The first equation of system (9) has a solution [3]:

$$T = \exp \eta, \quad \eta = x + \tau \quad (10)$$

The solution to the second equation (9) can be found in various forms.

Research results

1. Let it be sought in the form

$$W(x, \tau) = f_0(\xi) f_1(\tau) \text{ где } \xi = x + a_0 \tau. \quad (11)$$

Determining the partial derivatives $W_\tau = a_0 f'_0 \cdot f_1 + f_0 \cdot f'_1$, $W_x = f'_0 \cdot f_1$, $W_{xx} = f''_0 \cdot f_1$, $W_{xx\tau} = a_0 f'''_0 \cdot f_1 + f''_0 \cdot f'_1$, and substituting into the second equation of system (9) we have

$$a_0 f'_0 \cdot f_1 + f_0 \cdot f'_1 = D_1 f''_0 \cdot f_1 + A a_0 f'''_0 \cdot f_1 + A f''_0 \cdot f'_1.$$

Dividing the last equation by $f_1(\tau) = \exp k\tau \neq 0$, we obtain the ordinary differential equation

$$A a_0 f'''_0 + (D_1 + A K) f''_0 - a_0 f'_0 - K f'_0 = 0 \quad (12)$$

which has the following characteristic equation

$$A a_0 \lambda^3 + (D_1 + A K) \lambda^2 - a_0 \lambda - K = 0.$$

The last equation is reduced to the form $z^3 + pz + q = 0$ (13)

by the following substitution $\lambda = z - \frac{D_1 + Ak}{3Aa_0}$, and the roots are found by the Cardan formula, and for $k = -\frac{D_1}{A}$ we have $p = -\frac{1}{A}$, $q = -\frac{D_1}{A^2a_0}$ where a_0 - is the value of the expression under the root $\Delta = -\frac{D_1^2}{4A^4a_0^2} - \frac{1}{27A^3} = 0$ при $a_0 = \pm \frac{3\sqrt{3}D_1}{2\sqrt{A}}$.

Using Cardan's formula, we find the roots of the cubic equation

$$z_1 = \frac{3q}{p} = \frac{2}{\sqrt{3A}}, \quad z_{2;3} = \frac{\frac{2}{\sqrt{3A}}}{2} = \frac{1}{\sqrt{3A}}.$$

Thus, the second equation of system (9) and the solution of the homogeneous part can be written in the following form

$$W_{\text{част}}(x, \tau) = P \exp(x + \tau). \quad (14)$$

We seek a particular solution of the inhomogeneous second equation of system (9) in the form, i.e. the equation under study has the form

$$D_1 W_{xx} + A W_{x\tau} - W_{\tau} = -B_1 \exp(x + \tau). \quad (15)$$

Based on the method of undefined coefficients, a particular solution will be written

$$W_{\text{част}}(x, \tau) = -\frac{B_1}{D_1 + A - 1} \exp(x + \tau). \quad (16)$$

Thus, the general solution of the second equation of system (9), taking into account (10), (14), will be written down finally

$$W_{\text{одн}}(x, \tau) = \left[C_1 \exp \frac{2\xi}{\sqrt{3A}} + (C_2 + C_3 \xi) \exp \frac{\xi}{\sqrt{3A}} \right] \exp \left(-\frac{D_1}{A} \tau + P \exp(x + \tau) \right). \quad (17)$$

To find the integration constants, it is necessary to set the initial-boundary conditions (3) - (8) explicitly, in particular, in the form of a polynomial corresponding to the variables in x and t .

2. Another solution to the homogeneous equation system (9) can be found by the form

$$W(x, \tau) = f_0(x + a\tau), \quad \xi = x + a\tau. \quad (18)$$

Here, too, defining the partial derivatives $W_{\tau} = af_0'$, $W_x = f_0'$, $W_{xx} = f_0''$, $W_{x\tau} = af_0'''$, and substituting into the homogeneous equation (9) we obtain

$$Aaf_0''' + D_1f_0'' - af_0' = 0, \quad (19)$$

and its characteristic equation will be written as $\lambda(Aa\lambda^2 + D_1\lambda - a) = 0$, one value $\lambda = 0$. Solve the quadratic equation $Aa\lambda^2 + D_1\lambda - a = 0$ and assume that $D_1^2 + 4Aa^2 = 16D_1^2$. We can do this, since a is still an arbitrary value. Find the roots of the quadratic equation, and for $a = -5D_1$, $\lambda_1 = -2$, $\lambda_2 = \frac{10}{3}$, $\lambda_3 = 0$. So, the solution to the homogeneous equation, the second equation of system (9) will have the form

$$W_{\text{одн}}(\xi) = C_1 \exp(-2\xi) + C_2 \exp \frac{10}{3}\xi + C_3. \quad (20)$$

It can be found that the first n equation of system (9) has the following solution

$$T(x, \tau) = P_0 \exp x \cdot \cos \beta \quad \text{где } \beta = x + 2\varepsilon. \quad (21)$$

Therefore, we seek a particular solution to equation (9) taking into account (20) in the following form:

$$W_{\text{част}}(x, \tau) = \exp x [M_1 \cos(x + 2\tau) + M_2 \sin(x + 2\tau)]. \quad (22)$$

We define partial derivatives:

$$W_x = \exp x [M_1 \cos \beta + M_2 \sin \beta] + \exp x [-M_1 \sin \beta + M_2 \cos \beta],$$

$$W_{xx} = 2 \exp x [-M_1 \sin \beta + M_2 \cos \beta],$$

$$W_{x\tau} = 2 \exp x [-2M_1 \cos \beta - 2M_2 \sin \beta],$$

$$W_{\tau} = \exp x [-2M_1 \sin \beta + 2M_2 \cos \beta]$$

and substituting the found partial derivatives into the equation under study, we have

$$\begin{aligned} & \sin \beta [2M_1 - 4AM_2 - 2D_1M_1] + \\ & \cos \beta [2D_1M_1 - 4AM_2 - 2M_2] = \\ & -B_1P_0 \cos \beta. \end{aligned} \quad (23)$$

Equating the coefficients at $\cos \beta$ and $\sin \beta$, respectively, we obtain the system of equations

$$\begin{cases} 2M_1 - 4AM_2 - 2D_1M_1 = 0 \\ 2D_1M_1 - 4AM_2 - 2M_2 = -B_1P_0 \end{cases} \quad (24)$$

from which we find $M_1 = 2AB_1$, $M_2 = B_1(1 - D_1)$ при $P_0 = 1 - D_1 - 2AD_1 + 4A^2$.

Thus, a particular solution for the function $W(\beta)$ is written in the form

$$W_{\text{факт}}(\beta) = \exp x [2AB_1 \cos \beta + B_1(1 - D_1) \sin \beta]. \quad (25)$$

We write the general solution of equation (9) in the form

$$W(x, \tau) = C_1 \exp(-2)\xi + C_2 \exp \frac{10}{3} \xi + C_3 \exp x [2AB_1 \cos \beta + B_1(1 - D_1) \sin \beta]. \quad (26)$$

Here also C_1 , C_2 , C_3 are found from the explicit specification of the initial-boundary conditions.

3. Suppose that equation (9) can have solutions in the form

$$W(x, \tau) = f_1(x) \cdot f_2(\tau) \quad (27)$$

determining the partial derivatives $W_\tau = f_1 f_2'$, $W_x = f_1' f_2$, $W_{xx} = f_1'' f_2$, $W_{xx\tau} = f_1'' f_2'$ and substituting into the second equation of system (9) we obtain

$$f_1 f_2' = D_1 f_1'' f_2 + A f_1'' f_2'. \quad (28)$$

In the last equation, dividing the left and right sides by $f_2(\tau) = \exp n\tau$ we obtain an ordinary differential equation with constant second-order coefficients

$$(D_1 + An) f_1'' - n f_1 = 0. \quad (29)$$

Determining the roots of the characteristic equation (29) as $\lambda_{1,2} = \pm 1$, with $n = \frac{D_1}{1-A_1}$.

Let us find a solution to the homogeneous equation in the form

$$W_{\text{одн}}(x, \tau) = [C_1 \exp x + C_2 \exp(-x)] \exp \frac{D_1}{1-A_1} \tau. \quad (30)$$

Now we will look for a particular solution in the form $W_{\text{факт}}(x, \tau) = \gamma \exp \eta$. Hence, finding W_x , W_{xx} , $W_{xx\tau}$, W_τ and substituting it into the equation under study, as a result of

which we obtain its solutions as

$$W_{\text{факт}}(x, \tau) = -\frac{B_1}{2} \exp \eta. \quad (31)$$

Thus, the general solution of the second equation of system (9) taking into account (27) is written $W(x, \tau) = [C_1 \exp x + C_2 \exp(-x)] \exp \frac{D_1}{1-A_1} \tau - \frac{B_1}{2} \exp(x + \tau)$.

Here, the integration constants are also found from conditions (3) - (8).

Conclusions

It is important to remember that in the process of finding solutions to the analyzed object using mathematical equations, all the invariants under study are idealized and give us a general idea. Thus, when solving the system of equations (9) for two different particular solutions of the heat equation, three solutions were found for the second evaporation function. We succeeded in this in connection with the systems that the system of equations (9) is linear. Possible other solutions to system (9) will be developed in the following studies.

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DIGITALIZATION AS A TOOL FOR ACHIEVING AGRICULTURAL COMPETITIVENESS OF THE KYRGYZ REPUBLIC

Annotation. *In the article, digital agriculture is considered as a promising direction for improving management efficiency, which will increase gross production. Digitalization will transform agriculture into an environment for creating high-performance and climate-resilient systems. The author substantiates the conclusion that digitalization is not an end in itself, but a necessary tool for achieving competitiveness in the information economy.*

Keyword. *Agriculture, digitalization, innovation, productivity, competitiveness, information, technology.*

Аннотация. *В статье цифровое сельское хозяйство рассматривается как перспективное направление повышения эффективности управления, что позволит увеличить валовое производство. Цифровизация превратит сельское хозяйство в среду для создания высокопроизводительных и адаптируемых к изменению климата систем. Авторы обосновывают вывод о том, что цифровизация - не самоцель, а необходимый инструмент для достижения конкурентоспособности в информационной экономике.*

Ключевые слова. *Сельское хозяйство, цифровизация, инновации, производительность, конкурентоспособность, информация, технологии.*

Аннотация. *Макалада санариптик айыл чарбасы башкаруунун натыйжалуулугун жогорулатуунун келечектүү багыты катары каралат, көрсөтүлгөн багыт дүң өндүрүштү жогорулатууга мүмкүндүк берет. Санариптештирүү жогорку өндүрүмдүү жана климаттын өзгөрүүсүнө ыңгайлаштырылган системаларды түзүүчү чөйрөгө айландырат. Автор санариптештирүү - өз алдынчалык максат эмес, маалыматтык экономикада атаандаштык жөндөмдүүлүккө жетишүү үчүн керектүү шайман экендиги жөнүндө тыянакты негиздейт.*

Негизги сөздөр. *Айыл чарба, санариптештирүү, инновациялар, өндүрүмдүүлүк, атаандаштыкка жөндөмдүүлүк, маалымат, технологиялар.*

Introduction

The need to increase the supply of food, fiber and energy to meet the needs of a growing world population is forcing modern society to move towards technological development through the use of innovative technologies. Without the use of innovations, it is impossible to increase production volumes that meet the demand of the domestic and foreign markets. They are an effective means of competition, as they reduce the cost of production while improving its quality.

In the modern information economy, digital solutions are increasingly penetrating all segments of the agro-industrial complex (AIC). The same companies that in the near future will be able to unite their business into

a single system based on a digital platform will become the undisputed market leaders. Agriculture of the Kyrgyz Republic is a traditional industry and the existing competitive advantages allow us to supply high-quality organic products to foreign markets.

However, in terms of resource allocation and technological solutions, the agriculture of the Kyrgyz Republic remains "at an average level", when the effectiveness of management, sales to consumers and risk management are still limited by the lack of accurate information. The current state of the country's agriculture can hardly be called highly technological, in most regions of the republic they still use primitive methods of irrigation, cultivation, etc., but digital technologies are not alien to modern agriculture [1].

In this context, digital agriculture appears to be a promising alternative in meeting needs and in improving management efficiency, which allows for a more correct allocation of resources and ensure the professional development of personnel employed in the fields.

Materials and methods

Digital transformation has made significant strides in the agriculture of developed countries, called smart agriculture. Predictive opinions of experts for the coming years converge on the point that the digital revolution in agriculture will be a catalyst that will allow the agricultural sector to meet the needs of future generations. In other words, the digital agriculture revolution will fully meet the requirements of sustainable development. Digitalization will inherently transform all links in the agricultural value chain. At the same time, resource management of any element of this chain can be built on the principles of optimization,

individual approach, rationality and predictability.

The Internet and digitalization create specific supply chains in all sectors of the global economy that overcome cross-border barriers at minimal cost. Currently, up to 12% of international trade in goods and about 50% of trade in services are carried out via the Internet. On the Facebook platform, 50 million small and medium-sized enterprises posted information (in 2013 there were 25 million, that is, an increase in 2 years was 100%), while 30% of their potential consumers are located abroad [2], [3].

Digital agriculture will provide an environment for the creation of systems characterized by high performance, predictability and the ability to adapt to changes, including those that provoke climate change. This, in turn, can help to improve food security, profitability and resilience of the national economy.

In the context of the Sustainable Development Goals, digital agriculture can deliver economic benefits through increased productivity, better spending and market opportunities, through increased communication and greater inclusiveness, social and cultural benefits, through optimized resource use and adaptation to climate change. - environmental benefits [4].

Results and discussion

In the classical sense, the concept of "digital economy" means an activity in which the main factors of production are digital (electronic, virtual) data, both numerical and textual. The basis of the digital economy is the information economy, which is based on information and telecommunications infrastructure and provides access and implementation their digital and information skills in all spheres of life (economy, production, education, trade, management, etc.).

The potential benefits from digitalization of the agrarian sector are compelling for the Kyrgyz Republic, but their implementation will require major changes in

agricultural production systems, agriculture, public life and natural resource management. Therefore, a holistic, systems approach will be required to reap the full potential benefits.

Table. Digitalization conditions

<i>Basic</i>	<i>Companions</i>
Complexity	Internet complexity
Financial inclusion	Mobile devices and social media
Computer literacy	Population skills
information and communication education	Entrepreneurship culture

The table shows the minimum set of conditions that allow the use of technology, includes the basic conditions: complexity, financial accessibility, computer literacy, ICT education; accompanying (favorable) conditions, that is, factors that make it possible to introduce technologies: the use of the Internet, mobile phones and social networks, skills in working with digital technologies, supporting a culture of entrepreneurship and innovation in the agricultural sector (talent development, accelerated learning hackathons, business incubators, acceleration programs, etc.).

In the agri-food sector, the proliferation of mobile technology, remote sensing and data services is already increasing smallholder farmers' access to information, inputs, markets, finance and training.

In our opinion, "digitalization" should be viewed as a tool for achieving competitiveness, and not as an end in itself. With a systematic state approach, digital technologies will significantly stimulate the development of an open information society as one of the essential development factors in the Kyrgyz Republic, increasing productivity, economic growth, job creation, as well as improving the quality of life of citizens of the republic.

However, there are big problems in the country in the implementation and dissemination of digital technologies in entrepreneurship, production and public life. Today, more than 1/3 of the rural population of the Kyrgyz Republic does not have access to broadband Internet. Half of the rural schools and almost all health care institutions are not connected to the world wide web. According to the International Telecommunication Union, in 2017, 38% of the population over 18 had access to the Internet. According to the National Statistical Committee of the Kyrgyz Republic for 2018, the number of access points to the Internet is 24,263 units, 51.5% of which are in Bishkek, and the smallest share is in Talas region - 2.5% [5]. The digital adoption index in Kyrgyzstan in 2016 was 0.49 points and ranked 96th out of 183 countries [6]. This situation can be corrected only with the help of public-private partnership projects, which allow reaching more than 80% broadband Internet coverage in a few years.

The world's leading companies Monsanto, Bayer, Syngenta, John Deere are setting up the production of digital platforms for smart agriculture systems based on the collection and processing of big data on climatic conditions, soil conditions, etc. It is

with the help of such sensors that large US agricultural producers' yields were increased to 70%, energy costs were reduced by \$ 10 per acre, and water consumption was reduced by 8%.

Most of the currently produced agricultural units, even the simplest ones, are equipped with electronics. And in modern tractors or combines for monitoring and control, many different electronic sensors and an on-board computer are used. In recent years, navigation devices have become an indispensable tool for locating agricultural machinery in space and time. Digital agriculture provides for the implementation of all operations in the cultivation of agricultural crops, taking into account the spatial and temporal variability of soil fertility parameters, the state of plants, natural and climatic conditions.

Conclusions

Thus, in the coming years, the digitalization of the agricultural sector will entail significant shifts in agriculture and the production of products in this industry. It can ensure the production of economic, environmental and social benefits, but at the same time provoke a number of problems. The development of digital technologies should be carried out in an integrated manner in each sector, by renowned experts and entrepreneurs and government agencies [7]. Within value chains, full control and coordination can be ensured, and optimal models for the management of agricultural land, crops and animals can be created.

Digitalization of the agricultural sector will reduce risks, increase yields, plan the production and sale of goods more accurately and in a timely manner, shorten the supply chain, reduce costs, a shortage of qualified labor, and provide all stakeholders with reliable information [8]. Digitalization in Kyrgyzstan should provide Kyrgyz agrarians with the opportunity to use information platforms and innovative technologies for

mutually beneficial cooperation of agricultural products between the EAEU countries [9]. Uneven access to digital technology and services means the risk of a digital divide. Smallholder farmers and other rural residents are at risk of not keeping pace with the transformation, not only in terms of computer literacy and digital access, but also productivity and various aspects of economic and social inclusion. The introduction of technology is not enough to get results. Social, economic and political systems will have to provide the basic and accompanying conditions that will allow the digitalization of agriculture.

Thus, the policy of competitiveness provides for the achievement of digital transformation of economic sectors, spheres of activity, their acquisition of new competitive qualities and properties; which should contribute to the development of the information society based on integration and cooperation with ensuring standardization, security and trust, as well as on the basis of the complexity of public administration.

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Summary

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DIGITALIZATION AS A TOOL FOR
ACHIEVING AGRICULTURAL
COMPETITIVENESS OF THE KYRGYZ
REPUBLIC

The article is devoted to researching the problems of digitalization in the Kyrgyz Republic. The article substantiates that in order to achieve sustainable competitiveness, it is extremely important to make the most of innovative technologies. It is determined that digitalization is a full-scale introduction of digital technologies in production and business, aimed at bridging the digital divide and creating a full-fledged digital infrastructure in agriculture.

Резюме

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ЦИФРОВИЗАЦИЯ КАК
ИНСТРУМЕНТ ДОСТИЖЕНИЯ
КОНКУРЕНТОСПОСОБНОСТИ
СЕЛЬСКОГО ХОЗЯЙСТВА
КЫРГЫЗСКОЙ РЕСПУБЛИКИ

Статья посвящена исследованиям проблем цифровизации в Кыргызской Республике. В статье обосновано, что для достижения устойчивой конкурентоспособности крайне важно максимально использовать инновационные технологии. Определяется, что цифровизация - полномасштабное внедрение цифровых технологий производство и бизнеса, направленное к преодолению цифрового разрыва и созданию полноценной цифровой инфраструктуры, в сельском хозяйстве.

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SECTION II. AGRONOMY

UDC: 633.2.039.6

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MODERN MANAGEMENT SYSTEMS FOR PASTURE AND FOREST RESOURCES IN THE KYRGYZ REPUBLIC UNDER CLIMATE CHANGE

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Abstract. The article presents the results of research and work on the development of technology for improving degraded low-productive pastures with using resource-saving technology and formation of nurseries for seed production of forage grasses.

Key words: Pasture, climate change, forest resources, seed production of pasture grasses.

Introduction. Agro-land and forest resources in our republic play one of the key functions in maintaining biodiversity, ecological balance and economic component. Most part of the population (over 60%) lives in rural areas and is involved in agricultural production, which means it directly depends on the available water, land and forest resources.

Kyrgyzstan is a mountainous country, in which mountainous landscapes are

represented on more than 90% of all territory, including pastures - about 86%, arable land - about 10% and forests - a little more than 4%. While local residents are intensively using all available resources for production and livelihoods, increasing the processes of degradation, felling and depletion, effects of climate change have recently played a special role, which make mountain areas especially vulnerable.

Even insignificant changes in annual temperatures, amount of precipitation and more frequent climatic and weather anomalies lead to the loss of valuable resources of natural ecosystems, including pastures and forests.

Currently, the most important the environmental problem is global warming [5]. According to the forecast of the IPCC, by 2100 the average annual global surface air temperature will rise by 1-3.5°C; the

precipitation regime will also change. According to experts, these changes can lead to negative consequences in many regions of the planet: in the natural environment - to a reduction in the diversity of flora and fauna; in socio-economic sectors, namely in agriculture, forestry and fisheries - to a decrease in productivity; and will also adversely affect human health [1, 3, 4].

The Kyrgyz Republic has 20 ecosystem classes (Fig.1), ranging from

alpine tundra analogues (alpine deserts and the nival zone), medium-altitude forest analogues, to the medium- and low-altitude steppe and desert analogues, as well as aquatic ecosystems (marsh, lake, river). At the same time, all the natural ecosystems, to some extent, are subject to anthropogenic influence, which disrupts their normal functions and the ability to maintain the natural diversity of species [6].

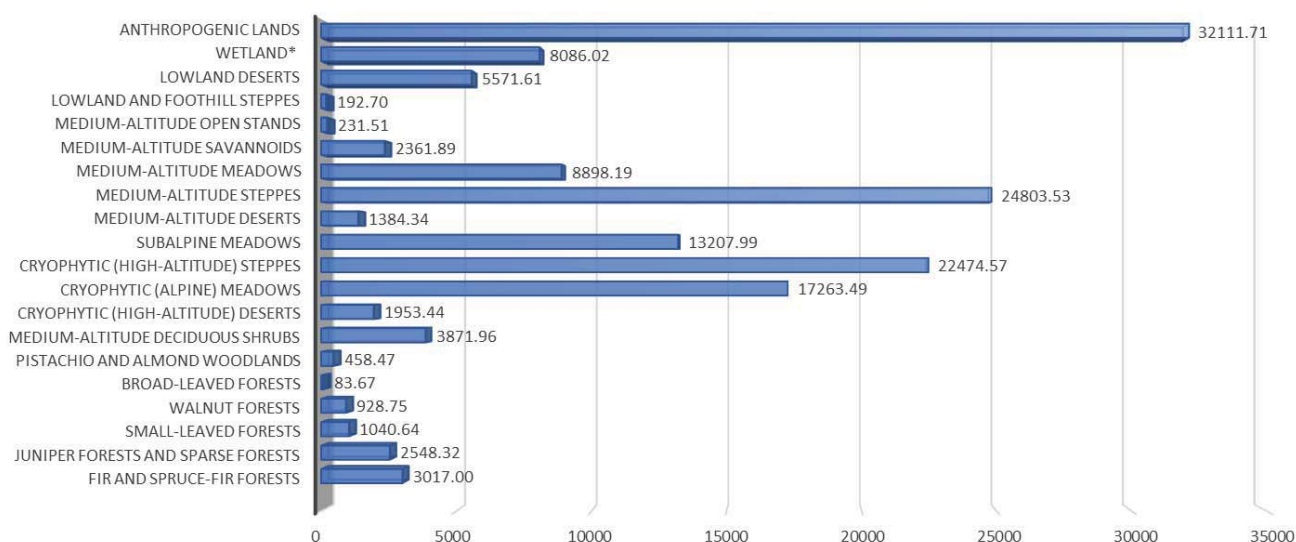


Figure 1. Areas of Ecosystem in Kyrgyzstan, km² [5]

Each of these ecosystems is affected to varying degrees by climate change, which threatens all spheres of human life: ecosystem services and benefits, socio-economic spheres, food security and human health. Forest ecosystems play a huge role in the formation of the local climate, CO₂ retention and oxygen production, as well as pastures play very important role in retaining soil CO₂, formation of a catchment, soil

protection functions and provision of fodder, medicinal and melliferous grasses. In order to preserve such valuable resources, it is necessary just now to develop and implement modern management systems for pasture and forest resources.

Taking into account that the degradation of pastures is already more than 80% today (including lands of the forest fund), we have begun work on the

development of technology for improving degraded low-productive pastures using resource-saving technology, as well as the formation of nurseries for seed production of forage grasses.

As part of this research and work, the following activities are planned and carried out:

1. Demonstration of current work at the Institute's experimental field, in preparing a nursery for the production and multiplication of varietal grass seeds.
2. Monitoring and research of areas of natural pasture grass growth for seed collection.

Collection of seeds of grasses from natural pastures on the basis of recommendations, geo-botanical studies of the State Scientific-Research Institute "Kyrgyzgiprozem" in 2015. Preparation of seeds of natural pasture grasses.

Adaptation of a science-based grazing system for farm animals with the introduction of elements of pasture crop rotation.

Materials and research methods.

The research was carried out on the lands of the Kyrgyz research institute of livestock and pastures. Phenological research; field germination of seeds (% of sowing); plant survival; the accounting of the yield of pasture fodder was carried out for all grazing

cycles; dynamics of changes in species composition, etc. (according to generally accepted methodologies).

Results. Seed-growing of promising grasses (pasture grasses) is carried out in the Experimental Seed Farm of the KLPRI in Sokuluk district of Chui oblast, 15 km north of Bishkek in a sharply continental climate, at an altitude of 750-800m above sea level. The experimental plot was aligned with the topography and soil fertility. The soil of the experimental plot is sierozemic with the occurrence of groundwater at a depth of 3-4 m, the mechanical composition of the plot is medium sterile coal. The humus content in the arable horizon ranges from 1.48 to 2.05%, the soil reaction is slightly alkaline (7.8 - 8.2). The content of gross phosphorus is average - 0.89 - 0.116%, nitrogen 0.125 - 0.161% and a sufficient content of mobile potassium 3-5%.

This nursery consists of 4 hectares of grasses that was established in 2016 - 2 hectares: spring and autumn sowing of 1 hectare each; 2017 - 1 hectare of spring sowing; 2018 - 1 hectare of spring sowing. Sowing was carried out with high-quality seeds, as it is one of the most important conditions for obtaining even sprouts and highly productive grass stand. Therefore, for sowing, we prepared ripe, filled, large seeds, clean of weeds and other impurities. Before sowing, the sowing rate was calculated and the required number of seeds was prepared, and the sowing qualities of the seeds were

determined. Sowing was carried out by the seeding norm, in accordance with the approved recommendations: *Dactylis glomerata*, *Bromus inermis* - at the rate of 16 kg of seeds per 1 hectare; meadow fescue - 15 kg/ha; thin-spiked wheatgrass - 12 kg/ha.

The following types of grasses grow in the nursery: *Bromus inermis* (*Bromopsis inermis* Holub.) Jalyn, *Dactylis glomerata* (*Dactylis glomerata* L.) Targyl, wild rye (*Agropyrum trichophorum*) Dolon, meadow Meadow Fescue (*Festuca pratensis* Huds.) Borissy ovary, Kyrgyz, striated Meadow Fescue, *Festuca valesiaca* (Meadow Fescue, betege). These seeds can be used to improve degraded pastures by overseeding. Additionally, seeds of wild pasture grasses can be used for overseeding, which were collected from natural forage lands.

For this purpose, tracts were examined following tracts: Karkara, Kaindy, Jety-Oguz (Issyk-Kul oblast), Karakujur, Salton-Sary, Salkyn-Tor, Eki-Naryn (Naryn oblast), Kyzyl-Unkur, Arstanbap (Jalal-Abad oblast) and Suusamyр valley foothills pastures of Chui oblast (Panfilov, Moscow, Sokuluk districts) were examined to determine the places of possible collection of seeds of wild fodder plants.

Weather conditions in 2019 were not favorable for seed formation - the spring was dry and cold, followed by a hot summer, as a result pasture vegetation could not form full generative shoots in sufficient quantity. Due to the hot summer, the observation began in

the first half of June. All the main tracts and places where we collected seeds in previous years were examined.

During the examination, it was revealed that the grasses are in the phase of flowering, the beginning of seed ripening in Jalal-Abad, Chui and Issyk-Kul oblasts; in Naryn oblast - in the earing phase - the beginning of flowering.

During the monitoring, places of mass seed growth were determined and it was revealed that the seeds began to ripen in the second half of June - early July. The seeds began to ripen in the second half of June - early July; the seeds were collected by hand.

In total, after cleaning and bringing the seeds to sowing conditions, 600 kg of seeds were collected, including: *Dactylis glomerata* - 64 kg; meadow fescue - 142 kg; thin-spiked wheatgrass - 73 kg; rootless wheatgrass - 115 kg, *Bromus inermis* - 206 kg.

To restore degraded pastures and increase the yield of low-productive pastures, including on lands of the forest fund, overseeding of plants correctly selected to local conditions (according to soil and climatic conditions) is of certain importance.

Improvement of forest pastures can also be carried out by overseeding of grass mixtures, which will reduce the degradation processes, increase their productivity and forage quality due to a variety of overseeding, including from leguminous grasses.

Recommended grass mixtures were compiled and seeds of pasture grasses were

sown on 60 hectares of degraded pastures in 6 pilot aimaks: "Saruu" and "Darhan" of Jety-Oguz district in Issyk-Kul oblast; "Ugut" and "Togolok-Moldo" of Ak-Talaa district in Naryn oblast; "Shaidan" and "Nooken" of Nooken district in Jalal-Abad region on an area of 10 hectares per each Pasture committees.

Tillage was carried out by harrowing 2 two tracks. First, harrowing was carried out, then forage grasses were sown. After overseeding of seeds of perennial forage grasses, repeated harrowing was carried out at high speed for better seed placement.

Thus, 100 kg of grasses and 100 kg of sainfoin were sown on each plot, based on rate of 10 kg of grasses and legumes per hectare.

Tillage was carried out by harrowing 2 two tracks. First, harrowing was carried out, and then fodder grasses were sown. After sowing seeds of perennial forage grasses, repeated harrowing was carried out at a high speed for better seed placement.

After the improvement of degraded pastures by over-sowing seeds of natural pasture grasses, acts of acceptance and transfer were drawn up and recommendations were given to Pasture Committees for the rational use of improved pasture areas (leaving for rest for 1 year for rooting and development of sown grasses).

Conclusion:

1. Perennial herbs have special requirements for soil cultivation and

agricultural technology for their cultivation, so the nursery conducts surveys and observations of plant growth and development, as well as carry out agrotechnical care.

2. In perennial grasses, during the seed ripening seeds fall. Some varieties ripeness so quickly that in 2-3 days one can lose half of the crop. In this regard, the determination of the optimal harvesting time for perennial grasses is one of the most important conditions for obtaining high seed yields. Too early harvesting results in hollow underripe seeds, and later harvesting leads to increased losses of the largest, most valuable seeds due to falling.

3. Improving measures for overseeding of grasses should be carried out on the basis of scientifically grounded recommendations, according to climatic conditions, seasonality, and the results of chemical analysis of soils.

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THE EFFECT OF FERTILIZERS ON AMINO ACID COMPOSITION OF WINTER WHEAT GRAIN IN THE CROP ROTATION OF THE MEADOW SOIL OF THE CHUI VALLEY

Abstract: The effect of prolonged application of fertilizers in crop rotation on the amino acid composition of winter wheat grains was established in the serozem-meadow soils of the Chui valley of the Kyrgyz Republic

Keywords: Long-term stationary experiment with fertilizers, fertilizers, winter wheat, crop rotation, "raw" protein, amino acid composition of grain, essential amino acids.

Background

The problem of increasing the production of high-quality grain is a key task of mankind. The main indicator of wheat grain quality is the amount of protein and their amino acid composition. Therefore, the increase in the protein content of grains with a high content of essential amino acids is one of the most urgent tasks of our time.

According to the data of the scientific and research institutions, one of the most important factors in regulating grain quality indicators is the use of mineral and organic fertilizers [1-5, 6-9]. Most researchers note that the use of fertilizers can increase the protein content in wheat grain. However, the increase in the protein content of grain under the influence of fertilizers occurs mainly due

to an increase in the proportion of gliadins, which are inferior to proteins with a low biological nutritional value from the point of view of the amino acid composition, but the quantity of full proteins (albumins, globulins) either does not change or decrease [1-3, 7, 8].

Methodology and objects of the studies

It should be noted that the issues of the effect of fertilizers on the quality of winter wheat grain in Kyrgyzstan, especially on the amino acid composition of the protein, have not been studied well. In the country, studies on determining the effect of fertilizers on the amino acid composition of the protein of winter wheat in a laboratory were practically not conducted, or they were carried out in short-term field experiments, where it is impossible to determine a clear facet of the effect of fertilizers on this indicator. A more precise answer to this question can be obtained in studies conducted in a stationary experiment. We conducted studies on the effect of prolonged systematic use of fertilizers in the crop rotation of the stationary experiment laid down in 1967 on a set of indicators characterizing the quality of winter wheat grain, including the amino acid

composition of the protein. It's worthwhile to note that this stationary experience served as a foundation of the Geographic Network of Field Experiments with Fertilizers of the former Soviet Union.

The object of the study was the second winter wheat of the "Intensive" grade in a nine-field areal sugar beet crop rotation

with the following alternation of crops: 1. Spring barley + alfalfa. 2. Lucerne. 3. Alfalfa. 4. Winter wheat. 5. Sugar beet. 6. Corn. 7. Sugar beet. 8. Winter wheat. 9. Sugar beet.

The scheme of the stationary experiment with fertilizers is presented in table

Table 1

Scheme of stationary experiment with fertilizers

№ п/п	Variant	Fertilizer system
1.	Basic	Without fertilizers
2.	N ₉₀ P ₉₀ K ₃₀	Mineral with one and a half nitrogen norm
3.	N ₆₀ P ₁₃₅ K ₃₀	Mineral with one and a half norm of phosphorus
4.	N ₆₀ P ₉₀ K ₃₀	Complete mineral system
5.	P ₉₀ K ₃₀	Mineral system without nitrogen
6.	N ₆₀ K ₃₀	Mineral system without phosphorus
7.	N ₆₀ P ₉₀	Mineral system without potassium
8.	N ₉₀ P ₁₃₅ K ₄₅	One and a half mineral system
9.	N ₁₂₀ P ₁₈₀ K ₆₀	Double mineral system

The plot area is 226.8 m², the repetition of the experiment is fourfold, the location of the plots is multi-rowed. Accounting for the crop - a continuous weighing method from the accounting plot. The definition of the "raw" protein was carried out according to the IFAS (Institute of Fertilizers and Agricultural Science named after Prianishnikov, Russia) technique. The agricultural technology which is generally accepted for this zone.

Results of the study

As noted above, the use of fertilizers has a certain effect on increasing the protein content of winter wheat grain, but the increase in its content is mainly due to an increase in the proportion of protein fractions deficient in terms of amino acid content - gliadins, while the content of complete protein fractions - albumin and globulins, is subject to minor changes. The content of amino acids in terms of protein fractions does not change much, but their content for total protein and dry matter increases due to

increased productivity when fertilizers are used [1-5, 6-9].

The results of our studies indicate that under the influence of fertilizers, the content of essential amino acids in the total protein of wheat grains increased in almost all variants of the experiment, except for the one-and-a-half-normal nitrogen rate against the

background of complete doses of phosphorus and potassium (table 2). This indicates that the N: P: K ratio in fertilizers is very important, with the optimal ratio of phosphorus and potassium fertilizers supplementing nitrogen and also positively affecting the quality of the grain.

Table 2

Effect of fertilizers on the amino acid composition of the protein of winter wheat grains, g / 100 g protein

Variant	Base without fertilizers	N ₉₀ P ₉₀ K ₃₀	N ₆₀ P ₁₃₅ K ₃₀	N ₆₀ P ₉₀ K ₃₀	P ₉₀ K ₃₀	N ₆₀ K ₃₀	N ₆₀ P ₉₀	N ₉₀ P ₁₃₅ K ₄₅	N ₁₂₀ P ₁₈₀ K ₆₀
Amino acids									
Asparagine	7,34	7,25	7,78	8,18	7,31	7,92	7,49	7,64	7,76
Threonine	3,99	3,92	4,20	4,24	4,18	4,52	4,20	4,35	4,30
Serin	6,52	6,58	6,96	6,61	6,58	7,38	6,68	7,0	6,79
Glutamine	50,02	49,83	51,75	50,12	50,42	54,26	52,64	57,02	55,02
Proline	17,47	17,34	19,75	17,72	19,14	20,62	17,19	19,08	17,17
Glycine	5,78	5,76	6,18	6,29	6,05	6,45	6,06	6,28	6,46
Alanin	4,87	4,80	5,10	5,29	5,10	5,47	5,08	5,22	5,32
Valine	5,18	5,01	5,34	5,40	5,31	5,80	5,39	5,56	5,53
Methionine	2,41	2,20	2,44	2,50	2,38	2,46	2,08	2,28	2,24
Isoleucine	4,6	4,44	4,83	4,83	4,74	5,10	4,75	4,99	4,88
Leucine	9,46	9,22	10,0	9,90	9,71	10,66	9,76	10,29	10,02
Tyrosine	4,85	4,68	5,16	5,20	5,15	5,26	5,00	5,30	5,28
Phenylalanine	6,96	6,72	7,64	7,72	7,52	7,96	7,51	7,96	7,94
Gisticin	3,33	3,26	3,5	3,54	3,42	3,74	3,45	3,58	3,69
Lysine	3,88	3,75	4,00	4,14	3,99	4,14	4,00	4,08	4,16
Arginine	6,70	6,26	6,82	7,43	6,97	7,50	7,10	7,16	7,49
Essential amino acids	36,48	35,26	38,45	38,73	37,83	40,64	37,69	39,51	39,07

From the data in table 2, one can see that the threonine content increased by 0.19-0.53 g, valine by 0.13-0.62, isoleucine by 0.14-0.50, leucine by 0.25-1, 20, phenylalanine by 0.56-1.0 and lysine by 0.11-0.28 g / 100 g protein. At the same time, with the exception of full fertilizer ($N_{60}P_{90}K_{30}$), a one and a half norm of phosphorus against nitrogen and potassium ($N_{60}P_{135}K_{30}$) and nitrogen-potassium fertilizer, the content of methionine in the protein decreased by 0.30-0.33 g / 100 g of protein. With the improvement of mineral nutrition, there was also an increased content of glutamine and

more often proline, which are parts of the gliadin fraction of proteins.

Out of free amino acids, the content of asparagine, arginine, alanine, and tyrosine has increased under the influence of a single ($N_{60}P_{90}K_{30}$) and double fertilizer rate ($N_{120}P_{180}K_{60}$), as well as nitrogen-potassium nutrition.

Different levels of grain yield and protein content, determined by the conditions of mineral nutrition, led to an unequal collection of protein and irreplaceable amino acid from a unit area (table 3).

Table 3

**Effect of fertilizers on collection of protein and essential amino acids with winter wheat
grain yield, kg/ha**

Variant	Control without fertilizers	N ₉₀ P ₉₀ K ₃₀	N ₆₀ P ₁₃₅ K ₃₀	N ₆₀ P ₉₀ K ₃₀	P ₉₀ K ₃₀	N ₆₀ K ₃₀	N ₆₀ P ₉₀ K ₃₀	N ₉₀ P ₁₃₅ K ₄₅	N ₁₂₀ P ₁₈₀ K ₆₀
Amino acid									
“Raw” protein	518,0	772,5	852,0	965,5	650,5	684,5	770,0	888,0	935,0
Essential amino acids	188,9	272,4	327,7	374,4	246,1	278,1	290,2	350,8	365,2
Including:									
Threonine	20,7	30,3	35,8	41,0	27,2	30,9	32,3	38,6	40,2
Valine	26,8	38,7	45,5	52,2	34,5	39,7	41,5	49,4	51,7
Methionine	12,5	17,0	20,8	24,2	15,5	16,8	16,0	20,2	20,9
Isoleucine	23,8	34,3	41,2	46,7	30,8	34,9	36,6	44,3	45,6
Leucine	49,0	71,2	85,2	95,7	63,2	73,0	75,2	91,4	93,7
Tryptophan									
Phenylalanine	36,0	51,9	65,1	74,6	48,9	54,5	57,8	70,7	74,2
Lysine	20,1	29,0	34,1	40,0	26,0	28,3	30,8	36,2	38,9

The data in table 3 indicate that the use of fertilizers in crop rotation, mainly due to an increase in grain yield and a slight increase in the content of essential amino acids, significantly increases the collection of "crude" protein and essential amino acids. If the collection of "raw" protein was 518 kg on an option without fertilizers, 188.9 kg/ha of essential amino acids, then the application of the full fertilizer rate (N₆₀P₉₀K₃₀) yielded "raw" protein to 966.5 kg/ha, essential amino acids up to 374, 4 kg/ha. The introduction of double and one-and-a-half fertilizer rates ensured the collection of "raw" protein 935.0

and 888.0 kg/ha, essential amino acids 365.2 and 350.8 kg/ha, respectively. That is, the application of higher fertilizer rates does not ensure a further increase in wheat quality. The lowest yield of "raw" protein and essential amino acids was observed when nitrogen was excluded from the full fertilizer. When using fertilizers, the yield of essential amino acids increases by 1.5-2.0 times in comparison with the control. It should be noted that the protein of winter wheat, with prolonged use of fertilizers in crop rotation, becomes of higher quality in terms of amino acid composition, the proportion of complete

proteins - albumin and globulins increases to 35-38%, while most researchers note that an increase in the protein content of grain under the influence of fertilizers occurs mainly due to an increase in the proportion of defective proteins - gliadins, which have a low nutritional value, and the amount of complete protein fractions of albumin and globulins practically does not change and does not exceed 25-30% (1, 3, 5, 8).

Based on the studies and results obtained, the following conclusions can be drawn;

1. Long-term systematic use of fertilizers in crop rotation has a certain effect on protein content in winter wheat grains and their amino acid composition.
2. Increase in the protein content of grain under the influence of fertilizers is due to an increase in the proportion of almost all protein fractions, including by increasing the proportion of albumins and globulins to 35-38%, the content of which does not normally exceed 25-30%.
3. Under the influence of fertilizers, due to an increase in the yield and the proportion of full-fledged protein fractions of albumin and globulins, the yield of essential amino acids is increased by 1.5 - 2.0 times compared to the control, the wheat protein becomes more complete, high-quality in terms of amino acid composition with high nutritional value.

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¹Ergeshova K.E., ²Oryntaeva K.B., ¹Belek uulu E., ³Tazhamatova S.K.**OLD TOMATO VARIETIES IMPROVED BY THE METHOD OF SELECTION IN THE CONDITIONS OF ORGANIZED AREAS OF THE CHUY VALLEY OF KYRGYZSTAN**¹*Kyrgyz National Agrarian University named after K.I. Scriabin*²*Kyrgyz Experimental Breeding Station for Sugar Beet KOSS*³*Central laboratory for examination of seeds of the Department for examination of agricultural crops*

Annotation: Everyone knows that the harvest begins with seeds and depends on the quality. The yield depends on the original quality of the seed of each variety. There are 3 basic requirements for the seeds of vegetable crops, each of which is equally important: 1. A gardener-vegetable grower must have seeds of those varieties or hybrids that are most suitable for growing in a given area by a set of characteristics. 2. The seeds must be viable; have a high germination and germination energy. 3. Seeds must be healthy from pathogens. Now our market is saturated with seeds of vegetable crops of foreign selection. Is it advisable in these conditions to engage in artisanal seed production? This is justified for a number of reasons.

Key words: Tomato, sugar beet, seeds, harvest, vegetable grower, vegetable crops, foreign selection.

Each region should have seeds for its own vegetable varieties. But in Kyrgyzstan, there are no seed farms for vegetable crops, so gardeners are forced to receive seeds on their own, or use imported seeds of varieties that are not adapted to local conditions. The imported seeds are mainly hybrids of the first generation, therefore, primary seed production is not conducted in the republic for all vegetable crops. Local varieties are lost due to the lack of seeds, there are few left, only among gardeners. Mostly, foreign-bred hybrids were brought, because of the high

cost of these hybrids, farmers sow what falls into their hands, sometimes unknowingly collect seeds from hybrids, as a rule, they are split in the second generation. There is no selection and seed production work for vegetable crops in the republic. Not produced, elite seeds, even of zoned varieties, not to mention the creation of hybrid ones. There is no scientific research on vegetable crops, only at the Agrarian University for students some work is being done for the thesis. One of the important conditions for obtaining high yields of vegetable crops and good quality products is the availability of a sufficient number of seeds with high varietal and sowing qualities.

The natural and climatic conditions of Kyrgyzstan are favorable for the cultivation of both marketable and seeds of all vegetable crops and obtaining high yields, both from open and protected ground. It is here that there are all the conditions for the production of early and off-season vegetables, for the full satisfaction of the demand of the local population, as well as for expanding their export to the northern and mountainous regions, where it is not possible to cultivate this valuable, medicinal product. If one of the suppliers suddenly interrupts supplies, the republic will be left without seed and planting material, and people will be left without food. Growing seeds of local varieties will be economically beneficial for farmers, peasants and hobbyists of vegetable growers, grown

seeds of local varieties will provide sustainability in agricultural activities and will contribute to the conservation of biodiversity of vegetable crops. One of the reserves for increasing the yield of seeds and their quality in the household economy of the Chui Valley is the use of varieties adapted to local conditions, and increasing their quality by using high agricultural technology of seed production, as well as the application of correct individual and mass selection. isolation, washing, threshing, drying and storage of seeds. Currently, local adapted varieties differ in taste, but so far the varietal and sowing qualities do not meet the desired effect. The remaining vegetable seeds on the hands of amateurs are of low quality, since seed growers do not follow the most important rules of agricultural technology and seed production rules and, as a result, deteriorate the quality of both seeds and varieties. If you look closely at the assortment in the register of zoned varieties, then the hybrids of foreign producers grow like mushrooms in all vegetable crops (Table 1). They are expensive, not affordable for average peasants and farmers, not to mention the poor. In the future, the path of development of selection and seed production of vegetable crops in our republic is not yet foreseen, there are no scientific practitioners and no officials.

Therefore, the scientific work carried out on the project for the conservation, improvement and renewal of locally adapted varieties of vegetable crops, including tomato, is timely and certainly very relevant. Therefore, at the K.I. Skryabin KNAU, work was carried out to improve local adapted tomato varieties in varietal and sowing quality by the method of individual and mass selection and the 3 new forms that emerged, which differed from the initial one, were transferred as an improved new form and called Er-Darkhan, Mira and Saltanat ... The

ripening time of tomatoes in the open field depends on the characteristics of the variety, the creation of favorable conditions for them, on the climatic conditions of the area and on the methods of agricultural cultivation for seeds. Therefore, the same variety can bear fruit at different times and, accordingly, the seeds in them ripen at different times.

In our research, all tomato varieties were sown in different villages and each village at different times, as far as possible, the climatic conditions of the area. Accordingly, seedlings appeared at different times, respectively, and planted at different times, however, all phases of development began at different times, differed by several days (Table 1). Our study showed that the phases of tomato development depended on the characteristics of the variety. For example, in s. Nurmambet was the first to bloom Er-Darkhan, Cherry red round, Cherry red oval, Cherry yellow oval, the second - Local Gift, and Saltanat - bloomed later than everyone else and ripening also came later than all varieties. The same indicators were confirmed in the studied varieties of S.A. The Toktonaliev difference was insignificant within the experimental error. Tomato variety Bovine hearts grown with. Sting, p. A. Toktonaliev and the KNAU nursery ripening came and 10-12 days earlier than Mira, they matured in the village. Spiked by mulching with straw. Mulching with straw facilitated rapid maturation. This means that the roots had enough warmth and this contributed to good growth and development, and as a result, the fruits ripened earlier to obtain tomato seeds (Table 1). This pattern was also observed in other cultivated vegetable crops of pepper (Table 2), cucumber, onion and carrot. Of all the studied varieties of tomato, the early ripening variety turned out to be Er-Darkhan, in which after 26 and Mir 36 days the fruits ripened after flowering, and the fruits of the Saltanat

variety ripened later than all, and after 52 days, Bull's Heart, 50 days after flowering, the fruits ripened. The rest of the varieties ripened almost equally, the difference was 2-4 days. The analysis of the biometric measurement showed that the size was the

Bull Heart variety and the Saltanat variety. Fruit weight was 364 and 298g. accordingly, their fruits are dense, fleshy, the juice is very thick and they are considered large fruiting swarms.

Table 1. Phenological observations of tomato in the conditions of the Chuy valley for 2018-2019.

Where was the study done	Varieties	Dates						Days (from sowing) to flowering			From sowing to ripening
		sowing	seedlings	landing	bloom	fruit decision	maturation	Zveia	From flowering to Fetus	matured	
Nurmambet	Er-Darkhan	24.03*	06.04		10.06	01.07	30.07	83	27	30	113
		28.03	03.04	10.05	17.06	02.07	24.07	73	16	22	105
Nurmambet	Local gift	24.03*	06.04		15.06	08.07	30.07	83	22	44	127
		28.03	03.04	10.05	15.06	24.07	05.08	78	29	50	128
Nurmambet	Saltanat	24.03*	06.04		15.06	08.07	30.07	83	22	44	127
		28.03	03.04	10.05	27.06	29.07	17.08	91	33	52	143
A. Toktonalieva	s.Zhal	07.04	13.04	15.05	25.06	22.07	18.08	83	27	49	132
		05.04	12.04	20.05	18.06	14.07	20.08	74	26	63	137
Nurmambet	The world	24.03*	06.04		10.06	05.07	05.08	78	26	38	119
		28.03	03.04	10.05	17.06	09.07	07.08	81	33	34	115
A. Toktonalieva	s.Zhal	07.04	13.04	15.05	15.06	12.07	08.08	73	38	31	111
		05.04	12.04	20.05	08.06	10.07	10.08	64	32	39	103
Nurmambet	Cherry red circle	24.03*	06.04		15.06	08.07	30.07	83	22	44	127
		28.03	03.04	10.05	10.06	15.07	25.07	69	27	53	122
Nurmambet	Cherry red oval	24.03*	06.04		15.06	08.07	30.07	83	22	44	127
		28.03	03.04	10.05	10.06	15.07	29.07	74	35	50	124
Nurmambet	Cherry yellow oval	24.03*	06.04		15.06	08.07	30.07	83	22	44	127
		28.03	03.04	10.05	10.06	15.07	29.07	74	35	50	124
s.Zhal	Bull heart	10.04	15.04	15.05	20.06	23.07	06.08	72	34	45	117
		04.04	11.04	10.05	18.06	15.07	10.08	76	28	53	129
A. Toktonalieva	Kennel KNAU	28.03	03.04	10.05	10.06	15.07	25.07	69	27	53	122
											123

Table 2. Biometric measurements of various tomato varieties in the Chuy valley for 2018-2019.

№	Name of the villages where the study was carried out	Grown varieties	Description of the fruit				Fruit weight, g	Fruit taste
			Fruit color	Fruit shape	Fruit height, cm	Fruit diameter, cm.	Index	
1	village Nurmambet from. A. Toktonaliev	Er-Darkhan-Gizal	red	Oblong-elongated	7.3	4.8	159	Sweet with a pleasant scent
					7.6	4.9	186	
							172,5	
2	village Nurmambet from. A. Toktonaliev	Local gift	red	Rounded round	5.6	5.3	159	Sweet and sour, sour
					5.4	5.0	160	
							159,5	
3	village Nurmambet c. A. Toktonaliev s. Zhal KNAU	Saltanat	Reddish Pink, hot pink. Pink	Flat, flat ribbed at the base	6,7	10,0	309	Sweet, thick juice with a pleasant tomato flavor
					7,1	12,0	310	
					9,5	12,7	286	
					9,8	13,2	287	
							298	
4	village Nurmambet from. A. Toktonaliev s. Zhal KNAU	The world	Red, bright red.	Rounded-flat, round. Round flat	7.2	12.0	293	Very sweet, sweet with a natural tomato scent
					7,6	14,0	369	
					9,2	10,7	286	
					9,0	13,2	387	
					8,3	12,5	308	
5	village Nurmambet from. A. Toktonaliev	cherry red circle	red	round	3.2	1.8	12	Sour
					3.9	3.6	15	
							13,5	
6	village Nurmambet from. A. Toktonaliev	cherry red oval	Red	Oval - oblong	5.3	2.0	18	Sweet and sour
					4.2	2.0	19	
							18,5	
7	village Nurmambet from. A. Toktonaliev	cherry yellow oval	yellow	Oval - oblong	4.2	2.3	11	Sweet, sour-and-sweet
					5.8	2.0	13	
							12	
8	s. Zhal Kennel KNAU A. Toktonaliev	Bull heart	Red, bright red	Cordate oblong rounded	18	10.0	392	Sweet, thin-skinned, fleshy
					12.0	7.0	350	
					14.3	7.0	350	
							364	

Conclusions:

1. The economic efficiency from the introduction of resistant varieties, compared to unstable ones, is within 15 -20%.
2. Improved local varieties by selection method based on studies of resistance to climatic conditions, pests exceed the zoned varieties, both in yield and especially in product quality.
3. The data obtained make it possible to recommend new improved local ancient varieties to vegetable growers, amateur gardeners, farmers, breeders, specialists and students of agronomic directions in vegetable growing, breeding and seed production of vegetable crops and when creating new highly productive and resistant genotypes to biotic environmental factors, as well as plant protection.
4. Improved local varieties will be multiplied, introduced and disseminated to growers and growers.

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SECTION III. ANIMAL HUSBANDRY

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EXTERIOR FEATURES OF YOUNG SHEEP OF DIFFERENT BREEDS AFTER FEEDING

Аннотация: В статье приводятся исследование экстерьерных особенностей баранчиков трех пород разводимые на юге республики. Актуальность рассматриваемой проблемы заключается в том, что впервые рассматриваются в сравнительном аспекте экстерьерные особенности и продуктивность этих пород после нагула в летний пастбищный период. Цель исследований – изучить экстерьерные особенности трех пород. В результате проведенных исследований, баранчики алайской и местной породы в 4 и 7 месячном возрасте, по промерам статей тела превосходят породу кыргызского горного мериноса. По индексу массивности также превосходят мясные овцы. Эти различия подчеркивает породные особенности мясо-шёрстных и мясных пород.

Кортундусу: Макалада, республиканын түштүгүндө өстүрүлгөн, койлордун үч тукумунун экстерьердик өзгөчөлүктөрүн изилдөөлөр келтирилген. Каралып жаткан изилдөөнүн актуалдуулугу, жайкы жайыт мезгилинде азыктангандан кийин бул пордалардын экстерьердик өзгөчөлүктөрү жана кунардуулугу биринчи жолу салыштырмалуу өнүткө каралып жаткандыгында. Изилдөөнүн максаты - үч порданын экстерьер өзгөчөлүктөрүн изилдөө. Жүргүзүлгөн изилдөөлөрдүн натыйжасында, алай жана жергиликтүү тукумдардын эркек козуларынын 4 жана 7 айлык кезинде, дене-бойунун ченем-өлчөө жагынан, кыргыз тоо меринос тукумунан ашып

түштү. Массивдүүлүк индекси боюнча эт багытындагы койлор да жогору болду. Бул айырмачылыктар эт-жүн жана эт пордаларынын тукумдук өзгөчөлүктөрү менен баса белгилеп кетсе болот.

Abstract: The article presents a study of the exterior features of rams of three breeds bred in the south of the republic. The urgency of the problem under consideration lies in the fact that for the first time the exterior features and productivity of these breeds after feeding in the summer grazing period are considered in a comparative aspect. The aim of the research is to study the exterior features of the three breeds. As a result of the conducted research, rams of alai and local breeds at 4 and 7 months of age, according to the size of their body, surpass the breed of Kyrgyz mountain merino. According to the massiveness index, meat sheep are also superior. These differences emphasize the breed characteristics of meat-wool and meat breeds.

Ключевые слова: кыргызский горный меринос, алайская полугрубошерстная порода, местные курдючные грубошёрстные овцы, экстерьер, промеры частей тела, индексы телосложения

Омоктуу сөздөр: кыргыз тоо мериносу, алай жарым кылчык жүндүү тукуму, жергиликтүү куйруктуу кылчык жүндүү койлору, экстерьер, дене-тулкунун ченемдери, дене түзүлүштүн индекстери

Keyword: kyrgyz mountain merino, alai semi-rough-woolly breed, local fat-tailed rough-woolly sheep, exterior, measurements of body parts, body indices

Introduction. Sheep breeding in the southern region of the Kyrgyz Republic is one of the leading traditional branches of agriculture. Sheep breeding for some regions of the south of the republic is a necessary industry that allows solving many socio-economic issues of the population, especially in areas located in the foothill and mountain zones of the region [1].

Among the common breeds of sheep bred in the south of the republic, along with others, are the local fat-tailed sheep, the Alai semi-rough-haired breed and the Kyrgyz mountain merino. In the southern zone of the republic, the selection of kyrgyz mountain merino sheep was carried out to create the southern kyrgyz intra-breed (zonal) type, which was based on animals of the katta-taldyk factory type [2].

One of the main indicators of adaptation of animals to the content in specific conditions, as well as health and strength of the constitution are their exterior features [3, 4]. Knowledge of the features of growth and development of young animals is an urgent issue that allows you to properly organize and apply appropriate methods of their cultivation [5].

Linear measurements of animals allow us to judge their physique, and the change in these measurements at different age periods gives an idea of the energy of growth and development. Physique indices are used for in vivo assessment of meat content [6].

The aim of our research was to identify the features of linear growth of the exterior of rams of different breeds at 4 months and after feeding at 7 months of age.

Methods. Experimental work on studying the exterior characteristics of sheep of different genotypes was carried out on livestock breeds of the kyrgyz mountain merino, alai and local coarse wool fat tail sheep in the farm "Katta-Taldyk" Osh region.

The experimental groups included 25 young rams from each breed. weighing and

measurement of measurements were carried out in young rams at 4, 6 and at the end of feeding, at 7 months of age. Measured: height at the withers, oblique length of the body, depth, width and circumference of the chest, the circumference of the pastern. On the basis of measurements, physique indices were calculated [7], which characterize the growth and development of young rams: shortness, sprawl, bony and massiveness.

Young rams within the group were selected of the same height and development. There were differences between the growth and development groups. Since this difference was determined by the breed affiliation of young rams at the same age. The experimental animals were in the same conditions of keeping and feeding the animals on the farm.

Biometric data processing [8] was performed using the Microsoft Excel program.

Results and Discussion. The main indicators of growth and development of young sheep, in addition to live weight, are measurements of body weight and their change over different age periods. V. I. Kosilov [9] points out that there is no consensus in science about the relationship between growth and development. It is believed that development is a derivative process of growth [10]. Exterior features of animals, according to P.N. Kuleshov [4], is an indicator of fitness for maintenance in specific conditions, as well as health and strength of the constitution.

In our studies, we studied the exterior features of the physique of three breeds of sheep at the age of 4 and 7 months of age.

The analysis of the obtained data indicates that the alai and local rams at 4 and 7 months of age, according to the size of their body, exceed the breed of the kyrgyz mountain merino (Table 1).

At 4 months of age, the difference in height at the withers between KGM and APG is 1.18 cm, or 2.1% ($P < 0.95$), between KGM and MG – 3.64 cm, or 6.3% with a significant difference ($P > 0.999$), between APG and MG – 2.46 cm, or 4.2% ($P > 0.99$). According to the oblique length of the trunk between the groups of breeds was, respectively-0.58 cm,

or 1.0%, ($P<0.95$); 3.74 cm, or 6.4%, ($P>0.99$) and 3.16 cm, or 5.3%, ($P>0.99$). In depth, width and chest circumference, respectively-1.16; 1.06 and 3.22 cm, or 4.5; 8.0 and 4.5% ($P<0.95$; $P<0.95$ and $P>0.99$).

This difference, of course, is manifested by the breed characteristics of young rams. Since, Alai and local rough-haired sheep breeds are meat breeds

Table 1. Measurements of the body parts of young rams of different genotypes, cm
($\bar{X} \pm Sx$, $n=25$)

Breed	withers height	body length	chest depth	chest width	chest girth	pastern girth
4 months old						
KGM	57,42 $\pm$ 0,32	58,74 $\pm$ 0,53	25,80 $\pm$ 0,21	13,32 $\pm$ 0,27	71,68 $\pm$ 0,45	7,92 $\pm$ 0,07
APG*	58,60 $\pm$ 0,20	59,32 $\pm$ 0,46	26,96 $\pm$ 0,16	14,38 $\pm$ 0,39	74,90 $\pm$ 0,47	7,78 $\pm$ 0,08
MG	61,06 $\pm$ 0,28	62,48 $\pm$ 0,51	27,70 $\pm$ 0,21	15,62 $\pm$ 0,39	83,12 $\pm$ 0,43	8,80 $\pm$ 0,05
7 months old						
KGM	65,13 $\pm$ 0,33	66,77 $\pm$ 0,52	27,06 $\pm$ 0,17	15,96 $\pm$ 0,24	89,17 $\pm$ 0,45	7,96 $\pm$ 0,08
APG*	67,46 $\pm$ 0,19	69,60 $\pm$ 0,33	28,70 $\pm$ 0,15	15,32 $\pm$ 0,34	99,60 $\pm$ 0,51	7,88 $\pm$ 0,07
MG	69,94 $\pm$ 0,25	71,88 $\pm$ 0,40	30,32 $\pm$ 0,19	17,06 $\pm$ 0,36	101,88 $\pm$ 0,39	9,88 $\pm$ 0,07

***KGM** - kyrgyz mountain merino

APG - alai semi-rough woolly breed

MG - local fat-tailed rough-woolly sheep

At 7 months of age, after summer feeding, the growth in height at the withers of the kyrgyz mountain merino breed was 7.71 cm, or an increase of 13.4 %. At the same time, the increase in height at the withers in rams of the alai semi-rough-haired and local fat -tailed breeds were almost the same and amounted to 8.86 and 8.88 cm, respectively, or 15.1 and 14.5 %. The development of the width and depth of the breast is directly proportional to the circumference of the breast. According to the breast circumference for three months, the largest increase is observed in APG – 24.7 cm, or 33.0%, then it is noted in KGM-17.49 cm, or 24.4%.

The difference in body size between groups of different breeds at 7 months of age is significantly different than at 4 months of age. For example, in height at the withers, the difference between KGM and APG was 2.33

cm, and between KGM and MG – 4.81 cm, and between APG and MG, the difference decreased to 2.48 cm.

Analysis of the growth of the size of articles showed that the increase in height at the withers in KGM for three months was 7.71 cm, or 13.4%, in APG the increase was 8.86 cm, or 15.1% , and MG-8.88 cm, or 14.5%. By chest circumference, respectively-17.49 cm, or 24.4%; 24.7 cm, or 33.0% and 18.76 cm, or 22.6 %. There is also a pattern of breed characteristics of meat breeds, where they are superior to fine-wooled rams. The size of the animal determines its productivity, especially meat content [12].

For a complete description of the exterior of experimental sheep of different breeds, we calculated the indices of physique (Table 2).

Table 2. Indices of the physique of young rams, %

Index	Breed		
	KGM	APG	MG
4 months old			
Sprawleds	102,30	101,23	102,33
Long legs	55,07	53,99	54,63
Shortness	122,03	126,26	133,03
Massiveness	124,83	127,82	139,40
7 months old			
Sprawleds	102,52	103,17	102,77
Long legs	58,45	57,46	56,65
Shortness	133,55	143,10	141,74
Massiveness	136,91	147,64	145,67

At 4 months of age, according to the body index, local rough-haired sheep were more stretched and knocked down. In massiveness, they also surpass meat sheep. For example, at 7 months of age, mg is 8.8% higher and apg is 10.7% higher than that of the kyrgyz mountain merino. These differences emphasize the breed characteristics of meat-wool and meat breeds. Fat-tailed sheep have a strong constitution: a powerful, well-developed body; strong, well-muscled hooves.

Conclusions. 1. Young rams of Alai and local breeds at 4 and 7 months of age, according to the size of their body, exceed the breed of the kyrgyz mountain merino.

2. At 7 months of age, after summer feeding, the growth in height at the withers of the kyrgyz mountain merino breed was 7.71 cm, or an increase of 13.4 %. At the same time, the increase in height at the withers in rams of the alai semi-rough-haired and local fat -tailed breeds were almost the same and amounted to 8.86 and 8.88 cm, respectively, or 15.1 and 14.5 %.

3. According to the massiveness index, meat sheep are also superior. For example, at 7 months of age, MG is 8.8% higher and APG is 10.7% higher than that of the kyrgyz mountain merino. These differences emphasize the breed characteristics of meat-wool and meat breeds.

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PROSPECTS AND WAYS TO INCREASE SHEEP PRODUCTIVITY OF KYRGYZ FINE WOOL BREED

Аннотация: бул макалада республиканын акыркы үч жыл ичиндеги Кыргыз ичке уяң жүндүү тукумундагы койлордун башы, тируулөй салмагы, кыркылып алынган жана өндүрүлгөн жүнү каралган.

Аннотация: в данной статье рассмотрены живая масса и настриг шерсти Кыргызской тонкорунной породы, поголовье овец и производства шерсти в республике за последние три часа.

Abstract: this article examines the live weight and shear of wool of the Kyrgyz fine-wool breed, the number of sheep and wool production in the republic over the past three hours.

Өзөктүү сөздөр: Тукуму, тириүүлөй салмагы, кыркылган жүн, асыл тукум заводдор, асыл тукум чарбалар, тукумдатуу, жубайлаштыруу, малдардын жынысы, жүндүн таза чыгышы.

Ключевые слова: порода, живая масса, настриг шерсти, племзаводы, племхозы, разведение, скрещивание, пол животных, выход чистой шерсти.

Key words: breed, live weight, wool shearing, breeding farms, breeding farms, breeding, crossing, sex of animals, yield of pure wool.

Sheep farming, as a branch of animal husbandry, occupies an important place in the national economy. Sheep breeding makes it possible to make better use of the feed resources of farms, especially the variety of rangelands. By selling wool,

sheep, smokes, lamb, the milk of the farm makes some profit.

The main products of sheep breeding are wool, which is an indispensable raw material for the manufacture of various fabrics, carpets, wallow shoes, etc.

Meat, fat and milk are important for the nutrition of the population, especially in the Central Asian republics.

The rich experience, practical knowledge and painstaking work of the Chabans played a major role in the creation of the fine sheep breeding industry of Kyrgyzstan.

From 1932 to 1956, the Kyrgyz sheep breed was bred by the breeding of native Kyrgyz wombs with Caucasian sheep sheep, Siberian Merinos, Prekos, Württembergs, imported from Germany, Altai, Stavropol, rocks of Grozny and Ascension.

The purpose of the selection was to combine high wool productivity with good meat properties and excellent adaptability to mountain pasture content.

Kyrgyz sheep of fine breed are currently being raised in our country. The meat-to-wool productivity ratio, or more precisely the amount of wool washed per kg of live weight, is considered to be one of the most important indicators of the difference between the fine sheep breeds.

The relationship between the living mass and the flooring of sheep of different breeds to some extent characterizes the direction of the tribal work with them, the type and some biological features.

As mentioned earlier, the development and differentiation of fine-grained rocks has historically been in the direction of changes

in the relationship between wool and meat productivity, between the flooring of wool and living mass.

The first group includes sheep breeds with a net wool flooring per kg of live weight of more than 50 g. Such fine-grained rocks are called wool or fine-grained wool rocks.

The second group consists of fine-grained sheep with 40 to 50 g of soap per kg of live weight. Such sheep are called thin-tailed sheep of a wool-meat line.

The third group consists of fine-grained sheep with 40 g of soap per kg of human flesh. They're called fine-grained meat-wool breeds.

Table 1.

Live weight and shearing of the Kyrgyz fine-wool breed

Age group	Live weight, kg.			Sheared dirty wool, kg.		
	2018	2019	2020	2018	2019	2020
Sheep adults	96,0	97,0	97,0	11,1	11,1	11,2
1.5 years	67,1	67,4	67,5	9,7	9,7	9,8
Uterus	53,0	54,0	54,0	4,4	4,3	4,3
Bright 1 year	36,0	36,1	36,5	3,7	3,6	3,6

As can be seen from Table 1, live masses of sheep by sex and age groups in sheep-96, 97 and 97 kg; 1.5-67.1, 67.4 and 67.5 kg; uterus-53, 54 and 54 kg; bright-36, 36.1 and 36.5 kg for the specified years and,

respectively, a patch of dirty wool in sheep- 11.1, 11.1 and 11.2 kg; 1,5 years 9,7, 9,7 and 9,8 kg; uterus 4,4, 4,3 and 4,3 kg; bright 3,7, 3,6 and 3,6kg.

Table 2

Live weight and shearing of wool of elite animals in breeding farms

Breeding category	Animal gender	Live weight, kg	Sheared wool, kg		Coefficient(odds)	
			in the original	washed	Woolness	Meat
Breeding plants	Lamb	114,0	11,60	5,85	51,9	19,4
	Uterus	63,0	4,65	2,42	38,8	25,7
Breeding farm	Lamb	111,0	11,42	5,80	52,4	19,3
	Uterus	61,0	4,40	2,30	37,7	26,5

Table 2 shows that despite the high productivity of sheep on tribal farms, the relevant parameters were still at an appropriate level throughout the breed.

The number of Kyrgyz fine-breed sheep dropped very sharply during the

restructuring period, due to privatization and lack of breeding activities in specific herds and low wool prices until the last 7-8 years.

The number of small-scale sheep in recent years is shown in table 3.

Table 3

Number of fine wool breed (thousands of heads)

SBP(state breeding plants)	Years		
	2018	2019	2020
им. Луцихина	5501	5788	6010
«Оргочор»	1253	1400	1462
«Катта-Талдык»	2853	3013	3117
Total in the Republic:	9607	10201	10589

Table 3 shows that, as of 1 January 2020, the number of fine sheep increased by 980 or 10.3 per cent compared to 2018.

It should be noted that the largest proportion of sheep is found in farm and peasant farms in the Republic.

From the point of view of breeding, it has been proved that it is most economically advantageous to breed sheep that have dual produce, wool and meat.

Over the past few years, wool production has dropped sharply, and the sheep production system has broken down. A sharp decline in wool production occurred when its price on the world market declined.

The reason for this situation was also a sharp decrease in the number of fine-grained sheep and an increase in the demand in the markets of the republic for meat sheep production. Wool production in the Republic in recent years is shown in table 4.

Table 4

Production of wool of fine wool sheep in the Kyrgyz Republic in recent years

Name	Годы		
	2018	2019	2020
Fine-wool sheep in the SBP, head.	9607	10201	10589
Sheared dirty wool, kg	3.03	3.01	3.03
(on average from 1 head.)	29.1	30.7	32.08
Total fine wool, tons.	42.0	42.0	42.0

As the data of Table 4 show, the production of fine wool increases every year in 2019. 1.6 tons or 0.49%, and 2020. 2.98 tons or 0.95%.

In recent years, the price of thin wool has increased considerably, and the average merino wool has been sold at 78-80 soms per 1 kg.

The customers of wool in our republic are mainly the Kyrgyz Kamvolon-suction

Combine (KSKSK) and the «Kasiet» wool factory.

Currently engaged in breeding of thin-bore sheep - 3 state-owned breeding plants containing 10,589 heads of thin-bore sheep.

The main task of fine sheep breeding - production of fine wool, as the most necessary and on technical properties of the most valuable wool raw material.

On wool productivity, the most effective is fine-grained sheep breeding, which produces fine wool.

From thin-bore sheep the wool catches much more and incomparably better quality than the sheep of other breeds. The thin wools produce the most high-quality (smooth) and cloth (wool) fabrics.

Analysis of wool in recent years has shown that not only the quantity but also the quality of the wool sold has increased.

The production of wool and average wool per head in recent years is shown in table 5.

Table 5

Production and medium cut wool

Name	Unit rev.	Years		
		2018	2019	2020
Wool is thin, total	tons	29.10	30.70	31.08
Medium cut of dirty wool from 1 head	kg	3.03	3.01	3.03

This table 5 shows that the average wool finish per head was 3.03 kg in 2018. And respectively 3.01 kg 2019, 3.03 kg 2020.

The privatization of sheep breeding has led to the unbundling of the herds and the keeping of small numbers of sheep on private farms, with production and wool insufficient for effective marketing. Individual producers must cooperate to obtain acceptable wool, improve efficient production, storage, analysis, quality control and marketing.

At present sheep are grown in all regions and in the future it is necessary to improve and increase sheep breeding, to increase sheep numbers, to carry out in-depth breeding Tribal work in the development of livestock breeding and the improvement of existing breeds.

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BIOCHEMICAL COMPOSITION AND CALORIC CONTENT OF TIEN SHAN LAMB MEAT

Abstract: The scientific article discusses the issues of biochemical composition and calorie content of the meat of Tien Shan lambs. Studies have shown that, depending on age, its chemical composition changes significantly. The best indicators were found in lambs at the age of 8 months. The same results for calorie content. In lambs of 8 months of age, the calorie content was 322.7 K/ cal in 100g of meat.

Keywords: meat, lambs, chemical composition, Tianshan breed, biological value, animal husbandry

Relevance. Sheep breeding in Kyrgyzstan has been and remains one of the leading branches of animal husbandry. Suffice it to note that before the collapse of the union, good results were achieved in this livestock sector, the number of sheep reached up to 10 million heads, including 700 heads of the Tien Shan breed, or 7% of the total livestock. However, at present there have been significant changes in this direction of sheep breeding: the number of livestock decreased, the breeding and productive qualities of sheep raised, including the Tien Shan breed, worsened.

In recent years, attempts have been made to improve the breeding and productive qualities of the Tien Shan breed of sheep.

New breeding and technological methods of raising and feeding animals are reflected in the quantity and quality of the products obtained. Therefore, with the intensification of sheep breeding, the study of factors contributing to the finding of optimal ways to control the formation of meat productivity

of sheep raised in high mountains will reveal the biological characteristics of animals.

One of the features of Tien Shan sheep is their high early maturity. Due to early maturity, young animals become suitable for slaughter for meat at an early age. With full-fledged feeding, lambs at the age of 4 months reach a live weight of 30-32 kg, and at the age of 18 months - 50-52 kg. The high energy of growth in the early period ensures the production of young stock at the age of 7-8 months weighing 40-43 kg. When slaughtered, the meat yield in lambs is 48 %, and the content of pulp in carcasses is 81.3 %.

Material and research methods.

Lambs of the Tyanshan semi-fine fleece breed of sheep bred in the farms of the village of Min-Bulak, Naryn district, Naryn region, served as the material for the research. During the study period, all lambs were in the same household, so the conditions for their rearing were the same. To determine the biochemical composition and calorie content of meat, we used lamb at the age of 4, 6 and 8 months. 3 heads of lambs were slaughtered from each age. Laboratory studies of meat samples were carried out in the chemical laboratory of the department of feeding farm animals of the Kyrgyz Research Institute of Livestock and Pastures.

Research goal. The main goal of our research was to study and conduct research on the biochemical composition and nutritional value of the meat of Tien Shan semi-fine fleece lambs at different ages.

Research results. The age of animals is considered one of the main indicators that determine the quality of meat. Therefore, when determining the nutritional value of meat, it is important to know its chemical composition, in terms of age. The data of

laboratory studies showed that the chemical composition of lamb meat is characterized by high nutritional qualities, which has whole complexes of substances useful for the human body (Table 1).

Table 1.- Biochemical composition and calorie content of lamb meat

Moisture,%	Dry matter %	100g of absolutely dry matter contains, %					At natural moisture content, in 100g, it contains, g					Calorie content 100g meat	
		ash	fat	squirrel	calcium g / kg	phosphorus g / kg	ash	fat	squirrel	calcium g / kg	phosphorus g / kg	calories	Joule
4 months													
67,85	32,16	1,35	50,11	48,53	3,94	0,63	0,44	16,11	15,44	1,26	0,20	213,4	893,6
6 months													
60,61	39,38	1,95	51,12	46,92	4,56	0,85	0,77	20,10	18,50	1,80	0,33	262,8	1100,2
8 months													
51,86	48,14	1,71	51,39	46,89	4,66	0,72	0,82	24,76	22,55	1,92	0,35	322,7	1352,0

The moisture content of lamb meat decreases with age. So, at 4 months of age the moisture content in the pulp was 67.85 %, then at 6 months it decreased by 7.24 %, and at 8 months - by 15.99 %, respectively, the proportion of dry matter increases (from 32, 16 to 48.14 %). The moisture content of meat is highly dependent on the nutritional status of the lambs. The fattier the animal, the less water in its meat. In terms of fat and

protein content in 100 g of absolutely dry matter, no noticeable changes are observed with age, and the content of calcium, phosphorus and ash increases.

Our data are consistent with the results of studies by V.P. Lushnikova (2011), A.F. Vogel (2000), who noted that with age, the moisture content in the muscles of lambs decreases, and the fat content increases,

which has a positive effect on the nutritional value of meat.

It is well known that very fatty meat is not widely consumed. As K. Petrovsky (1960) writes, "... It would seem that one can conclude: in the diet it is necessary to use mainly lean meat. However, it is not. The fact is that as the fatness of meat decreases, the qualitative composition of its proteins deteriorates. That is, the amount of connective tissue proteins with lower nutritional and biological value increases in meat."

With natural moisture content in 100 g of muscle, the content of fat, protein, ash and macronutrients such as calcium and phosphorus increases with age. The ratio of protein to fat in lamb meat is approaching the optimal value. So, in 4-month-old lambs it was equal to 1: 1.04, 6- and 8-month-old - 1: 1.09 and 1: 1.10, respectively. The richer the meat is in protein, the higher its dietary quality.

Numerous studies have established that the main feature of lamb as a food product is a small amount of cholesterol in fat - 28 mg % compared to pork fat - 74.5-126 mg % and beef - 75 mg %.

The calorie content of meat is an important indicator of the quality of meat. The values of this indicator in the meat of lambs increases with age, which is explained by the increased fat deposition in the body.

Uzakov Ya. M. (2005) believes that the population of the regions where sheep breeding is a traditional occupation is less susceptible to atherosclerosis diseases. It has been established that daily consumption of mutton increases the resistance of tooth enamel to caries, and also, to a certain

extent, serves as a prophylactic agent against age-related changes, diabetes and many other ailments.

Conclusions. It has been established that meat - lamb obtained from lambs of the Tien Shan breed in the year of their birth at 4, 6 and 8 months of age is distinguished by high biological and nutritional value and is the most environmentally friendly and safe product for consumption.

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SECTION IV. VETERINARY MEDICINE

UDC:578.834.1

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ROLE OF CORONAVIRUS IN ACUTE RESPIRATORY VIRAL INFECTION

Abstract. Today's coronavirus pandemic covers more than 200 countries. For the last 100 years, zoonanthroponoses have been main causes of pandemic or severe cases of ARVI. Coronavirus infection made itself felt back in 2003, the so-called SARS, which spread to a number of countries in Southeast Asia. The second outbreak was observed in 2012 in Saudi Arabia, where approximately 50% of all reported cases of MERS (Middle Eastern coronavirus) were fatal. In both cases, the virus crossed the interspecies barrier, first transmitted from animals to humans, and then from person to person.

Key words: virus, magnesium, respiratory infections, zoonanthroponosis.

Introduction In the media around the world, day and night, virologists give their comments and forecasts about the respiratory coronavirus infection epidemiological situation. Communicating with my colleagues - virologists, immunologists and specialists in the field of molecular biology from other countries, like everyone else, I believe that the coronavirus pandemic will gradually decline. There are basically three reasons for this. First, the natural law of epidemic, after a certain period of time the infection will start to decay. Secondly, the quarantine and sanitary measures carried out all over the world will give results. Thirdly, the approaching dry hot season will also be fatal for the virus.

Respiratory viral infections are caused by many viruses, among them there are both RNA-containing and DNA-containing. RNA-containing viruses include rhinoviruses, coronaviruses, respiratory syncytial viruses, influenza virus, parainfluenza virus, and adenoviruses are

related to DNA-containing (1). They are the main pathogens of acute respiratory viral infections (ARVI). Mixed respiratory infections are also possible when an organism is infected with two or more viruses. Unfortunately, these studies were mostly interesting to virologists and immunologists, but after the coronavirus infection outbreak, I think they will begin to differentiate ARVI in the future, because 95% of the above listed viruses cause the same clinical picture. Skillful infectiologists also cannot differentiate them without laboratory diagnostics. The above listed viruses cause respiratory syndromes in both humans and animals, birds. Therefore, methods of virological and immunogenetic studies are similar.

There is a specific term zoonanthroponosis in epidemiology. What is it? Zoonanthroponoses (from Greek zoo - animal, anthrōpos - man, nosos - disease) are infectious diseases common to humans and animals.

First of all, animals are the source of pathogens of zoonanthroponoses for humans, and primarily those that people often come into contact with in the course of economic activity and in everyday life: agricultural and domestic animals, rodents, as well as wild animals that are objects of hunting. Many zoonanthroponoses are characterized by natural foci.

For the last 100 years, zoonanthroponoses have been the main causes of pandemics or severe cases of ARVI. The ~~usual~~ pattern of virus transmission is the following: pathogen (virus) a susceptible human being a human being. In case of zoonanthroponoses, quite complex relationships develop between

epidemic and epizootic processes. Primarily, animals and birds, etc. are the source of zoonanthroponoses pathogen. Naturally, the mechanism of transmission changes: pathogen (virus) animals, birds, etc. sick animals, birds human being (infected) human being. In most cases, infected people can no longer transmit the infection to other healthy people, but these natural laws do not always exist. The interspecies barrier is sometimes overcome and usually occurs in the form of epidemic or pandemic. The pandemic recurred in 100 years. The Spanish flu of 1918-1920 caused the death of more than 50 million people (according to various sources, up to 80 million people). 550 million people were ill with flu — a bit less than a third of the world's population. At that time, many researchers believed that frequent wars, unsanitary conditions, poor nutrition, and the creation of military and refugee camps had contributed to the development of the pandemic.

Today's coronavirus pandemic covers more than 200 countries. In both cases, the virus broke the interspecies barrier, first it was transmitted from animals to humans, and then from humans to humans. Human coronavirus was discovered in 1964. According to researchers, it makes 10% among ARVI. But the COVID-19 circulating in the world today is transmitted from bats to humans (98% of the genome matches). Epidemiologists have established that bats were the source of the infection. An outbreak of the disease was observed in places where these rodents are eaten. And all cases of the disease were connected with domestic contacts with bats (care, slaughter, cooking, etc.).

The coronavirus infection made itself felt back in 2003, the so-called SARS which spread to a number of countries in Southeast Asia. Severe acute respiratory syndrome (SARS) is an acute respiratory disease very similar to flu, chest x-ray examinations show a picture of lung inflammation. According to

WHO, during the epidemic, 8,433 cases of the disease were registered in 30 countries of the world, 900 people of them died. Thanks to the use of restrictive and sanitary quarantine measures, the World community managed to achieve the first victory over the SARS epidemic. In 2003, WHO officially declared the end of the SARS epidemic (6,7)..

The second coronavirus outbreak was observed in 2012 in Saudi Arabia, where approximately 50% of all registered cases of MERS (Middle East coronavirus) were fatal. By the summer, the disease was registered in 23 countries, and in 2015, an outbreak was registered in South Korea. Of 2,494 cases registered worldwide, 912 people died from MERS (8,9).

The virus is strictly an intracellular microorganism, so when the virus enters the blood, white blood cells including their three main types: T-helpers, B-lymphocytes and T-killers, come out to fight it. Biologists, doctors, and veterinarians know the mechanism of their interaction, so I will write in a more simple way. When the virus enters the body, all these cells interact and begin to fight the viruses. Which organ in our body is the main one in this struggle? Of course, the Thymus!

Thymus is an organ of the immune system, and it is one of the main organs of children immune system, it significantly atrophies after puberty. Additional decrease in the size of the thymus occurs when the body ages, that is associated with the decrease in the immunity of elderly people. But the thymus deserves to be called the point of happiness. Thymus is translated from Greek as life force. To put it simply, stem cells are trained to fight various microorganisms in the thymus. (10).

The thymus produces T-lymphocytes, white blood cells that destroy abnormal cells with "nonshared" antigens, i.e. viruses and bacteria

Viruses enter the body through the nose, mouth, or eyes, and then attach themselves to the respiratory tract cells. But the virus must then enter the cell's cytoplasm in order to reproduce itself (multiply). Immunity works here, the main factor of organism protection. Many questions arise. Why are children less susceptible to coronavirus infection? It turns out that children protein on the cell membrane to which coronaviruses attach themselves is absent or very thin. And the second factor: even if coronaviruses enter the cell, the immune system works (T-helpers, B-lymphocytes and T-killers).

Adults protein on the cell membrane is thicker, the virus is easily attached by its receptors and penetrates the cell. The second factor why adults are seriously ill is the weakness of the immune system. What does one need to do! Of course, increase the immunity.

As experts say, without knowing the immune background of the organism, it is simply useless to take immunostimulants stupidly. Even in case of good immunity, but if we do not comply with all quarantine and sanitary and restrictive measures, we will not achieve positive results, and this expose our relatives, colleagues, and all the people around us to danger.

Still, we need to improve our immune system in order to resist various ARVI. Immunologists all over the world suggest the following to improve immunity:

Magnesium gives calmness, in stressful situations the body consumes magnesium reserves. To reduce excitement, it is necessary to have adequate amounts of magnesium. These are mineral water, legumes, vegetables, walnuts, hazelnuts, and soy. There is a lot of magnesium in whole-grain cereals: buckwheat, millet, barley, and oats.

Zinc is the most important element in the fight against infectious diseases. Zinc is

needed for producing antibodies. Elderly people lack zinc. White and red meat, fish, eggs and seafood are rich in zinc.

Vitamin D which is responsible for normal functioning of white blood cells is found in pomegranate juice, garlic, thyme, and mushrooms. Vitamin D is still formed in our organism under the influence of sunlight. It is enough to be in the sun for 15 minutes at least once every two days.

Vitamin C is an antiviral substance that gives white blood cells the energy to kill bacteria and viruses. Vitamin C is found only in raw vegetables and fruits (kiwi, black currant, strawberry, cherry, citrus, sweet and hot pepper (capsicum), dill, parsley, cabbage, sorrel, etc.) (4).

Naturally, in addition, one needs moderate physical activity. Musculature contains glutamine, the main fuel for white blood cells.

If we strictly implement all the measures taken by our state to combat coronavirus, we will get out of this epidemiological situation with good results in a short period of time

2. Conclusion

All these facts suggest that the virus has always been circulating in nature. But when favorable conditions are created the virus overcomes the interspecies barrier. These are zoonanthroponotic diseases that are transmitted from animals to humans. Therefore, in many developed countries, such as England, Australia, Austria, the USA, Japan, etc. where veterinary medicine specialists are trained doctors are also trained in parallel. I think we should take into account the experience of other countries in training veterinary medicine specialists and medical specialists in parallel.

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DEVELOPMENT OF CONDITIONS FOR PRESERVATION AND STORAGE OF "LA SOTA" AND "KYR/1-16" STRAINS OF NEWCASTLE DISEASE VIRUS.

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Abstract. During the study the conditions of conservation and storage of vaccine strains of the NB virus at the initial stage of research, the protective effect of various additives for the virus in the process of lyophilization of virus-containing materials was determined. The following components were used as stabilizing media: skim milk (50% in semi-finished product) mixture of peptone (3%) with sucrose (3%); peptone (3%) with lactose (2.5%) and multicomponent protective medium No. 2, consisting of lactose (1%) edible sorbitol (1%), sucrose (3%), gelatin (2%) and benzotriazole (0, 01%).

Key words: virus, strain, vaccine, La Sota, Kyr-1-16, biological activity.

Introduction. Virulent infectious diseases of birds, which include Newcastle disease (ND), are of particular relevance for the Kyrgyz Republic due to the possibility of transcontinental spread. Kyrgyzstan by geographical location is on the way seasonal flight of wild birds, which creates a risk of skidding on the territory of the Republic of pathogens diseases. According to the degree of pathogenicity of Newcastle disease virus strains, there are velogenic - highly pathogenic, mesogenic - medium pathogenicity and lentogenic - low pathogenicity, or avirulent. Furthermore, the field strains of virus may be different tropism (ability to hit the individual organs and systems).

To struggle with Newcastle disease, along with general veterinary and sanitary measures, specific prevention is carried out.. Vaccination of poultry provides immunity to disease 48–96 hours after vaccination.

Vaccines are administered by aerosol, oral, ocular and intramuscular methods.

Widespread and active use of effective vaccines contributes greatly to the fight against certain diseases and their elimination . [2]. However, new vaccines are in high demand for effective control of new and re-emerging pathogens of livestock [3].

TSohranenie biological properties of the virus during lyophilisation is largely dependent on the composition of the protective environment that is added to the virus-containing material [4]. The key to the reliable stability of dry biological products is the use in the technology of their preparation of effective protective stabilizing media that prevent damage to microorganisms during freezing, dehydration and long-term storage in a dried state at various temperatures. [5,6,7]. In different research and production centers of the world for the preparation of a live vaccine, the virus is stabilized by various means that have a protective effect during lyophilization and under different temperature storage conditions. The basic principle of stabilization is the preservation of the biological activity of the virus [8,9,10,11]. Advantageously, the protective medium should provide protection against any factors causing death of the microorganisms when they freeze dried and stored in dry state

2. Methods:

We used mesogenic strains isolated on the territory of the Kyrgyz Republic from domestic animals and lentogenic La Sota strain.

The following were used as stabilizing media: skim milk (50% in semi-finished product) mixture of peptone (3%) with sucrose (3%); peptone (3%) with lactose (2.5%) and multicomponent protective medium No. 2, consisting of lactose (1%) edible sorbitol (1%), sucrose (3%), gelatin (2%) and benzotriazole (0, 01%).

3. Results and discussions

Mixtures of peptone with carbohydrates were prepared in the form of sterile mother liquors with a doubled content of components, and during the preparation of semi-finished products they were mixed in a 1: 1 ratio with vaccinated suspensions; a similar proportion was maintained when using sterile skim milk. №2 protective medium was prepared as a stock solution with a 10- fold content of components used and introduced into a virus-containing suspension in a ratio of 1: 9. The resulting mixture of virus-containing media and protective materials dispensed into vials

and freeze-dried apparatus at the exhaust of such composition for semi lyophilization parameters of vaccine.

Initial samples of semi-finished products and dried samples of materials resuspended to the original volume were titrated at 9-11 days of the ECE. The difference in the titers of the biological activity of the initial and dried samples of the preparations was used to judge the protective effect of the tested media. The research results are presented in table 1

Table 1 - The effectiveness of various stabilizing media during lyophilization of the strains "La Sota" and "Kyr / 1-16" of the virus ND

Strains of Virus	Composition protective medium	Biological activity of semi-finished products $\lg \text{ЭИД}_{50} / \text{см}^3$	Biological activity of dried samples, $\lg \text{ЭИД}_{50} / \text{см}^3$	Loss of biological activity $\lg \text{ЭИД}_{50} / \text{см}^3$
«La-Sota»	Skim milk	9,78±0,22	9,45±0,16	0,33
	Peptone + lactose	9,87±0,11	9,37±0,08	0,50
	Peptone + sucrose	9,87±0,22	9,62±0,07	0,25
	Medium # 2	9,87±0,16	9,59±0,12	0,28
	Virus Containing suspension (control)	10,17±0,14	9,06±0,16	1,11
«Kyr/1-16»	Skim milk	9,67±0,14	9,37±0,17	0,30
	Peptone + lactose	10,12±0,11	9,67±0,08	0,45
	Peptone + sucrose	10,20±0,14	9,92±0,17	0,28
	Medium # 2	9,64±0,08	9,37±0,17	0,27
	Virus Containing suspension (control)	10,33±0,19	9,10±0,14	1,23

The data in Table 1 indicate that all tested protective additives to a significant extent ($P < 0.05-0.001$) have a protective effect in relation to vaccine strains of the ND virus in comparison with the control. Approximately the same protective effect at the stage of lyophilization is provided by commercial

milk, peptone with sucrose, and protective medium No. 2 ($P > 0.5$). A mixture of peptone with lactose has a lesser protective effect for both strains. The degree of inactivation of viruses is 1.6-2.0 times higher than when using the above media.

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ISOLATION AND CULTIVATION OF INFECTIOUS RHINOTRACHEITIS VIRUS

Abstract. The article presents the results of adaptation of the virus on cell cultures. The ability of infectious rhinotracheitis to multiply in a cell culture with characteristic cytopathic changes and accumulation in the required titers (4 log TCD 50 / ml) was studied in different cell cultures. The titer of virus was determined by the manifestation of CPE. In studies to obtain a virus suspension, Vero and MDBK cell lines with a well-formed monolayer were used, which were later infected with a viral suspension.

Key words: infectious rhinotracheitis, cultivation, Vero, MDBK, CPE.

Аннотация. В статье представлены результаты адаптации вируса на культурах клеток. Способность инфекционного ринотрахеита размножаться в культуре клеток с характерными цитопатическими изменениями и с накоплением в необходимых титрах (4 log ТЦД 50/мл) изучали в разных культурах клеток. Титр вируса определяли по проявлению ЦПД. В исследованиях для получения вируссодержащей суспензии использовали перевиваемые клетки Vero,

MDBK выращенные в матрасах с хорошо сформировавшимся монослоем, которые инфицировали вирусной суспензией.

Ключевые слова: инфекционный ринотрахеит, культивирование, Vero, MDBK, ЦПД.

Аннотация. Макалада вирусту өстүрмө клеткаларына ыңгайлаштыруунун натыйжалары каралган. Жугуштуу ринотрахеиттин мүнөздүү цитопатиялык өзгөрүүлөрү менен клетка өсүмдүгүндө көбөйүп, керектүү титрлерде топтолушу (4 log TCD 50 / ml) ар кандай клеткаларда өстүрүү жөндөмөлөрү изилденген. Вирустун титри цитопатиялык аракет (ЦПА) көрүнүшү менен аныкталган. Вирус суспензияны алуу боюнча изилдөөлөрдө матрацтарда жакшы калыптанган бир катмардуу өстүрүлгөн Vero жана MDBK клеткалары колдонулуп вирус суспензиясы менен жуктурулган.

Ачкыч сөздөр: жугуштуу ринотрахеит, өстүрүү, Vero, MDBK, ЦПА

1. Introduction.

The fight with respiratory infections remains relevant, since the biology of viruses are complex and multifaceted. Some viruses cause only respiratory syndrome (rhinoviruses, respiratory syncytial viruses, reoviruses); the others, along with the respiratory syndrome, cause damage to the intestines, genital, nervous system (parvovirus, viral diarrhea, infectious rhinotracheitis); the third group has an immunosuppressive effect (viral diarrhea and

adenovirus I and II serotypes). In nature, these viruses act as a mixed infection. This is confirmed by the fact that in the blood serum of a sick animal, serological reactions in diagnostic titers simultaneously release 2-4 different virus-specific antigens [2, 3]. Isolation and identification of respiratory viruses by species can speed up and improve diagnostic performance.

Among the general biological characteristics of respiratory viruses, a

special place is occupied by their ability to adapt and multiply in different cell cultures. In this regard, it was necessary to isolate the virus of infectious bovine rhinotracheitis from the biomaterial and adapt it to continuous cell cultures. [6, 7, 8].

2. Materials and methods

To isolate infectious bovine rhinotracheitis virus, various biological materials were used (exudate from nasal sinuses, trachea and bronchi, pieces of lungs and trachea). A 10 % suspension was prepared from the biomaterial of the affected organs of calves that has died from respiratory infections. In mortar with a pestle, the pathological material was ground with crushed sterile sea sand, adding later phosphate-buffered saline (PBS) with antibiotics (streptomycin 1000 U/ml, gentamicin 200 µg/ml and penicillin 1000 U/ml) in 1:10 ratio. Then the suspension was centrifuged at 1000 rpm. for 2 minutes at + 4 °C. The resulting supernatant was collected in separate sterile tubes and stored at –20 °C until use [1, 4]. For the cultivation of infectious rhinotracheitis, continuous Vero and MDBK cell culture lines were used. Eagle medium was used.

To infect the cells, mattresses with a continuous young cell monolayer were selected (Fig. 1.). The growth medium was discarded after the cells were washed 2 times with Hanks solution to remove serum antibodies and inhibitors.

250 mkl of the prepared suspension was added in to mattresses, and by rocking it was distributed evenly every 15 min. over the cell monolayer. In this form, the mattresses were left for 1 h at 37 °C for the adsorption of the viruses on the cell surface. Then Eagle's maintenance medium with antibiotics was added. The mattresses were closed with an airtight rubber stopper and placed for incubation at 37 °C. The infected mattress were examined daily under the microscope [5].

3. Results and discussion

The technology of cultivation of infectious rhinotracheitis in cell culture is as follows. In an infected mattress, viral particles adsorbed on the cells penetrate inside and the virus begins to reproduce. New viral particles leave and enter new unaffected cells. This continues as long as there are live intact cells. As a result of this process, almost the bulk of the cells in the mattress are affected by the virus.

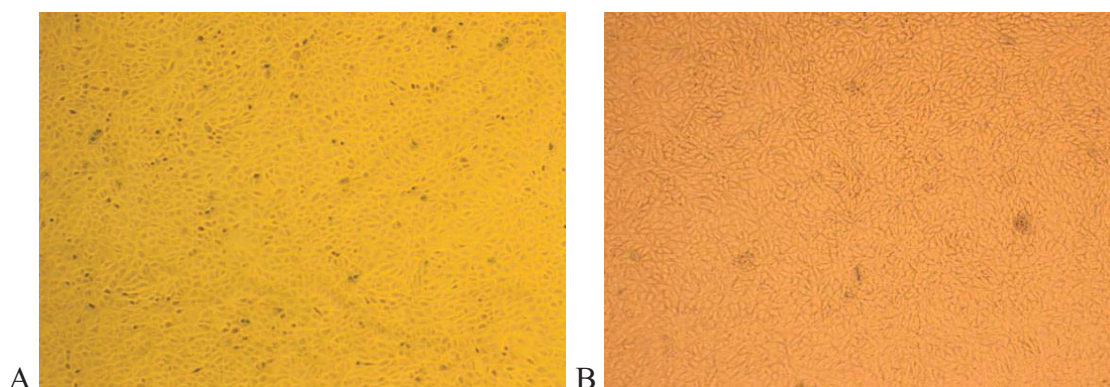


Figure: 1. Culture of cells MDBK (A) and Vero (B) with a continuous monolayer.

In fig. 2 shows the results of viral replication in cell cultures, which turned out to be unequal in cytopathic action (CPE) (Fig. 2).

The multiplication of the virus in cell culture is judged by the CPE. CPE is any change of cells in a cell culture under the influence of virus multiplying in them. Physiological changes in cells are difficult to establish, but morphological changes are detected quite easily. It is enough to use for this a microscope. A negative control (non-infected monolayers) is always necessary to compare morphological changes with infected cells. In this case, almost any morphological differences between the

infected cell culture and the control one observed under a microscope can be suspected of manifestation of CPE. These differences can cover the entire monolayer or can be noted only in the form of small groups of cells among normal cells. The intensity of CPE is expressed by what percentage of the cell monolayer is affected by the virus. The isolated infectious rhinotracheitis virus began to show CPE on 4th day after infection of the monolayer (Fig. 2).

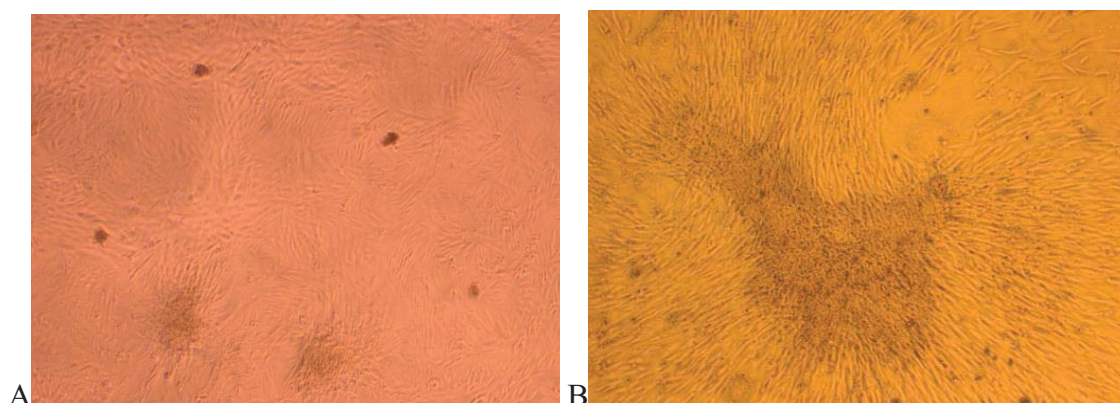


Figure: 2. Mattresses MDBK (A) and Vero (B) on the 2nd day after infection with infectious rhinotracheitis

CPE was observed in both mattresses from the first passage on the 4th day after infection. At the beginning, the cells increased in volume and began to acquire a rounded shape. Then the cells began to collect into conglomerates, the cell

monolayer lost its shape. By the end of cultivation, the cell culture monolayer completely lost its original structure. Microscopic examination showed the accumulation of cells in conglomerates and the formation of voids among the monolayer.

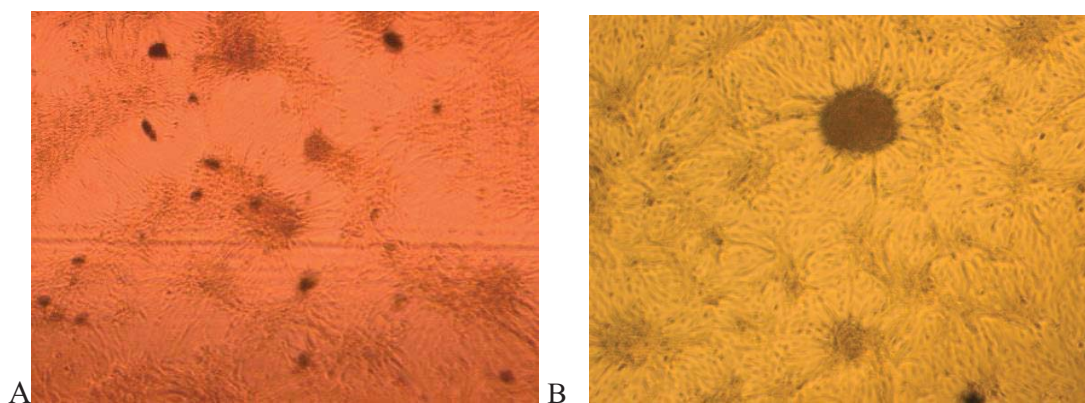


Figure: 3. Mattresses MDBK (A) and Vero (B) on the 10th day after infection with infectious rhinotracheitis

The formation of cell spots was observed on the 7th day and CPY was 30 %. On the 10th of post infection day, the area of such spots increased, the formed conglomerates were in the form of bunches of grapes. The CPE area was 50 % from the culture surface. After 10 days, the infected cell culture was harvested and new cell

monolayers were infected. Thus, as a result of 3 rounds of infection, we obtained a virus isolate, which was subsequently preserved at -80 °C. To identify the new isolate, PCR test have been done. The PCR results showed that the new isolated virus is virus of infectious bovine rhinotracheitis (results not shown).

Table 1 - Assessment of the sensitivity of infectious rhinotracheitis on cell cultures

№	Transplantable cell culture	1 st day	4 th day	7 th day	10 th day
1	Vero	0 log	2 log	3,5 log	4 log
2	MDBK	0 log	1,5 log	2,5 log	3 log

Infectious rhinotracheitis reproduced well in Vero and MDBK cell lines, causing characteristic CPE. But on the MDBK cell culture, the virus multiplied more slowly, and the infectious activity did not exceed 2-3 logs (table 1).

Experiments have showed that the transplantable Vero cell lines were susceptible to infectious rhinotracheitis. In the Vero cell culture, the virus multiplied with characteristic cell changes and, from the 1st passage, caused by characteristic changes of infectious rhinotracheitis in the cell lines and the titer was reached up to 4 log TCID 50/ml.

Thus, the isolated virus of infectious bovine rhinotracheitis adapts actively more to Vero cell cultures then to MDBK. This cell culture is most suitable for the cultivation of infectious rhinotracheitis.

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ENZYME IMMUNOASSAY ANALYSIS IS AN IMPORTANT TOOL FOR ASSESSING THE IMMUNE STATUS OF CATTLE IN AREAS WITH FMD SECOND VACCINATION IT

Annotation. The article presents the results of serological monitoring to detect antibodies after vaccination for FMD type (A, O, Asia-1) in three regions of the republic. In these regions, vaccination against foot and mouth disease in cattle is carried out annually, because they belong to an area with a high risk of entry and spread of the FMD virus. The detection after vaccination of antibodies in the blood of animals against the FMD virus is an important preventive protection against FMD in animals. This method allows you to control and prevent the spread of the FMD virus among farm animals. The ELISA method has high sensitivity, specificity and is suitable for the analysis of blood serum of various animal species.

Key words: foot and mouth disease, vaccine, antibodies, immunity, immune status, ELISA.

Abstract. The article presents the results of serological monitoring to detect antibodies after vaccination for FMD type (A, O, Asia-1) in three regions of the republic. In these regions, vaccination against foot and mouth disease in cattle is carried out annually, because they belong to an area with a high risk of entry and spread of the FMD virus. The detection after vaccination of antibodies in the blood of animals against the FMD virus is an important preventive protection against FMD in animals. This method allows you to control and prevent the spread of the FMD virus among farm animals. The ELISA method has high sensitivity, specificity and is suitable for the

analysis of blood serum of various animal species.

Key words : foot and mouth disease, vaccine, antibodies, immunity, immune status, ELISA.

Introduction. The main task of modern veterinary science and practice is the creation of sustainable welfare of the country for especially dangerous infectious animal diseases.

One particularly dangerous infectious disease of cloven-hoofed, continues to inflict serious economic damage to the livestock industry in many countries, which concerns FMD earlier refers to the number of wasps about dangerous animal diseases (group s A OIE classification). In accordance with the new classification, it is included in the OIE list of diseases in the category "Diseases of different animal species" due to the fact that more than 100 species of agricultural and wild animals can suffer from it (1,2,4). The epizootic situation of foot and mouth disease in the world, including in a number of states bordering on the Kyrgyz Republic , remains tense all the time, so there is a high probability of its introduction . to our territory. Since 2016, Kyrgyzstan is a prosperous country that carries out regional preventive vaccination of animals against foot and mouth disease . In order to control the immune background and identify possible latent recovered animals and virus carriers in areas with a high risk of entry and spread of foot and mouth disease, it is necessary to constantly carry out systematic monitoring studies (epizootological, immunological and serological).One of the main methods of

preventing the disease is the systematic immunization of farm animals with inactivated mono - and polyvalent vaccines.

The effectiveness of combating particularly dangerous diseases such as foot and mouth disease, plague of small ruminants, sheep pox, rabies, anthrax, catarrhal fever of sheep depends on the speed of organizing security and quarantine measures, the speed of which is largely determined by the time required to identify the virus. which caused diseases of animals and birds [4 – 11].

Taking into account the danger of the occurrence of foot and mouth disease in our country and the possibility of large economic losses, the problem of modern measures to combat this disease is of particular importance. In this regard, in the system of measures to protect states from foot and mouth disease infection, the primary

task is to develop and apply modern diagnostic methods. ...

The purpose of this work : to conduct serological monitoring to assess the immune status of cattle using enzyme immunoassay in areas where vaccination against foot and mouth disease is carried out.

Materials and methods

Selectively , in three regions of the republic, blood was taken from vaccinated animals for the study of sera for the presence of antibodies of the foot and mouth disease virus , which was studied using diagnostic test systems by ELISA. Were taken 300 samples of pathological material from cattle (blood was taken from the jugular vein of cattle). Blood serum was separated in 2 ml tubes Eppendorf , labeled and stored in a refrigerator e for further studies. The research was carried out in the laboratory of Virology and Biotechnology.



Fig. 1. Selection of pathological material from cattle

To detect antibodies in the blood serum of animals after vaccination, a commercial kit for the determination of FMD antibodies (FGBI ARRIAH) was used in accordance with the protocol for its use.

Lyophilized preparations K1-K8, carbonate-bicarbonate buffer solution pH 9.6 were prepared for sensitizing the plates.

The plates were sensitized and incubated for 18 hours at a temperature of $4 \pm 2^{\circ} \text{C}$. In parallel with the plate sensitization, the antigen reacted with the tested and control blood serum samples. To this diluted sample 's 1:32 in two replications .

As control 1, we used positive serum of cattle to FMD virus, control 2 - weakly

positive serum of cattle to FMD virus, control 3 - normal serum of cattle.

After 18 hours of incubation, the sensitized plate was washed and 50 μl of the prepared mixture was added and incubated for 1 hour at a temperature of $37.0 \pm 0.5^{\circ} \text{C}$. After incubation, 50 μl of solution No. 3 and 50 μl of detector antibodies were added to the washed wells of the plate, incubated 1 hour at a temperature of $37.0 \pm 0.5^{\circ} \text{C}$.

After the end of incubation, they were washed again, then 50 μl of the conjugate was added to all wells of the plate, incubated for 1 hour at a temperature of $37.0 \pm 0.5^{\circ} \text{C}$. After the end of incubation and washing, 50 μl of the substrate Solution ABTS were added to all wells of the plate, kept 20

minutes at 25 ° C in a dark place. After staining, 50 µl of “stop” solution was added to all wells of the plate to stop the reaction.

Then read the ratio of the optical density of the samples on a spectrophotometer at a wavelength of 405 nm.

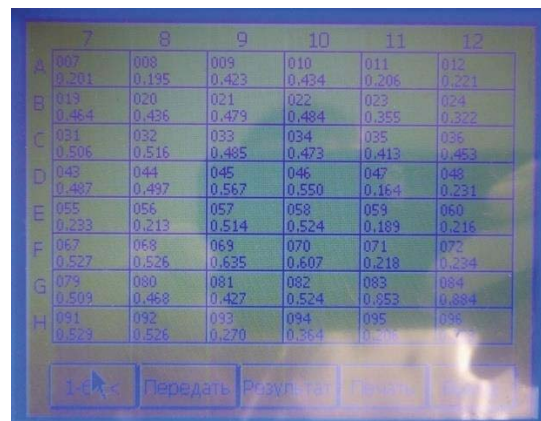
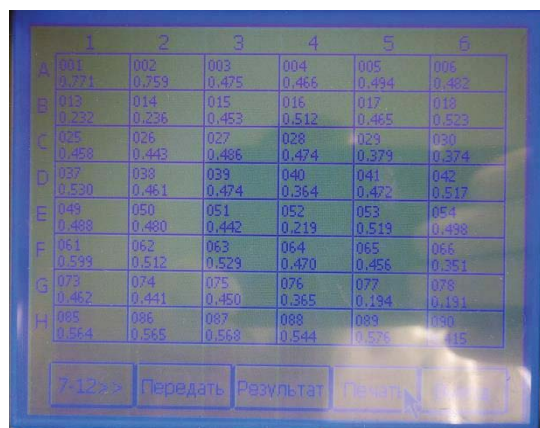


Fig. 1 Results of a study of the presence of antibodies after vaccination for foot and mouth disease (type A , O , Asia-1).

After the end of measuring the optical density from the spectrophotometer, the calculation was carried out according to the following formula.

3. Research results

For the purpose of prophylactic vaccination against FMD monitoring and evaluation of the immune background in cattle in the 3 regions of the republic were

taken blood samples from cattle , which have been vaccinated against foot and mouth disease types A , O , Asia 1.

Table 1 Results of the study of cattle blood serum after vaccination against foot and mouth disease in three regions of the republic

Jalal-Abad region							
District names	Number of samples	Negative			Positive		
		Type A	Type O	Type Az-1	Type A	Type O	Type Az-1
Suzak district	75	67	71	70	8	4	5
Aksy district	69	62	63	66	7	6	3
Nookan district	73	63	66	68	10	7	5
Bazar-Korgon district	75	66	71	72	9	4	3
Toktogul district	74	66	68	67	8	6	7
Batken region							
Kadamjay district	113	100	104	103	13	9	10
Leilek district	109	94	98	100	15	11	9
Batken district	106	89	96	94	17	10	12
Osh region							

Uzgen district	120	101	107	109	19	13	11
Aravan district	117	102	106	109	15	11	8
Nookat district	110	97	98	96	13	12	14
Total:	1041				134	93	87

The data in the table show that 42 positive results were obtained in the Jalal-Abad region of type A, 27 for type O, 23 for type Asia-1, and that in Batken region it was learned: type A - 45, type O - 30, type Asia - 1 -31, in Osh oblast: type A - 47, type O - 36, type Asia-1 - 33 positive samples.

A negative result was obtained in the Jalal-Abad region: type A - 324 samples, type O -

339 samples, type Asia-1 - 343, in Batken region: type A - 283 samples, type O - 298, type ziya-1 -297, Osh region: type A - 300, type O - 311, type Asia-1 - 314 samples. The results of blood serum studies obtained with the use of ELISA indicate that in the three regions studied among cattle, most of the animals do not have FMD virus antibodies in the blood.

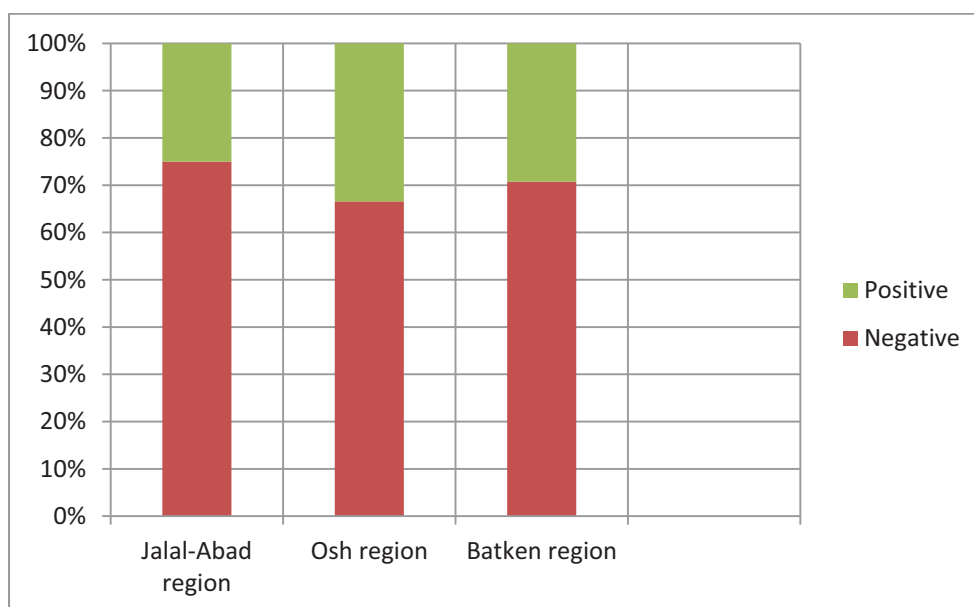


Chart 1 Analysis of the strength of immunity after vaccination for foot and mouth disease in cattle 3 areas.

Diagram 1 shows that there is an unsatisfactory level of immune animals among the vaccinated livestock. Perhaps this is due to lack of immunogenicity yu use a vaccine, or malfunctioning of the cold second chain and trans and vaccines, or violated the rules of animal vaccination.

Conclusions:

Of the 1041 samples of serum tested by ELISA for antibodies against FMD,

314 samples (30.16%) were positive, at 69.84 % of cattle were found antibodies load cells , indicating a lack of immunity in animals .

The unfavorable epizootic situation for foot and mouth disease in the world, including in a number of states bordering on the Kyrgyz Republic, remains tense all the time, therefore, it is highly likely to be brought into Kyrgyzstan .

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ORAL TUMORS IN DOGS AND THEIR MORPHOLOGICAL CHARACTERISTICS

Abstract

Oncological diseases in dogs' oral cavity are a significant veterinary problem. Early disease detection through the use of morphological tests helps to choose proper treatment. Knowledge of histomorphological structure and the mechanism of spread of tumour node has a great prognostic importance.

The study of neoplasm in dento-facial apparatus is conducted in a comprehensive manner, taking into account the anamnesis, clinical manifestations, degree of invasion, location of tumours, age of dogs and their breed. The diagnosis is based on the results of pathomorphological studies on biopsy material.

This article explores the morphological manifestation, gender and breed predisposition to tumours. It has been established that benign tumours (65%) predominate in the structure of diagnosed oral tumours in dogs. The most common tumour pathology is detected in adult dogs (7 years and older). The study of dental neoplasms is carried out in a comprehensive manner, taking into account the anamnesis, clinical manifestations, degree of invasion, location of tumours, age of dogs and their breed. The diagnosis is based on the results of pathomorphological studies on biopsy material.

Аннотация

Онкологические заболевания ротовой полости у собак составляют значительную ветеринарную проблему. Ранняя диагностика с использованием

морфологического исследования способствует выбрать правильное лечение. Знания гистоморфологической структуры, механизм распространения опухолевого узла имеет важное прогностическое значение.

Изучение новообразования зубочелюстного аппарата проводится комплексно, с учетом анамнеза, клинических проявлений, степень инвазии, расположение опухолей, возраста собак и породной принадлежности. Диагноз поставлен по итогам патоморфологических исследований биопсийного материала.

В данной статье изучена морфологическое проявление, половозрастная и породная предрасположенность к опухолям. Установлено, что в структуре диагностированных опухолевых поражений ротовой полости у собак преобладают доброкачественные опухоли (65%). Наиболее часто опухолевая патология выявлено у взрослых собак (от 7 лет и старше).

Аннотация

Иттердин ооз көндөйүндөгү туюк жара патологиясы олуттуу ветеринардык көйгөй болуп саналат. Морфологиялык изилдөөлөрдүн жардамы менен эрте диагноз коюу - дарылоону туура тандоого жардам берет. Гистоморфологиялык түзүлүшүн, шишик түйүнүнүн жайылуу механизмин билүү чоң прогноздук мааниге ээ.

Ооз көңдөйүндөгү неоплазмаларды изилдөө, анамнезди, клиникалык көрүнүштөрдү, шишиктердин жайылуу деңгээлин, жайгашкан жерин, иттердин жашын жана тукумун эске алуу менен комплекстүү жүргүзүлдү. Диагноз биопсиялык материалдын патоморфологиялык изилдөөлөрүнүн натыйжасында коюлган.

Бул макалада ооз көңдөйүнө чыккан туюк жаралардын морфологиялык өзгөрүүлөрү, иттин курагы жана тукумдун шишикке болгон көз карандуулугу изилденген. Иттердин ооз көңдөйүнүн туюк жара түзүмүндө ырбабас шишиктер басымдуулук кылары аныкталды (65%) жана эң көп тараган шишик патологиясы 7 жаштан жогорку иттерден аныкталды.

Key words: tumor, oral cavity, melanoma, epulis, morphology, predisposition.

Ключевые слова: опухоль, ротовая полость, меланом, эпюлис, морфология, предрасположенность.

Негизги сөздөр: туюк жара, ооз көңдөйү, меланом, эпюлис, морфология, көз карандылык.

Introduction

Recently, spontaneous neoplasms in dogs have become a frequent reason to visit veterinary clinics. Among the most common neoplasia are tumors of breast, skin, reproductive and oral organs [13, 14]. The latter type of tumors is the subject of a number of studies by domestic and foreign authors, which reveal the importance of knowledge about tumors classification, diagnostics and treatment [1, 3, 7, 8, 22].

According to various authors, oral tumor's account up to 7% of all tumors in dogs and dogs are affected 2.5 times more likely than other animals [2, 4, 27, 30].

Tumor growths in the oral cavity of dogs occur at all ages, but are mostly registered in the second half of life (9 to 15 years) [17].

There are data on the ratio of jaws tumors. Some authors note that 70% of the tumors are located on upper jaw and 30% on lower jaw [7].

Melanoma (30-40% of cases), squamous cell carcinoma (20-30%) and fibrosarcoma (10-20%) are the most common malignant tumors in the oral cavity [26,29]. Epulis and fibromatosis are the most common among the tumors-like masses [20].

With regard to breed characteristics of dogs, some authors argue that breed susceptibility plays a special role in formation of oral tumours. Large breeds are more susceptible (4-5%) than dwarf dog breeds (3%) [7]. Cocker Spaniels, German Shepherd dogs and German shorthaired pointers are in the primary risk groups [6, 21].

Researches on tumors etiology and appearance of clinical forms are still ongoing and remain insufficiently studied. There is evidence in literature that oral organ neoplasms develop due to inflammatory processes, mechanical trauma or irritation by odontogenic deposits. Viruses and cellular changes on biochemical level can also be factors contributing to their occurrence.

Considerable attention is paid to the etiology of malignant tumors, which can be transformed from benign to irreversible processes without consecutive transmutation. In terms of forms of manifestation, clinical signs, localization and growth process, it is not always possible to diagnose such tumors in time; this is due to specific location of tumors and the lack of a scheduled examination of animal by its owner or doctor [18].

In the case of oral tumor, practicing veterinarians highlight the following clinical signs: jaw deformity, hypersalivation, loss of teeth, food refusal, difficulty in eating and in some cases bleeding.

In many cases, the animal arrives to the clinic already with signs of tumors growth and the vet refuses to treat animals with oral tumors due to significant postsurgical defects and inability of animal by itself to take water and food [23]. The doctor's task is to ensure that the patient is able to take food and water with no outside help, which in turn will improve its quality of life and make it easier for the owner to take care of its dog [27].

Based on published statistics and analysis of previous studies, it has been concluded that there is no scientifically substantiated data on the spread of dentoalveolar neoplasms and the data available vary considerably. In some studies, malignant neoplasms prevailed among oral tumors and amounted to 58% [15], while in others, in contrast, malignant neoplasms were 15% and benign ones 85% [5].

The study of morphological picture and clinical manifestations of tumors has not only scientific but also practical importance. Tumors of the oral cavity must be diagnosed comprehensively and at early stage. Based on above, the **purpose of this paper** is to study the frequency of diagnosis of oral tumors in dogs in the structure of other tumors and morphological manifestation of different histological types.

Research material and methods

The research was carried out in the scientific morphological laboratory of the Department on VSE, Histology and Pathology of the KNAU named after K.I.

Skryabin. Clinical studies were conducted on the base of veterinary clinics in Bishkek.

The material used in the study was 14 dogs of different breeds, age-gender groups, which were found to have oral tumors. The biopsy material was fixed in 10% aqueous solution of neutral formalin with subsequent histological treatment and preparation of histologic sections 5-7 microns thick. Histologic specimens for general description of tissue structure were stained with hematoxylin and eosin and studied with the use of light binocular microscope Biomed-4 (Russia), Leica ICC 5 HD (Germany). The objects under study were microphotographed using the MicroOptix MX 100 microscope (Austria) and a digital camera Levenhuk C1400 NG 14Mpix.

Research results

We have analysed about 278 tumors of dogs in various localities, of which 5% (14 cases) were oral neoplasms. In clinical and morphological examination of the structure of detected tumors, benign tumors prevailed, accounting for 65% and malignant tumors 28%.

Benign tumors are represented by papillomas, fibromas, and among malignant tumors melanoma and squamous cell cancer are more common. Tumor-like masses have been identified as epulis, which is represented by a solid mass that protrudes along the gingival margin.

The age of sick dogs ranges from 2 to 12 years, averaging 7 years. Boxer dogs are more susceptible to disease (35%).

During the physical examination of dogs with oral neoplasms they had reduced or no appetite, hyper salivation and halitosis. During the tumor examination we determined its location, size, growth pattern, connection with the surrounding tissue and the condition of lymph nodes.

New growths were detected in various parts of oral cavity in different shapes and sizes, dense consistency, with a smooth surface. The main tumor localization was the lower jaw in 9 cases (64%) and the upper jaw in 21%.

Among benign neoplasms in the oral cavity, tumors from epithelial (papilloma, squamous cell papilloma), connective (fibroma, odontogenic fibroma) and muscular (leiomyoma) tissue were more frequently observed. These tumors are characterized by slow growth and look like an oval formation with a smooth surface, in some cases with papillary projections.



Fig. 1A. Macroscopic manifestation of oral papilloma in a Boxer dog.

More often they are localised in the soft, hard palate, tongue and gums of the lower jaw. New growths are large, easily traumatized, inflammatory responses and erosions appear causing anxiety in dogs.

In pathogistological examination (Fig. 1) of papillomas a structural heterogeneity was revealed: papillary projections of a multilayer squamous epithelium cover the connective tissue stroma. Focal cell polymorphism was detected: dual-core cells, enlarged nuclei. Tissue atypism. Mitotic activity of cells is increased.

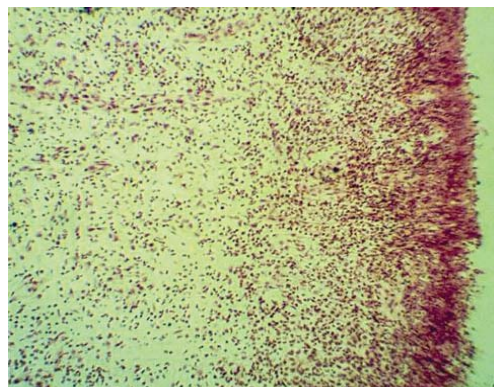


Fig. 1B. The histological structure of the oral papilloma. Stained with hematoxylin and eosin. X200.

Fibroma (Fig. 2) is microscopically represented by mature elements of connective tissue, incorrect, chaotic arrangement of fibres. The connective tissue layer contains inclusions of

odontogenic epithelium in the form of fractional islets, which consist of single round cells. The tumor is characterized by tissue atypism, with a large number of nuclei.



Fig. 2A. Macroscopic structure of oral fibroma. The removed tumor is indicated by the black arrow.

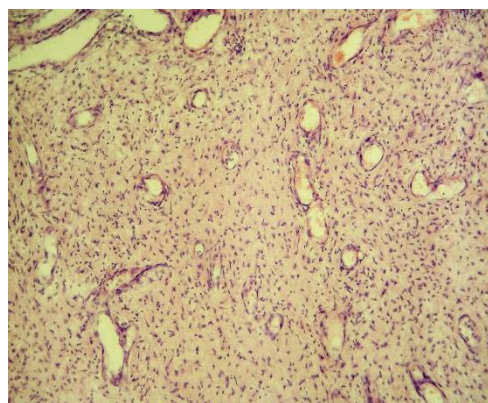


Fig. 2B. Microscopic picture of fibroma. Stained with hematoxylin and eosin. X200.

Melanoma is considered to be one of the fastest growing tumors and occurs in connection with oral pigmentation. In Rottweiler dog, a dark brown neoplasm is detected in the right half of the lower jaw with black inclusions, unclear borders, in



Fig. 3A. Macroscopic picture of oral melanoma in a Rottweiler dog. The red arrow indicates the tumor.

Melanoma of oral cavity is histologically represented by a cluster of atypical pigment cells containing dark-coloured melanin inclusions. There is no intercellular substance; the cells are located in exudate. The stroma surrounding the vessel and around the cells is homogeneous. Cell differentiation is disturbed and cell polymorphism is observed.

Discussion of results

The incidence of oral tumors in dogs in this study was similar to those previously reported in other studies [12, 19, 25, 28] and accounted for 5% of all tumors.

In our research, benign oral tumors predominate (65%), according to Harvey CE, 1993 and Frolov V.V., 2007 benign tumors also predominate (85%), and in the research of Khankhasykov S.P. malignant tumors predominate (58%) of the oral cavity [7, 15, 11].

We diagnosed oral neoplasia in dogs in different age groups, the average age of which was 7 years. According to other authors [17, 30], there is some correlation

some places with ulcers and necrosis foci. Displacement of teeth and bad breath are observed. The anamnesis shows that growth is approximately 2 weeks, eating difficulties, one-sided chewing, shortness of breath and weakness (Fig. 3).

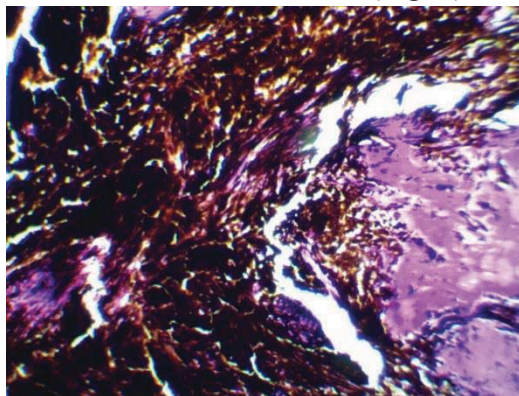


Fig. 3B. Microscopic structure of melanoma. Stained with hematoxylin and eosin. X100.

between the development of oral neoplasia and the age of animals, and it is more often diagnosed in dogs older than 10 years. Observations by V.V. Frolov, K.V. Divisenko (2007) showed that oral cancers in dogs depend on breed characteristics [1, 22].

In our research among other dog breeds, the Boxer dogs were more susceptible to oral tumors. The predominant occurrence of oral tumors in Boxers is reflected in the work of international researchers. Khanhhasykov S.P. (2013) states that the prevalence of this pathology in the Boxer dogs reaches 74% of cases.

Researchers believe that dogs are more likely to have a tumor on the gums of their lower jaw [15]. In our studies, we have found that the lower jaw is more likely to be affected than the upper jaw.

According to Stephen and Withrow (2001), melanoma (30-40%), squamous cell carcinoma (20-30%) and fibrosarcoma (10-20%) are common among oral tumors. In our studies, we have found that melanoma is more common among malignant tumors

in the oral cavity (75%). Although, some foreign researchers often put first the squamous cell cancer in dogs [9, 10, 16, 25, 31]. In his work, S.P. Khankhasykov puts fibrosarcoma in first place (47.05%). Spangler and Kass (2006) noted in their works that melanoma affects the gingiva of the lower jaw in 42-63% of cases [24].

Conclusions

1. The researches have shown that oral cancers account for 5% of all dog tumors
2. In the structure of oral neoplasms in dogs, benign tumors predominate (65%). They are represented by papillomas, fibromas and leiomyomas.
3. Malignant tumors amounted to 28%, of which melanoma and squamous cell cancer were registered more frequently.
4. Dogs suffer from spontaneous tumors most often at the age of 7.
5. The Boxer dogs breed are more susceptible to cancer. (35%).
6. The main tumour site was the lower jaw in 9 cases (64%) and the upper jaw in 21%.

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POST-SLAUGHTER AND MORPHOLOGICAL EXAMINATION OF LARVAL ECHINOCOCCOSIS IN SHEEP AND CATTLE

Abstract. Based on the results of post-slaughter examination of carcasses and internal organs of animals in slaughterhouses and laboratories of veterinary and sanitary inspection of the republic's markets, the prevalence of echinococcosis among cattle and sheep is detected and macroscopic and histological changes in lungs and liver at this parasitic disease are studied. In the Kyrgyz Republic the prevalence of larval echinococcosis among cattle on average is 6%, and in sheep - 15%. In the affected organs (liver and lungs) specific cysts in different sizes are detected in various quantities. The histological structure of echinococcus cysts has diagnostic value.

Key words: echinococcosis, cattle, sheep, prevalence, pathomorphology, lungs, liver.

Аннотация. По результатам послеубойного осмотра туш и внутренних органов животных в убойных пунктах и лабораториях ветеринарно-санитарной экспертизы рынков республики, установлена распространенность эхинококкоза среди крупного рогатого скота и овец, а также исследованы макроскопические и гистологические изменения в легком и печени при данном паразитарном заболевании. По республике распространенность ларвального эхинококкоза среди крупного рогатого скота в среднем составляет 6%, а у овец - 15%. В пораженных органах (печень и легкие) обнаруживаются различных размеров специфические кисты в различном количестве. Гистологическое строение эхинококковых кист имеет диагностическое значение.

Ключевые слова: эхинококкоз, крупный рогатый скот, овца,

распространенность, патоморфология, легкие, печень.

Аннотация. Республикадагы мал союлуучу жайларда жана базарлардагы ветеринардык-санитардык экспертизиялоо лабораторияларында союлган малдардын этин жана ички органдарын текшерүүнүн негизинде, бодо малдардын жана койлордун арасында эхинококкоз ылаңынын жайылуусу аныкталды. Мындан сырткары, ушул паразитардык ылаң менен жабыркаган өпкө, боорлордогу макроскопиялык жана гистологиялык өзгөрүүлөр изилденди. Республика боюнча орточо эсеп менен ларвалдуу эхинококкоз ылаңынын жайылуусу бодо малдардын арасында 6% ды, ал эми койлордун арасында 15% ды түзөт. Жабыркаган ички органдарда (өпкө жана боор) спецификалык кисталар табылган жана алар ар кандай көлөмдө. Эхинококк ыйлаакчасынын гистологиялык түзүлүшү диагностикалык мааниге ээ.

Өзөк сөздөр: эхинококкоз, бодо мал, койлор, жайылуу, патоморфология, өпкө, боор.

Cystic or larval echinococcosis (hydatidosis) is a parasitic disease in humans and animals, which is caused by the larval stage of echinococcus granulosus [9]. Kyrgyzstan is a hyper-endemic region for this parasitic disease, and the morbidity has doubled in the last 10 years. [6,11]).

The state control of cattle slaughter, community education and reduction of wild dog population are key measures in the fight against echinococcosis. The experience of countries with agricultural economic base and a high level of development (e.g. New Zealand) has shown that it is possible to control cystic echinococcosis. Well-

functioning government institutions, such as those responsible for veterinary welfare, are essential for the control. [7].

The disease is mostly asymptomatic in intermediate hosts (agricultural animals and humans) and is usually detected during the post-slaughter examination of animals. Hydatid cysts grow slowly. Cysts are mainly in the liver and lungs, but can be found in many other organs such as the spleen, heart, kidneys, etc. [13].

According to post-slaughter examination, the spread of larval echinococcosis among sheep varies from 1.8% to 70% in different countries. In Iran, larval echinococcosis of sheep is 7.5% [5], in Mauritania - 6.5% [10], in Ethiopia - 11.78% [8], and according to Torgerson P. R. together with co-authors (2009) it amounts to 64% [12].

The higher incidence of echinococcosis among agricultural animals in the Kyrgyz Republic is observed in small ruminants, averaging 28.5% [1, 2, 3]. According to A.M. Plieva (2007), sheep infestation in the Central Caucasus is 44.8%, but with advancing age, it reaches 79% [4].

The purpose of this paper is to identify the prevalence of larval echinococcosis in cattle and sheep after slaughter and to describe specific macroscopic and histological changes associated with this pathology.

OBJECT AND METHODS OF RESEARCH

The research was conducted in the Department of Veterinary and Sanitary Examination, Histology and Pathology of Faculty of Veterinary Medicine and Biotechnology in the KNAU named after K.I. Skryabin, slaughterhouses, laboratories of veterinary and sanitary inspection of the Republic. The object of research were carcasses and internal organs of cattle and sheep slaughtered for meat, liver and lungs of cattle and sheep affected by larval echinococcus. For histological examination, paraffin blocks were prepared from tissues of affected organs, from which histological sections 3-8 microns thick were done. Then the histological sections were stained with hematoxylin - eosin and Elastica-van Gieson.

RESEARCH RESULTS

During three years 2281 cattle and 1306 sheep were examined in the Kyrgyz Republic. On average in the country the prevalence of larval echinococcosis among cattle is 6%, which is 136 cattle from the total number of animals (2281) subjected to slaughter, and among sheep - 15% (196) from the total number of sheep (1306) subjected to slaughter. The prevalence of larval echinococcosis in sheep is 2.5 times higher than in cattle (Table).

Table

The prevalence of larval echinococcosis by regions of the republic and organ affection (post-slaughter examination) within 3 years

Region	Type of Animal	Number of animals examined	Detected sick animals and their % ratio	Gender	Age of affected animals	Frequently affected organs
Year 2017						
Osh	Cattle	558	23 (4,1%)	Cows and bulls	All ages	Liver, liver and lungs
Chui	Cattle	633	19 (3%)	Cows and bulls	All ages	Liver, liver and lungs
Naryn	Cattle	205	11(5,4%)	Cows and bulls	From 3,5 years and older	Liver and lungs, lungs

Osh	Sheep	647	88 (14%)	Sheep are greater in number	From 2 years and older	Lungs, liver and lungs
Naryn	Sheep	330	85 (26%)	Sheep are greater in number	From 2 years and older	Liver, liver and lungs
Year 2018						
Talas	Cattle	218	5 (2,3 %)	Cows and bulls	From 2,5 up to 5 years	Liver and lungs, liver
Issyk-Kul	Cattle	88	7 (8 %)	Cows and bulls	From 2 up to 3,5 years	Liver, liver and lungs
Chui	Cattle	178	15 (8,4 %)	Cows and bulls	From 1 years and older	Liver and lungs, lungs , liver
Naryn	Cattle	49	5 (10,2%)	Cows and bulls	From 2 years and older	Liver and lungs, liver
Talas	Sheep	116	3 (2,6 %)	Sheep	From 3,5 years and older	Lungs
Naryn	Sheep	144	11 (7,6 %)	Sheep are greater in number	From 2 years and older	Liver, liver and lungs
Year 2019						
Chui	Cattle	233	26 (11,1%)	Cows are greater in number	From 3 years and older	Liver and lungs, liver, lungs
Issyk-Kul	Cattle	17	6 (35,2%)	Cows are greater in number	From 4 years and older	Liver and lungs
Naryn	Cattle	20	9 (45%)	Cows are greater in number	From 4 years and older	Liver and lungs, liver, lungs
Djalal-Abad	Cattle	57	7 (12,3%)	Cows are greater in number	From 3 years and older	Liver and lungs, lungs
Osh	Cattle	25	3 (12%)	Cows are greater in number	From 4 years and older	Liver
Naryn	Sheep	50	7 (14%)	Sheep are greater in number	From 3 years and older	Liver and lungs, liver, lungs
Osh	Sheep	19	2 (10,5%)	Sheep	3 years	Liver
Total for 3 years	Cattle	2281	136 (6%)			
	Sheep	1306	196 (15%)			

Macroscopic changes in affected organs. Echinococcus cysts in cattle were localized both upside (Fig.1) and inside the liver and lungs. They had rounded, oval forms. The

cysts were white or white-yellowish. Some cysts were dense and white or white-gray color. The content of cysts was a clear fluid with a slightly yellowish hue. The echinococcus cysts of some

animals have no fluid, they are dense and contain stones. The size of cysts was different from a few millimeters to 10-15 cm in diameter. Their

number in the affected organs varied greatly. In some cases, almost complete diffuse damage of liver and lungs were observed.

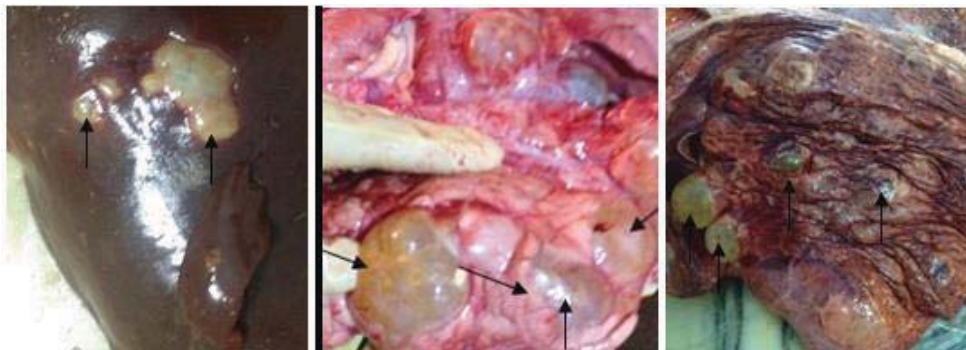


Fig.1. Bull's liver and cow's lungs. Echinococcus cysts in liver and lungs of cattle (indicated by arrows) affected by larval echinococcosis.



Fig.2. The liver and lungs of sheep affected by echinococcosis. Diffuse damage to the liver and lungs by echinococcus cysts.

As shown by figures, the localization of echinococcus cysts in sheep was upside as well as inside the liver and lungs (Fig.2). They had different (rounded, oval or irregular) shapes. Echinococcus vesicles were covered outside with a sac and were gray or white-yellowish. The size and volume of the echinococcus cysts were different and contained a clear fluid. The number of cysts in the affected organs varied. The size of echinococcus cysts was different from a few millimeters to 10 cm in diameter. Some sheep had almost complete diffuse damage of liver and lungs (Fig.2).

The tissues from the organs of cattle and sheep affected by echinococcus cysts, were fixed in 10% neutral formalin solution for further histological examination.

Histological structure of echinococcus cyst. Echinococcus cysts in sheep have their specific structure and consist of cavity, the wall of cavity and adventitial layer (Fig. 3 a). The cavities are filled with fluid and contain protoscolexes (Fig. 3 c). The wall of cavity consists of hyaline and germinative layers. Calcium salts deposit and echinococcus cyst decomposition are observed in some places of the wall of cavity or in cavity (Fig.3 d).

Lymphocytes, epithelium cells, macrophages, giant cells, eosinophils, plasma cells (Fig.3 b) represent cell infiltration of adventitial layer.

Lymphoid follicles are also detected around echinococcus cysts.

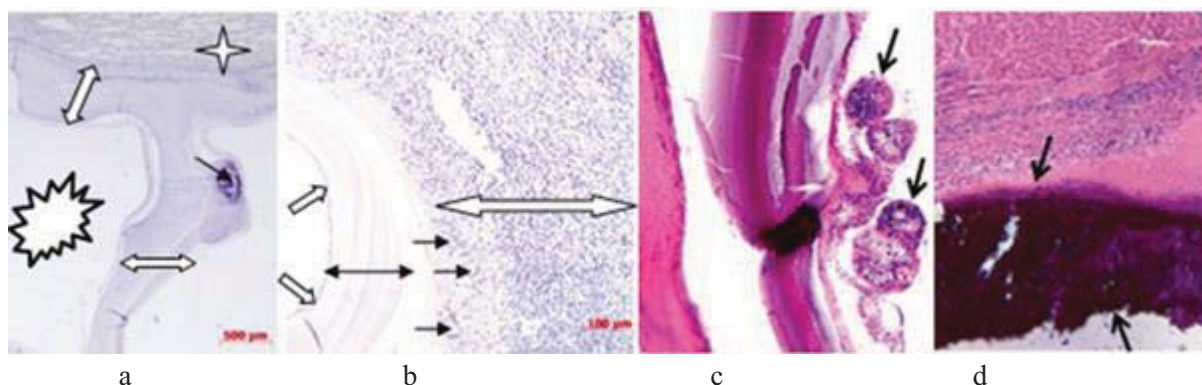


Fig. 3. a. Echinococcus cyst in the lung parenchyma of sheep: lung parenchyma (four-pointed star), the wall of echinococcus cyst (double white arrow), cavity of cyst (spot), deposition of calcium salts (black arrow), Bar = 500 μ m. Hematoxylin and eosin; b. Histological structure of the wall of cyst: immunogranulomatous reaction in adventitial layer (white double arrow); hyaline layer (black double arrow); germinative layer (white arrow); multinuclear giant cells (black arrows), Bar = 100 μ m. Hematoxylin and eosin; c. Protoscolexes in the cavity of echinococcus cyst (arrows) x 100. Hematoxylin and eosin; d. Deposition of calcium salts in the cavity of echinococcus cyst and its decay (arrows) x 100. Hematoxylin and eosin.

In histological examination, echinococcus cysts of cattle consist of cavity, cavity wall and adventitial layer (Fig. 4a). The cavities are filled with fluid and contain protoscolexes. The cavity walls consist of hyaline layer outside and germinative layer inside. In the adventitial layer, cell infiltration consists of macrophages, epithelioid cells, giant cells, lymphocytes, plasma cells and eosinophils (Fig. 4a, b). Collagen fibers predominate in the wall of echinococcus cysts (Fig. 4 c)

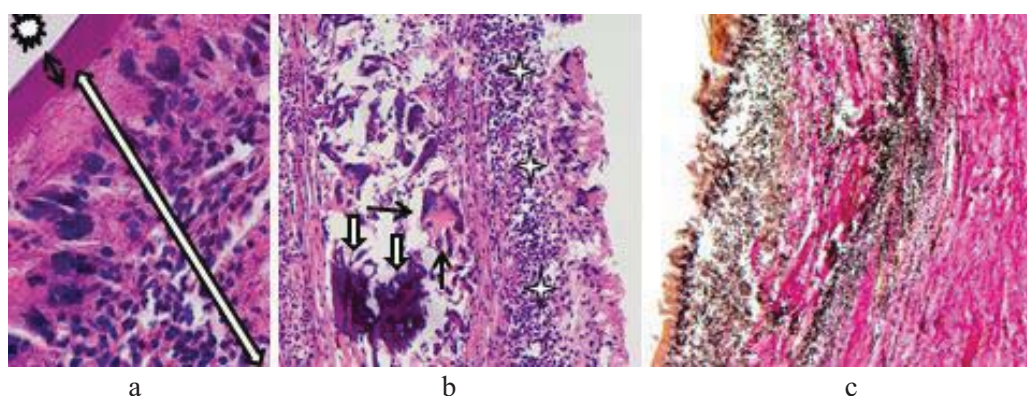


Fig. 4. Cattle' lungs. Echinococcus cyst a. cavity of echinococcus cyst (spot), cyst wall (double-headed black arrow), adventitial layer (indicated by double-headed white arrow), where the cell infiltration is localized. Hematoxylin eosin. x 400; b. A giant cell of Langerhans located in the wall of echinococcus cyst (black arrow), a deposit of calcium salts (white arrows) and the presence of cell

infiltration (four-pointed stars). Hematoxylin eosin. x 100; c. Cattle' liver. The predominance of collagen fibers in the wall of echinococcus cyst (stained red). Van Gieson x 40.

CONCLUSIONS:

1. According to the data on post-slaughter examinations, on the average in the Kyrgyz Republic the prevalence of larval echinococcosis among cattle is 6%, and in sheep - 15%. The prevalence of larval echinococcosis in sheep is 2.5 times higher than in cattle.
2. In the affected organs (liver and lungs) specific cysts in different sizes are detected in various quantities
3. Histologically, echinococcus cysts consist of a cavity, cavity paries and adventitial layer. The cavities of cysts are filled with fluid and contain protoscolexes. The histological structure of echinococcus cysts has diagnostic value.

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CLINICAL SIGNS AND PATHOLOGICAL CHANGES IN INFECTIOUS RHINOTRACHEITIS IN BOVINE

Annotation: The article is devoted to the study of clinical signs and pathological changes in infectious rhinotracheitis in bovine. A complex of clinical signs, including specific ones, in the form of redness of the nasolabial tapetum, was established. Pathological changes in target organs are described as displaced rhinitis, laryngitis, pharyngitis, tracheitis, conjunctivitis and mixed bronchopneumonia. Inflammatory processes in target organs are accompanied by an increase in regional (submandibular, retropharyngeal, bronchial and mediastinal) lymph nodes.

Key words: infectious rhinotracheitis, bovine, clinic, pathological changes, target organs.

Аннотация: Статья посвящена исследованию клинических признаков и патологических изменений при инфекционном ринотрахеите крупного рогатого скота. Установлен комплекс клинических признаков, в том числе специфических, в виде покраснение носогубного зеркальца. Описаны патологические изменения в органах-мишенях как смешанный ринит, ларингит, фарингит, трахеит, конъюнктивит и смешанная бронхопневмония. Воспалительные процессы в органах-мишенях сопровождался с увеличением регионарных (подчелюстных,

заглоточных, бронхиальных и средостенных) лимфоузлов.

Ключевые слова: инфекционный ринотрахеит, крупный рогатый скот, клиника, патологические изменения, органы-мишени.

Аннотация: Макала ийри мүйүздүү малдагы ринотрахеиттин клиникалык көрүнүштөрүн жана патологиялык өзгөрүүлөрүн изилдөөгө арналган. Көптөгөн клиникалык белгилердин комплекси аныкталган, анын ичинде тумшуктун жылаңач учунун кызаруусу түрүндөгү клиникалык белги байкалган. Бута органдарында аралаш ринит, ларингит, фарингит, трахеит, конъюнктивит жана аралаш бронхопневмония сыяктуу патологиялык өзгөрүүлөр баяндалган. Бута органдарындагы сезгенүү процесстери регионалдык (жаактын астындагы, кекиртектин артындагы, бронхиалдык жана медиастиналдык) лимфа түйүндөрүнүн чоңоюшу менен коштолгон.

Ачкыч сөздөр: жугуштуу ринотрахеит, ийри мүйүздүү мал, клиника патологиялык өзгөрүүлөр, бута-органдары

Infectious bovine rhinotracheitis is a highly contagious disease of bovine and some wild ruminants caused by Bovine Herpesvirus (BHV) -1 (Herpesviridae family, Alphaherpesvirinae subfamily) [5].

Infectious bovine rhinotracheitis virus was first isolated by Miller in 1955 in

the United States as the causative agent of a new respiratory disease in bovine (17). The virus, in addition to respiratory diseases, causes conjunctivitis, vulvovaginitis, meningoencephalitis and abortion (1, 5,9,13,15). The disease was first introduced to Japan by infected cattle imported from the United States and Canada in 1970. Now this viral infection is widespread in all countries of the world (20).

Infectious rhinotracheitis occurs in two forms: respiratory and genital. In 1958, I. Gillespie and others found that both diseases (infectious rhinotracheitis and infectious pustular vulvovaginitis) are caused by the same causative agent [12]. On the territory of the former USSR, this disease was first observed and described by F.M. Ponomarenko in 1938, and the causative agent of this disease was first identified by N.N. Kriukov, Z. F. Zudilina with co-author [1,2].

Pneumonia or pulmonitis in animals can be caused by many factors, including microorganisms (bacteria, viruses), parasites and stress [7,8]. Acute respiratory viral infections of bovine are a group of diseases that occur in the form of mixed infections. This group includes infectious rhinotracheitis, parainfluenza 3, adenovirus, rotavirus, coronavirus, respiratory syncytial infections, mycoplasmosis and chlamydia (7,8,11, 16, 18, 20).

Parainfluenza virus type 3, bovine respiratory syncytial virus, bovine adenovirus and bovine herpesvirus 1 cause respiratory infections in bovine and similar pathomorphological changes in the lungs are similar [7, 10, 11, 16, 18, 19]. Macroscopically, the above viruses in natural and experimental infection cause pneumonia, which is characterized by the presence of harden parts of gray-red color and atelectasis [6, 14, 20].

In the conditions of the Kyrgyz Republic, the spread of these infections in farms, the

immunogenic properties of viruses were studied. But pathomorphological changes in target organs, in particular in the upper respiratory tract, lungs, in the organs of the immune system and in the brain have not been researched [3,4].

The purpose of this work is to describe the clinical signs during the life of a sick calf in the mountainous conditions of our republic and pathological changes in the affected target organs in infectious rhinotracheitis in bovine.

OBJECTS AND METHODS OF RESEARCH

The research involved the calves that were kept in the farms of the Chui region. The anemnestic and clinical data of sick calves were obtained from the words of a veterinarian who monitored the condition of the calves. The autopsy was carried out in the dissecting hall of the farms of the Chui region. In total, 5 units of calves underwent pathological autopsy with the participation of a veterinarian of the farm, graduate students and scientists of the Kyrgyz National Agrarian University named after K.I. Scriabin. After autopsy of the calves, an autopsy report was drawn up. The larynx, trachea, apical and cardiac lobes of the lungs, regional lymph nodes, spleen and brain of sick calves were subjected to a thorough macroscopic examination.

Part of the pathological material taken from the above organs was fixed in a 10% aqueous solution of neutral formalin for histological and immunohistochemical researches, the other part was stored at - 80 ° C for virological researches. Histological researches were carried out in the laboratory of histology of the Department of Veterinary and Sanitary Expertise, Histology and Pathology of the Kyrgyz National Agrarian University named after K.I. Scriabin. Pieces from the organs of dead calves were placed in paraffin wax according to the embedding

method to obtain paraffin blocks. Histological sections with a thickness of 3-5 microns were prepared from paraffin blocks. Hematoxylin-eosin was used for staining histological sections. Stained histological sections were examined under a light microscope.

RESULTS OF THE AUTHOR'S RESEARCH

Anamnestic and clinical data.

Calves that were examined during life, then postmortem examinations were kept under normal conditions. The content is stalled and meets the veterinary requirements. Calves were fed milk for up to two months, and after two months - hay and compound feed, water was available around the clock.

Clinical symptoms during life of calves: depression of the general condition, standing still or lying, consumes food sometimes and reluctantly, fever, reddening of the nasolabial tapetum, difficulty in breathing, cough and running from the nose and eyes.

Presumptive clinical diagnosis - rhinitis, conjunctivitis, and bronchopneumonia.

Macroscopic changes found during autopsy of calves.

The dead calves are severely emaciated (Fig. 1). In dead calves, gray-yellow thick mucus is found in the nasal openings, the nasal mucosa is succulent, reddened, covered with thick mucus, and there are small shallow ulcers. The eyeballs are sunken, the conjunctiva is covered with thick gray-yellow mucus, there are thick runnings from the eye slits and a gray-yellow crust.



The pharyngeal tonsils are hyperemic, succulent, rise above the surface of the mucous membrane, elastic consistency. In the lumen of the pharynx, larynx and trachea, there is a frothy liquid mixed with gray-yellow mucus. When the larynx and pharynx are cut, a yellow mass with malodorous is released.

Their mucous membrane is succulent, reddened, some places of the mucous membrane are ulcerated. The bronchi are filled with a frothy transparent liquid mixed with a gray-yellow mass, the mucous membrane is hyperemic, and some places are ulcerated. The apical and middle lobes of the lungs are of dense consistency, red-violet in color, their surface is bumpy. The lobular structure of the organ is expressed. After the incision of the lung parenchyma and with pressure, a frothy liquid with an admixture of a gray-yellow mass flows out. Pieces of lungs are drowning in water. The posterior lobes of the lungs are pink or blue-red. When the lungs are cut, a frothy liquid flows down. Pleural thickening and adhesions between the lobes have been found in some lungs.

The brain is gray in color, elastic consistency, moderately moist in section, the border between the white and gray medullary substance is preserved. No edema, hemorrhage.

Submandibular, retropharyngeal, mediastinal and bronchial lymph nodes are enlarged, dense, juicy in the cut. The spleen is slightly enlarged, gray-purple in color, the edges are dull, the capsule is tense.

Fig. 1. A 4-month-old calf named Morozka. Holstein breed. Belongs to the “MIS-Sut” dairy farm. Clinical diagnosis - rhinitis, conjunctivitis, bronchopneumonia and emaciation.

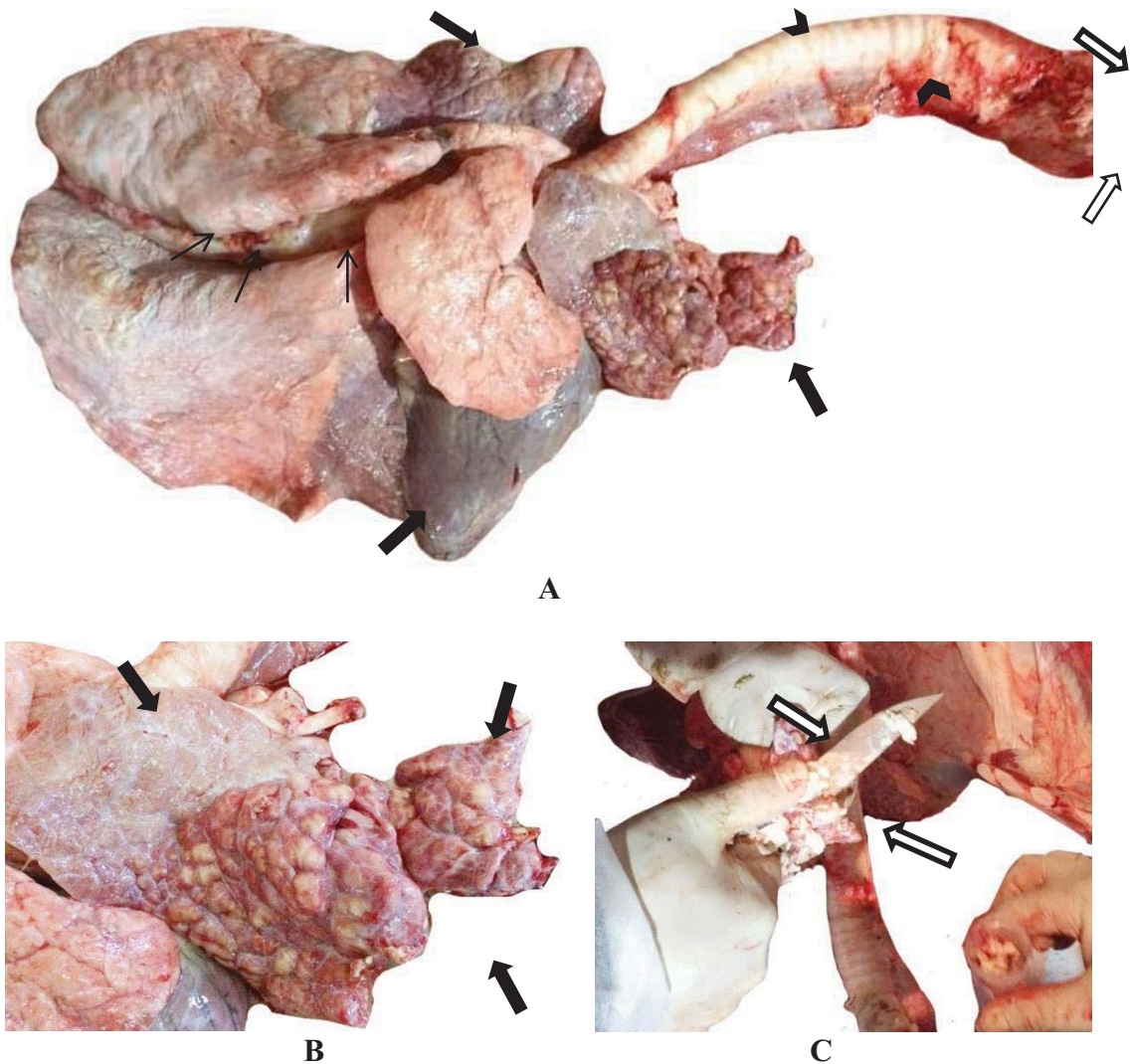


Fig.2. A. A 4-month-old calf. Complex damage of target organs: lungs, trachea, larynx and pharynx. Inflammation of the apical and middle lobes of the right and left lungs (indicated by black arrows). Inflammation of the trachea (indicated by black arrowheads). Focal purulent inflammation of the larynx and pharynx (indicated by white arrows). Enlargement of mediastinal lymph nodes (indicated by thin black arrows).

B. Magnification of figure A. Inflamed areas of the lung of a dense

consistency, red-purple in color, their surface is bumpy (indicated by black arrows).

C. Magnification of figure A. When the inflamed larynx and pharynx are cut, a purulent mass of yellow color with malodorous is released (indicated by white arrows).

Histological diagnostics. A research of histological preparations of the lungs of dead calves from infectious rhinotracheitis shows mixed bronchopneumonia

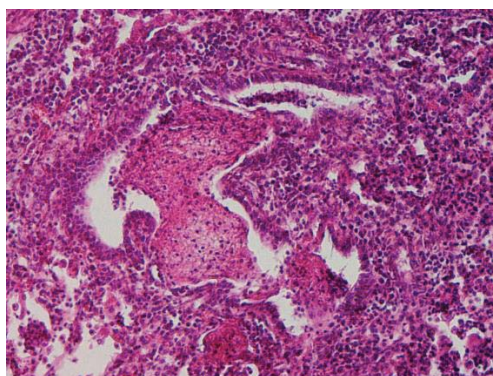


Fig.3. A 4-month-old calf. Paraffin sections of the lungs. Mixed bronchopneumonia. Pulmonary edema. The alveoli, bronchioles and bronchi are filled with cellular infiltration, fibrin and pus. The wall of the alveoli and bronchioles is defective. Hematoxylin-eosin. x100.

CONCLUSIONS

1. In calves with infectious rhinotracheitis, the following symptoms were clinically found: emaciation, depression, decreased appetite, fever, redness of the nasolabial tapetum, difficulty in breathing, cough and running from the nose and eyes.
2. Macroscopic changes:
 - Emaciation
 - Laryngitis, pharyngitis, tracheitis, conjunctivitis.
 - Hyperplasia of the submandibular, retropharyngeal, bronchial and mediastinal lymph nodes.
 - Catarrhal-purulent, interstitial, fibrinous, and mixed bronchopneumonia.
 - Pulmonary edema.
 - In some cases, pleurisy.
3. Histological diagnosis - mixed bronchopneumonia.

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MORPHOBIOCHEMICAL AND IMMUNE PARAMETERS OF BLOOD OF COWS AND THEIR CALVES IN ENVIRONMENTAL PROBLEMS

Abstract. The article presents the data of an experimental study obtained under conditions of ecological disadvantage of the Chui zone of Kyrgyzstan. Individual biogeocenotic pathologies in cows and their calves it's result from disturbance of the circulation of substances have been studied: soil-water-feed (plants) - animal.

The study of soil, water, plants and blood in experimental animals on the content of macro- and microelements and heavy metals was carried out, and the influence of anomalous changes in the biotic circulation of macro- and microelements and heavy metals along the trophic chain was studied in the framework of experimental experiment: soil-water -cooks-animals on the health of mother cows and their calves.

It is established that in the conditions of ecological disadvantage of the Chui zone of Kyrgyzstan, so-called biogeocenotic pathologies of animals are widespread, such as osteodystrophy of cows and immune deficiencies in calves, etc.

This is proved by experimental morphobiochemical and immune studies of blood in newborn calves and mother cows.

Keywords. Ecology, biogeocenosis, circulation, biogeocenotic pathology, osteodystrophy, immune deficiencies, cow, calves, macro and microelements, heavy metals, soil, water, plant, blood, experiment.

Introduction. In connection with the change in the environment, new, previously unknown animal diseases, called biogeocenotic pathologies, appeared in

Kyrgyzstan. Biogeocenotic pathology are mass diseases in plants, animals and humans that arise as a result of unfavorable changes in biogeocenoses (N.A. Urazaev, 1985; A.A. Elenshleger, 1998; I.A. Shkuratova, 2001; A.R. Tairov , 2001; G.M. Topuria, 2003; M.D. Nogoibaev et al., 2010-2012; V.V. Valetov et al., 2011; A.V. Sindreva, 2012, etc.).

In real time we know, more than three dozen biogeocenotic pathologies of animals, among them special attention of scientists and practitioners attract such diseases that arise as a result of the disruption of the matter cycle. The biotic cycle is a necessary condition for the long existence of biogeocenoses as elementary structural units of the earth's biosphere. The structure of biogeocenosis is largely determined by food relations between organisms. Nutritional links between organisms have been called the food (trophic) chain. It must be remembered that between the animals and the objects of their nutrition an ecological balance has formed that prevents the occurrence of enzootics, if this equilibrium is violated, then one or other biogeocenotic pathologies in animals arise.

Therefore, a comprehensive study of the biogeocenotic trophic chain: - soil - water - plants (feed) - animals, is a very urgent task in the study of this pathology in cattle.

Materials and methods of research: The scientific and experimental research was carried out in the livestock farms of the Chui oblast of Kyrgyzstan, the content of macro - and microelements and

heavy metals in soil, water, plants (feed) and animal blood, was studied with atomic absorption spectrophotometry. A general clinical study of the experimental animals was carried out using the same methods adopted in veterinary medicine. The results of the study were recorded in detail and recorded in a special journal.

Research results: Soil, water, feed as a component of a certain biogeocenosis have important meaning, especially when studying biogeocenotic pathology in cattle.

The imbalance in the soil, water, feeds (plants) of a certain biogeocenosis of individual macro - and microelements and heavy metals is the main reason of biogeocenotic pathology in cattle. In this connection, we set ourselves the task of studying the soil, water, feed and blood for the content of macro and microelements and heavy metals in them. Comparative results of the content of macro- and microelements in soil, water, feed and blood of animals in experimental farms are shown in Table 1.

Table 1. -This content of macro- and microelements in soil, water, feed (plants) and blood in experimental animals

№ in/ ord .	Chemical element	Prototype					Control sample				
		the soil, mg / kg	water , mg / l	stern , mg / kg	blood		the soil, mg / kg	water , mg / l	stern , mg / kg	blood	
					cow	calves				cow	calve
1.	Calcium	9056,	36,7	6,6	11,8МГ%	11,1МГ/	3000,	70,0	5,0	12,8МГ%	10,5
2.	Phosphorus	785,0	0,1	1,5	2,9МГ%	4,2МГ/°	150,0	0,05	3,5	6,9МГ%	5,2
3.	Magnesium	763,2	5,74	989,	2,35%	2,63МГ/	700,0	15,0	600,	3,0МГ%	3,2
4.	Iron	17,5	0,007	165,	42,3МКГ%	30,8	170,0	0,3	200,	130МКГ%	120,5
5.	Copper	0,68	0,005	7,1	58,2МКГ%	23,0	6,8	0,05	8,5	95,3МКГ%	76,4
6.	Manganese	46,5	0,001	38,9	2,4МКГ%	2,0	70,0	0,02	55,0	18,2МКГ%	12,5
7.	Zinc	1,05	0,007	26,5	314,2МКГ	245	0,5	0,005	30,0	400,0МКГ	350,5
8.	Selenium	0,001	0,02	0,04	20,0МКГ%	25,5	0,002	0,03	0,1	20,5МКГ%	25,6
9.	Molybdenu	0,4	0,007	-	4,0МКГ%	4,0	-	0,5	-	4,7МКГ%	44
10.	Cobalt	0,02	0,004	5,1	4,0МКГ%	4,0	1,3	-	7,7	4,5МКГ%	4,2
11.	Iodine	0,002	0,01	0,1	3,2МКГ%	2,4	2,0	0,04	0,5	6,3МКГ%	4,0

Based on the data in Table 1, it can be assumed that the quantity of many macro - and microelements in the soil of the ecologically unfavorable biogeocenosis is much less than in the basic indicators, for example, the content of manganese, copper, cobalt, gland, selenium and iodine is much lower, and the amount of calcium,

phosphorus and magnesium, on the contrary more than the threshold concentration.

If we take the water data, we can conclude that the content of some elements, like calcium, magnesium, phosphorus, iron, copper, manganese, selenium, molybdenum, cobalt, iodine is reduced, and the other, like

zinc, is slightly increased to 0.007 mg / l against 0.005 mg/l.

The content of macro- and microelements in feeds indicates that individual indicators, for example, the amount of calcium, increased by 24.2% and magnesium by 39.3% compared to the norm. Other biogenic elements, such as phosphorus, iron, copper, manganese, zinc, selenium, cobalt and iodine in the feeds (plants), of this biogeocenosis were significantly lower than the control samples. This difference in the content of macro- and microelements in soil, water, and plants (feed) affects, in turn, the number of these elements in the blood of animals.

From the data of Table 1, it is also seen that the level of total calcium in the blood of experimental cows and their calves is at the lower limit of the physiological norm, and the amount of phosphorus decreased to 2.9 mg% 4.2 mg% vs. 6.9 mg% 5 , 2 mg%, respectively. This indicates a possible violation of the ratio of calcium to phosphorus (2: 1); the ratio turned out to be

shifted towards the predominance of calcium. From the analysis of blood results on the content of trace elements, it can be noted that almost all indicators, except for selenium, were extremely low in relation to control parameters.

Even the content of selenium was at the lower limit of the physiological norm. This is to say that in experimental animals, metabolism, especially mineral metabolism, is disrupted.

Also within the experimental experience, we studied the contents of toxic elements (Pb, Hg, Cd, Ni, As) in soil, water, plants (forages) and blood in animals (cows and calves). According to the results of the soil investigation, toxic elements (heavy metals) like lead, mercury, cadmium, nickel are within the permissible norm with the exception of arsenic. The arsenic content exceeds the MPC by 0.1 mg / kg (see Table 2). When examining water samples, it was found that the heavy metals under study were significantly below the MPC or were generally below the limit detection.

Table 2. -Data content of heavy metals in soil, water, plants (feed) and blood in experimental animals

№ in/	Chemical element	Prototype					Control sample (MPC)				
		the soil,	water, mg / l	stern, mg / kg	blood		the soil,	water, mg / l	stern, mg /	blood	
					cow	calves				cow	calves
1.	Lead (Pb)									cow	calves
2.	Mercury	0,05	0,01	0,08	0,0005	0,0003	0,1	0,0001	0,05	0,005	0,005
3.	Cadmium	0,01	0,002	0,25	0,0006	0,0005	1,0	0,001	0,3	0,03	0,03
4.	Nickel (Ni)	0,05	0,005	0,99	0,05	0,05	4,0	0,1	2,0	0,12	0,12
5.	Arsenic As)	0,2	0,04	0,23	0,40	0,40	0,15	0,05	0,25	0,05	0,05

Based on Table 2, it can be assumed that the average content of heavy metals in feed (plants) does not exceed the maximum permissible concentration. Only the amount

of arsenic in the plants reached a high level of 0.23 mg / kg against 0.25 mg / kg of the control sample. When blood was analyzed in cows and their calves in the experimental

group, the maximum permissible concentration limit for lead, mercury, cadmium, nickel was not established, although an 8.0-fold increase in arsenic concentration or 0.40 mg / l versus 0.05 mg / l was noted in control animals.

The results of the study of morphobiological and immunological parameters of blood in calves and mother cows are shown in Table 3.

Table 3. - Morphobiochemical and immunological parameters of blood in cows-mothers and newborn calves

№ in/ ord.	Indicators	Types of diseases			
		Osteodystrophy of cows	Control group	Immune deficiencies of calves	Control group
1.	Erythrocytes, in $10^{10}/l$	4,7±0,38	7,5±0,01	5,2±0,48	6,5±0,4
2.	Leukocytes, $10^9/l$	7,2±0,07	12,05±0,01	6,2±0,62	8,0±0,3
3.	Hemoglobin, g/l	12,7±0,4	12,9±0,05	94,2±0,21	120,0±2,4
4.	Total protein, g / l	3,90±0,29	8,6±0,03	4,07±0,12	7,90±0,16
5.	Sugar, mg%	38,2±1,48	60,0±0,31	99,8±1,23	80,9±0,02
6.	Phosphorus, mg%	2,9±0,05	6,0±0,2	6,2±0,16	7,50±0,05
7.	Calcium, mg%	11,08±0,77	12,5±0,41	10,6±0,11	12,0±0,45
8.	Reserve Alkalinity, % CO ₂	37,0±4,31	66,0±0,45	42,4±0,33	53,0±1,02
9.	Lymphocytes,%	48,5±0,24	64,0±1,03	48,2±0,01	70,1±1,02
10.	B - lymphocytes,%	13,4±1,12	16,6±0,21	12,04±0,04	22,3±0,82
11.	T - lymphocytes,%	32,6±0,74	36,3±0,32	13,2±0,30	35,7±2,04
12.	Phagocytic index,%	32,2±0,04	36,0±0,01	54,2±0,03	68,0±0,05

As can be seen from Table 2, the main indicators of hematologic blood status in cows and newborn calves of the experimental group undergo significant changes, namely the number of erythrocytes, leukocytes and hemoglobin in patients with osteodystrophy of cows and immune deficiency of calves is slightly lower than that of control (healthy) animals.

The sharpest differences were found in the study of biochemical parameters (total protein, sugar, phosphorus, calcium and

reserve alkalinity) of blood in patients in comparison with the data in healthy animals. Also the most noticeable change was established in the immunological parameters of the blood in the calves of the experimental group. Especially the total number of lymphocytes, B, T - lymphocytes and their phagocytic index tended to decrease, and this indicates a decrease in the protective - adaptive reactions of the body in calves with biogeocenotic pathology, i.e. immune deficiency.

From the above, we can conclude that the results of experimental studies have shown that in soil, water, feed, and blood in experimental animals, there is a serious imbalance in the content of macro- and microelements and heavy metals. This leads to a disruption in the circulation of

Conclusions

- In the soil of ecologically unfavorable biogeocenosis, the content of macro- and microelements in comparison with baseline values varies considerably, and the amount of toxic elements, like lead, mercury, cadmium, nickel is within the permissible norm, except arsenic. The arsenic content is -0.2 mg / kg with MPC -0.1 mg / kg.
- When analyzing the water of this biogeocenosis, it was found that the content of calcium, magnesium, phosphorus, gland, copper, manganese, cobalt, iodine was below the maximum permissible concentration. At the same time, the maximum permissible concentration for zinc was found to be 0.002 mg / l.
- In the plants (feeds) used for feeding animals in the Chui region, the following macro- and microelements are kept below the permissible level: phosphorus, iron, copper, manganese, zinc, selenium, cobalt, iodine with a significant excess of other elements, like calcium, magnesium, arsenic.
- When testing blood in experimental animals, it was found that the level of the content of a highly toxic element, like arsenic, exceeded the norm by 8.0 times, and the amount of essential trace elements was extremely low with respect to normal indices.

substances in biogeocenoses, i.e. there is a change in the biogeochemical trophic food chain: -soil-water-feed-animals. As a result, various biogeocoenotic pathologies occur in animals, such as osteodystrophy and immune deficiencies of calves.

- Imbalance in the content of macro- and microelements and heavy metals in the biogeochemical trophic food chain: - soil-water-feed-animals- leads to the emergence of various biogeocenotic pathologies in animals, such as osteodystrophy of cows and immune deficiencies of calves.

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MORPHOBIOCHEMICAL AND IMMUNE PARAMETERS OF BLOOD OF COWS AND THEIR CALVES IN ENVIRONMENTAL PROBLEMS

SUMMURY

The article presents the data of an experimental study obtained under conditions of ecological disadvantage of the Chui zone of Kyrgyzstan. Individual biogeocenotic pathologies in cows and their calves it's result from disturbance of the circulation of substances have been studied: soil-water-feed (plants) - animal.

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THE USE OF A NEW GENERATION DRUG FOR RODENT CONTROL

Abstract

Drugs of new generation are Derodent-D, Derodent-N and Derodent-E were developed and approbated. Derodent-D consists of the following components (mass %): difenacine 0,5-15; food plant oil 75-85; the extract of colchicum 4,0-10; valerian tincture 5,0-10,0; food slight soluble colorant 0,05-0,15. The fatal dose for rats is 5 mg/kg, for mice is 40 mg/kg.

Rodenticide Derodent-N is represented by the following composition (mass %): sodium salt of zoocumarin 0,5-1,5; distilled water 60-80; the extract of colchicum 5-12,5; valerian tincture 2,0-5,0; beet juice 10-30. Baits poisoned by deratization drug Derodent-N in doses 6 mg/kg for rats and 30 mg/kg for mice induce their 100% death.

Rodenticide Derodent-E consists of the following components (mass%): ethylfenacine 0,4-1,5; polyethylene glycol 85-98; the extract of elenium 0,2-1,5; valerian tincture 1,0-1,5, food colorant 0,5-1,5. A drug has higher toxicity for rats and mice inducing their 100% death in doses 1,8 mg/kg for rats and 4 mg/kg for mice.

Key words: synanthropic rodents, rats, mice, deratization, rodenticides, fatal dose.

Introduction

Study of special scientific literature on deratization, analysis of conducting and applicable rodenticides in the world, our materials, and data of other researches on efficiency of one or other poisons testify that

the main drugs of eradication of synanthropic rodents are anticoagulants. However, as it was mentioned above, long and constant usage led to formation of resistance of rodents and occurrence in the range of Western countries of population of rats resist to anticoagulants. The main reason of development of resistance of rats to anticoagulants, on opinion of researches, is weak toxicity of anticoagulants for rodents at single taking. Multiple applications of anticoagulants promote to development of resistance. In this connection, investigation of opportunities of prevention of formation in rodent's resistance and strengthening of toxicity of anticoagulants at its single appliance is actual. Analysis of the results of studies on mechanism formation of resistance in rodents gives us an assumption that opportunity of successful solution of these problems is based on of the following factors.

Formation resistance in rodents to often applicable rodenticides is, mainly, the result of occurrence and strengthening of biological memory. Biological memory means ability of creatures, conceiving external influence, to keep, strengthening and further reproduce changes of functional state and structure causing by these affects. Changes which promote larger adaptability to repeatable affects are preferably being kept and strengthened.

Based on our own materials and the data of other authors for further improvement, we selected ethylfenacine, difenacine and sodium salt of zoocumarin as the drugs that have

higher single toxicity for rodents and range additional advantages comparing with other anticoagulants.

The deratizational drug “Derodent-D”

The proposing deratizational drug “Derodent-D” is being prepared on the following technology: 10 g. of difenacine is being dissolved in 600 g. of food plant oil at constant heating up in water bath and periodical mixing. After full dissolving of difenacine, 1 g. of food colorant, 100 g. of the extract of colchicum and 50 g. of valerian tincture are being added and thoroughly mixed. The finished deratizational drug “Derodent-D” is being packing in hermetic dishware on 0,5; 1,0; 1,5 and 2 kg.

The proposing deratizational drug “Derodent-D” is being used in the

composition of the food poisoned bait. High quality grain, flake, porridges, mincemeats, and other products are being used for preparation of bait. 20 g. of the deratizational drug “Derodent- D” is being added into each kilogram of food basis and being thoroughly mixed.

Poisoned baits are being laid in the inhabitations of rodents by portions on 25-30 g. for eradication of rats and 3-5 g. for eradication of mice.

Baits poisoned by the deratizational drug “Derodent-D” are being eaten by rodents as well as not poisoned high quality food products; it is being provided 100% death of rodents.

Optimal correlation of components of the deratizational drug “Derodent-D” at which it has highest toxicity for rodents was tested on rats and mice (see table 1).

Table 1. Toxicity of the deratizational drug “Derodent-D” for rats and mice at different correlations of its components

Variants	Correlation of components (g.)					Quantity of rodents		Fatal dosed, mg/kg	
	difenacine	plant oil	the extract of colchicum	valerian tincture	food colorant	rat’s dead at conduction of experiment	mice dead at conduction of experiment	for rats	for mice
	M±m	M±m	M±m	M±m	M±m			M±m	M±m
1	0,5	75,0	4,0	5,0	0,05	20	30	16	71
2	0,75	80,0	5,5	7,5	0,075	20	30	8	58
3	1,0	85,0	7,0	10,0	0,1	20	30	5	40
4	1,25	90,0	10,0	12,5	0,125	20	30	5	40
	0,87± 0,16	82,5± 3,22	6,62± 1,28	8,75± 1,61	0,087± 0,01	-	-	8,5± 2,6	52,25± 7,55

Data of table 1 testify that the deratizational drug “Derodent-D”, containing 1- 1,25% of definacine, 85,5-90% of food plant oil, 7-10,0% of the extract of colchicum,

10,0-12,5% valerian tincture, has higher toxicity for rats and mice leading to thier 100% death in doses of the drug 5 and 40 mg/kg for rats and mice accordingly.

Table 2. Effectiveness of eradication of rodents by the mean of the poisoned bait containing components of the proposing drug “Derodent-D” at the bordering values

Variants	Correlation of components (g.)					Quantity of rodents				Mortality, %	
	Difenacine	Plant oil	The extract of colchicum	Valerian tincture	Food colorant	Rats	Mice	Rats	Mice	Rats	Mice
1	0,5	75,0	4,0	5,0	0,05	20	30	16	71	45,0	52,0
2	0,75	80,0	5,5	7,5	0,075	20	30	8	58	80,0	78,0
3	1,0	85,0	7,0	10,0	0,1	20	30	5	40	100,0	100,0
4	1,25	90,0	10,0	12,5	0,125	20	30	5	40	100,0	100,0
	0,87±	82,5±	6,62±	8,75±	0,087±	-	-	-	-	81,25±	52,50±
	0,16	3,22	1,28	1,61	0,1	-	-	-	-	12,97	11,41

Food plant oil and valerian tincture containing in the composition of deratizational drug “Derodent-D” attracts rodents and improves palatability of poisoned baits. The extract of colchicum damages capillaries of vessels oppresses klendusity of rodents and strengthens anticoagulant and toxic effect of difenacine. All this, in ultimate total, provides 100% effectiveness of the deratizational drug “Derodent-D” at eradication of synanthropic rodents. Its effectiveness at practical deratization was tested on the poultry, cattle-breeding, warehouses, and back rooms of Almaty, Aktobe, Zhambyl, Ural and Atyrau oblasts with scope more than 480000 m2 of the total area.

The deratizational drug “Derodent-N”

The proposing deratizational drug “Derodent-N” is being prepared and used as follows. 10 g. of sodium salt of dicumarinum shall be dissolved in 500 g. of distilled water at constant mixing.

After full dissolution of sodium salt of zoocumarin, 100 g. of the extract colchicum, 200 g. of beet juice and 50 g. of valerian tincture shall be added and thoroughly mixed in solution. After that, distilled water shall be added and mass of deratizational drug

“Derodent-N” shall be extended up to 1 kg. and again, being mixed. The finished deratizational drug “Derodent-N” shall be packed in hermetic bottles on 0,25; 0,5; 1,5 and 1,0 kg.

The proposing deratizational drug “Derodent-N” is being used in the form of food and liquid poisoned baits. High quality grain, flake, porridges, mincemeats, and other food products are being used for preparation of bait. 15 g. of the deratizational drug shall be added for each kilogram of the food basis and thoroughly mixed. Finished poisoned baits are being laid in the inhabitations of rodents by portions on 25-30 g. for eradication of rats and 3-5 g. for eradication of mice.

Water, broth and skim milk are being used for preparation of liquid baits. 6 ml. of the deratizational drug “Derodent-N” is being added for each liter of liquid and thoroughly mixed. Finished poisoned bait is being poured in hermetic dishware and laid in the inhabitations of rodents.

Optimal correlation of components of the deratizational drug “Derodent-N” at which it has the best toxicity for rodents was tested on rats and mice, (see Table 3).

Table 3. Toxicity of the proposing deratizational drug different correlation of its “Derodent-N” for rats and mice

Correlations of components, mass %					Quantity of laboratory rodents		Fatal dose, mg/kg	
Sodium salt of zoocumarin	Distilled water	The extract of colchicum	Valerian tincture	Beet juice	Rats	Mice	For rats	For mice
0,5	75,0	4,0	5	0,05	20	30	16	71
0,75	80,0	5,5	7,5	0,075	20	30	8	58
1,0	85,0	7,0	10,0	0,1	20	30	5	40
1,25	90,0	10,0	12,5	0,125	20	30	5	40

The deratization drug “Derodent-N” (variant salt of zoocumarin, 70-80,0% of distilled water, 10- 5% valerian tincture and 20-22% beet juice has leading to its 100% death in doses 6 and 30 mg/kg.

Analogical results were received at test o containing components of the deratizational drug results of tests are represented in table 4.

Baits poisoned by the proposing deratizational drug “Derodent-N” containing 1- 1,25% of sodium of zoocumarin, 70-80% of distilled water, 10-12,5% of the extract of colchicum and 20-22,5% beet juice in doses 6mg/kg for rats and 30 mg/kg for mice lead to its 100% death.

Table 4. Effectiveness of eradication of rodents by the components of the proposing drug “Derodent-N” poisoned bait containing bordering values

	Correlations of components, mass %					Quantity of laboratory rodents		Dose of the drug mg/kg		Mortality, %	
	Sodium salt of zoocumarin	Distilled water	The extract of colchicum	Valerian tincture	Beet juice	Rats	Mice	Rats	Mice	Rats	Mice
	M±m	M±m	M±m	M±m	M±m					M±m	M±m
1	0,5	60,0	5,0	2,0	15	20	30	6	30	48	46
2	0,75	65,0	7,5	3,5	17,5	20	30	6	30	34	72
3	1,0	70,0	10,0	4,0	20	20	30	6	30	100	100
4	1,25	80,0	12,0	5,0	22,5	20	30	6	30	100	100
	0,87± 0,16	68,75±4,21	6,62± 1,28	3,62±0,62	18,75±1,61	-	-	-	-	70,5±0,49	79,5±12,97

The deratizational drug «Derodent-E»

The proposing deratizational drug “Derodent-N” is being prepared and used as follows.

10 g. of ethylfenacine shall be dissolved in 800 g. polyethylene glycol-400 at constant mixing.

After full dissolution of ethylfenacine, 2 g. of the extract elenium, 10 g. of valerian tincture and 1 g. of food colorant shall be added and thoroughly mixed. After that, polyethylene glycol-400 shall be added and mass of deratizational drug “Derodent-N” shall be extended up to 1 kg. and again, being mixed.

The finished deratizational drug “Derodent-E” shall be packed in hermetic bottles on 0,5; 1,0; 1,5 and 2 kg.

The proposing deratizational drug “Derodent-E” is being used in the form of food poisoned baits. High quality grain, flake, porridges, mincemeats, and other food products are being used for preparation of bait. 10 g. of the deratizational drug shall be

added for each kilogram of the food basis and thoroughly mixed. Such poisoned baits are being laid in the inhabitations of rodents by portions on 15-20 g. for eradication of rats and 2-3 g. for eradication of mice.

Optimal correlation of components of the deratizational drug “Derodent-E” at which it shows the maximal toxicity for rodents was tested on rats and mice (see table 5).

Table 5. Toxicity of the proposing deratizational drug “Derodent-E” for rats and mice at different correlation of its components and at direct introduction in stomach

Variants	Correlation of components, mass %					Fatal dose, mg/kg	
	ethylfenaci ne	Polyethylene glycol 400	the extract of elenium	valerian tincture	food colorant	for rats	for mice
	M±m	M±m	M±m	M±m	M±m	M±m	M±m
1	0,6	90,0	0,9	1,0	0,5	6	13
2	0,8	92,5	0,95	1,5	0,75	4	8
3	1,0	95,0	1,0	2,0	1,0	1,8	4
4	1,2	97,5	1,5	2,5	0,25	1,8	4
	0,90±0,13	93,75±1,61	1,09±0,14	1,75±0,32	0,62±0,16	3,40±0,01	7,25±2,13

The deratizational drug “Derodent-E” containing 1,0-1,2% of ethylfenacine, 95-97,5% of polyethylene glycol-400, 1,0-1,5% of the extract of elenium, 2,0-2,5% of valerian tincture and 1,0-1,25% of food colorant has the highest toxicity for rats and mice leading to their 100% death in doses 1,8 and 4 mg/kg accordingly.

Analogical results were received at test of effectiveness of the poisoned bait containing components of the deratizational drug “Derodent-E” in different correlations. Effectiveness of the drug was tested on rats and mice. 20 rats and 30 mice were used for each sample (see Table 6).

Table 6. Effectiveness the poisoned bait containing components of the proposing drug “Derodent-E” in different correlations at of eradication of rodents

Variants	Correlation of components, mass %					Doses of the drug, mg./kg.		Mortality, %	
	Ethylfenacine	Polyethylene glycol 400	The extract of elenium	Valerian tincture	Food colorant	For rats	For mice	Rats	Mice
	M±m	M±m	M±m	M±m	M±m			M±m	M±m
1	0,6	90,0	0,9	1,0	0,5	1,8	4,0	38	32
2	0,8	92,5	0,95	1,5	0,75	1,8	4,0	76	74
3	1,0	95,0	1,0	2,0	1,0	1,8	4,0	100	100
4	1,2	97,5	1,5	2,5	0,25	1,8	4,0	100	100
	0,90± 0,13	93,75± 1,61	1,09± 0,14	1,75± 0,32	0,62±0,16	-	-	66,3± 13, 02	76,5± 16,05

Baits poisoned by the proposing deratizational drug “Derodent-E” containing 1,0- 1,2% ethylfenacine 95,0-97,5%; polyethylene glycol 400, 1,0-1,5%; the extract of elenium, 2,0-2,5% valerian tincture 1,0-1,25%; food colorant in doses 1,8 mg/kg for rats and 4,0 mg/kg for mice show 100% effectiveness at their eradication.

Substitution of inaccessible and expensive chlorpromazine for the easily accessible and cheap extract of elenium simplifies of production of the deratizational drug and reduces its prime cost. Moreover, the extract of elenium significantly strengthens toxicity of ethylfinacine for rodents. Ethylfenacine is being better dissolved in polyethylene glycol 400 than in polyethylene glycol 300, therefore, substitution of the last for the first increases economy of the drug.

Discussion

Synanthropic rodents settling the facilities of human activity have close contact with pocket of infection, food, and feed products, as well as with people and with pets and wild animals hereupon constitute extreme sanitary-epidemiological and epizootic dangers.

Generally, deratization and especially in the cases of occurrence of zoonosis is an inalienable part of anti-epidemic and anti-epizootic actions. Eradication in the cattle farms and in settlements such zoonosis as brucellosis, leptospirosis, tularemia tuberculosis, hydrophobia, helminths, etc. is extremely difficultly without extermination of synanthropic rodents and occasionally impossible.

Rodents are sources and transmitters of agents of the abovementioned diseases; therefore, all efforts directing to liquidation of these zoonosis are being frustrated.

Synanthropic rodents, mainly rats and mice, play the largest role in spread and support of zoonosis. They spread agents of more than two hundred different diseases which are human and pets' diseases. However, necessity of eradication of synanthropic rodents is stipulated not only their sanitary danger but and significant economic damage inflicted on national economy everywhere.

Experts of the World Health Organization (WHO) determined that rodents, especially rats eat and damage about 33 million grain crops and rice annually all over the world. Except grain crops and rice, they eat

vegetables, fruits, meat, milk and fish products, eggs, bite do death young chickens, piggery, and puppies of commercial fur animals. They spoil the food products by their excretions in 10 times more than eat.

Consequently, necessity of effective deratization is completely obvious from sanitary-epidemiological, epizootological and economical points of view. Unfortunately, protection of facilities of human activity from harmful rodents is still an unsolved and very actual problem. The number of rats grows annually all over the world and becomes threatening. For example, about thirteen years ago it was thought that number of rats is equal to number of populations in the world. Now it is deemed that number of rats exceeds number of populations in the world. According to the data of the WHO experts, more than 8 billion of rats inhabit in only one India where 10 rats is being fall per every inhabitant. In this country, 30 newborn infant rats are being fall per every newborn baby.

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SECTION V. HYDROMELIORATION

UDC: 626.824

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IMPROVING THE EFFICIENCY OF LAND RESOURCES USE ON THE EXAMPLE OF ALAMUDUN DISTRICT, CHUY OBLAST

Abstract. The article describes actual issues of increasing the efficiency of agricultural land use in the region. It is necessary to substantiate new approaches and methods of formation of relations of land users with environment, meeting modern economic conditions, on the one hand, and ecological requirements, on the other hand. The research uses documents of land legislation, materials of monitoring and cadastre of lands, land management schemes and projects, statistical data of agriculture and other branches of economy of the rayon and conducted correlation-regression analysis of lands.

Keywords: land resources, land efficiency, economic and mathematical modeling, ecologization.

Introduction. The issue of increasing rational and efficient use of land resources is an important element of government policy. Due to the lack of proper attention and necessary allocation of financial resources, the territories of so called “unsuitable” and “unsustainable” lands have increased.

Undoubtedly, land is the primary source of production in the agrarian sector of economy. The economic efficiency of agriculture, food security and the state ecosystem as a whole largely depend on the rational use of land resources. Agrarian reform, first of all, means a change in the system of land relations, which in turn is determined by changes in the form of land ownership, the rights of owners and users, which entails the redistribution of land fund between them. In the process of reforms, the Kyrgyz Republic still faces the need to solve

standard and non-standard economic issues related to structural transformations, working out the mechanism of formation and functioning of the market economic system [1-5].

Russian scientist Dobrynin V.A. stated that “The economic efficiency of land use should be understood as the level of farm management. It is characterized by production output from an area unit and its cost. All land users have the task of ensuring maximum productivity from each hectare of land with minimum production costs” [6-7].

However, an equal farm level may be achieved on lands of different quality, so in order to objectively assess the economic efficiency of land use in agriculture under certain zones, districts and other units it is necessary to take into account the data of its economic assessment.

Research materials and methods

Many factors influence the rational and efficient use of land resources, which can be divided into the following groups: managed and unmanaged.

Managed factors for sustainable land use include:

- Man-made: the positive and negative effects of human activity;
 - Technological: existing and applied land use methods, technologies; land use management approaches and methodologies.
- Unmanaged factors:
- economic: current economic situation in the country and the world community in a current context of pandemic;
 - political: land policy pursued by the state;
 - natural and climate related: climate conditions, landscape, quality of soil cover, etc.;

- social: living standards, availability/absence of social strains, quality of labor resources, etc.

To achieve rational and efficient land use, it is necessary to ensure that the three main groups of conditions, as institutional, informational and organizational, are met with sustainable land relations. Land relations reflect social relations between state authorities, local self-government bodies, legal entities, citizens regarding ownership, use and disposal of land, as well as regarding state management of land resources [8].

Land relations include the following crucial elements:

- forms of land ownership (private, state, municipal, other etc.);
- relations of land economic use;
- forms of land management (a system of political, socio-economic, legal and administrative measures aimed at organizing land use).

The basis for effective and rational use is the management system aimed at optimizing the use of agricultural land, preserving it for productive handling and preventing soil fertility depletion [9].

Efficient and rational land use increases the capacity of the territory and increases the level of socio-economic development of the region.

Efficient land use and social and economic development in Alamudun district

Alamudun district should improve the efficiency of land resource management and social and economic development, taking into account environmental conservation and based on a preliminary environmental and economic assessment of natural resources and setting limits to their exploitation in the near term.

The following activities are aimed at preserving environmental and economic activity:

- Ecological and economic ecologization.
- Legislation.
- Enhancement of economic mechanisms for natural resources management.

- Control over environmental protection and rational use of natural resources.
- Ecological monitoring and information support.
- Scientific support of environmental safety.
- Ecological education.
- Public participation in making environmentally significant decisions

Analysis of the state and development of land relations in the district revealed imperfections in the state regulation system. First of all, various organizations dealing with land issues in many respects have the same functions for accounting, registration, etc. In our opinion, the functions of institutions should be strictly defined. All issues related to the maintenance of the state land cadastre, cadastral valuation and monitoring of land, land management and control should be addressed by the Land Surveyor's office. Its role should be enhanced, and all information on effective land management should be concentrated in the database of the Land Survey, which will be created on an automated basis. At the same time, various departmental databases should be consolidated based on informational interaction.

As is known, the main indicator of the country's economic growth is the gross domestic product (GDP) or region (district) gross regional product (GRP). Solving the problem of recovering agrarian sector from the crisis requires a consistent Food Policy, which would include a number of key strategic directions:

stimulating the development of domestic agriculture, which, first of all, will require a certain redistribution of national income in favor of agricultural producers; attributing its main objective function to the agrarian reform, which is production growth; implementation of protectionist agrarian policy; making adjustments to social policy and significantly improving the nutritional status of low-income groups.

Gross domestic product is one of the most important indicators of the national accounts system, which characterizes the

final result of production activity of resident economic units and measures the value of goods and services produced by these units for final use.

Research findings. Economic and mathematical modeling (EMM) can be used to determine factors affecting GRP. The basis of EMM is correlation-regression analysis (CRA).

The system of statistical data processing and analytics often uses a combination of correlation and regression techniques. Correlation-regression analysis (CRA) is used to identify links between several business factors and assess the degree of interdependence of the criteria selected for the analysis. The technique uses two algorithms of action:

- Correlation, which is aimed at building relationship models.
- Regression used to predict events based on the most appropriate relationship model for the situation.

To determine the best factor that affects the economic growth of a region, it is necessary to construct a model of relationships between GRP (gross regional product) U and factors (X) affecting GRP growth (data from the National Statistical Committee of the Chuy oblast, including the Alamudun district) [10.11].

The designations of the following tables: U- gross regional product, in current prices, mln.som; X1 - Export of goods; X2 - Microcrediting; X3 - Private housing stock; X4 - Mineral fertilizer; X5 - Agriculture (wheat); X6 - Foreign trade turnover; X7 - Import of goods; X8- State budget income; X9- Agricultural land; X10- Agriculture (potatoes); X11- General agricultural sector; X12- Investments in fixed capital by territory; X13- Land taxes. Data for the last 5 years (from 2014 to 2018) are shown in tables 1 and 2.

Table 1

Years	X1	X2	X3	X4	X5	X6	X7
2014	120	2752,2	12919,3	4,2	25,6	530,3	410,3
2015	103	2204,3	13007,7	4,4	26,6	545,6	442,6
2016	140,3	2820,9	13112,8	5,1	25,5	609,2	468,8
2017	236,8	3493,2	13218,1	4,1	25,7	813	576,2
2018	215,8	4191,2	13395	5,6	26,8	1033,4	817,6

Table 2

Years	X8	X9	X10	X11	X12	X13	Y
2014	2307,3	10625,2	165,1	51121,6	33729,1	50727,2	58913,0
2015	2307,7	10624,7	166,3	51940,9	22691,2	62532	73501,6
2016	2557,2	10608,1	168	52782,6	22346,5	69330,1	78410,0
2017	2564	10607,2	168,8	51960,8	21199,8	80566,2	88419,1
2018	2978,9	10607,7	171,3	59515,9	22003,1	79020,4	83075,2

Correlation is used to measure the correlation ratio, regression of the correlation ratio between variables.

$$Y=a+b*x \quad (1)$$

The correlation matrix (r) to determine the correlations ratio between phenomena is shown in Table 3 and 4. The correlations ratio between Y and X should be greater or equal to 0.6.

Table 3

	X1	X2	X3	X4	X5	X6	X7
X1	1						
X2	0,886	1					
X3	0,843	0,9001	1				
X4	0,219	0,5441	0,66966	1			
X5	0,087	0,2661	0,45228	0,5	1		
X6	0,87	0,959	0,96919	0,6	0,48	1	
X7	0,769	0,9254	0,95387	0,7	0,59	0,9842	1
X8	0,741	0,9186	0,95989	0,8	0,43	0,944	0,958
X9	-0,81	-0,736	-0,8304	-1	0,08	-0,725	-0,65
X10	0,809	0,8813	0,99635	0,7	0,44	0,9501	0,941
X11	0,509	0,7969	0,84898	0,9	0,67	0,8617	0,935
X12	-0,49	-0,312	-0,6776	-0	-0,4	-0,509	-0,48
X13	0,867	0,7283	0,90826	0,4	0,26	0,8242	0,757
Y	0,79	0,5835	0,81769	0,3	0,22	0,7042	0,629

Table 4

X8	X9	X10	X11	X12	X13	Y
1,0						
-0,781	1,0					
0,9686	-0,8472	1,0				
0,93	-0,5105	0,859	1,0			
-0,51	0,67987	-0,69	-0,3822	1,0		
0,771	-0,89	0,901	0,5649	-0,8542	1,0	
0,6464	-0,85	0,812	0,42893	-0,9171	0,9811	1,0

After determining the correlation ratio, we eliminate the multicollinearity:

$$r_{xi,xj} > r_{xi,y}$$

$$r_{xi,xj} > r_{xj,y}$$

Analyzed data are shown in Table 5.

Table 5

Years	X9	X12	X13	Y
2014	10625,2	33729,1	50727,2	58913,2
2015	10624,7	22691,2	62532	73501,6
2016	10608,1	22346,5	69330,1	78410,0
2017	10607,2	21199,8	80566,2	88419,1
2018	10607,7	22003,1	79020,4	83075,2

The correlation matrix for the residue is given in Table 6.

Table 6

	X9	X12	X13	Y
X9	1			
X12	0,6798671	1		
X13	-0,890015	-0,854213	1	
Y	-0,84996	-0,917066	0,9810975	1

Thus, after determining the closeness of the relationship and elimination of multicollinearity in the model remained: X9 - Agricultural land, X12 - Investments in fixed assets by territory; X13 - Land taxes.

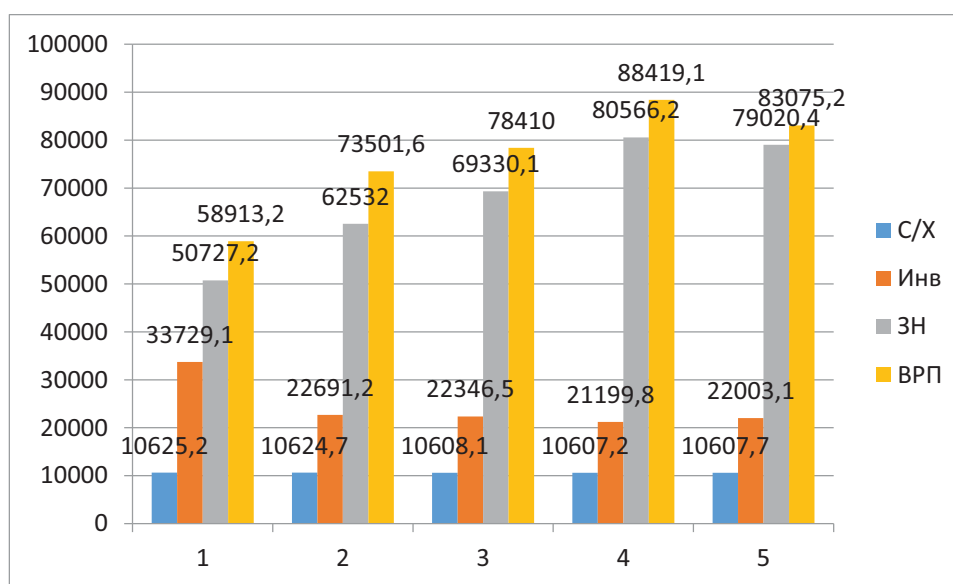


Fig. 1. Dynamics of indicators in the profile of Alamudun district.

X9 - The major share of land fund of Alamudun district is land of agricultural purpose. Social and economic development in Alamudun district should take into account the rational use of agricultural land.

X12 - The most important condition for sustainable social and economic development of regions is high activity of businesses and the government in the area of fixed capital investments (capital investments), which, according to KR laws, are the costs of new construction, reconstruction and technical re-equipment of existing enterprises, purchase of machinery, equipment, tools, inventory, design and survey work and other costs. Their

implementation contributes to the growth of gross regional product, number of jobs, income of citizens, tax revenues to budgets of different levels. There are numerous economic, social, technical, technological, environmental and other effects.

X13 - Today, for the purpose of sustainable economic development, special attention is paid to involving land resources into the economic turnover and improving efficiency of their use. The main purpose of introducing the land tax was to ensure the rational use of land, the alignment of socio-economic conditions of management on land of different quality and remoteness, ensuring the development of infrastructure in

settlements, as well as the formation of local budget revenues for social needs of the territories. Therefore, territorial authorities should be interested in increasing their own sources of income, as they allow for wider economic initiative in the regions. At the expense of received income from land tax,

local authorities get an opportunity to economically stimulate land users, develop new territories, etc.

With the use of Economic and Mathematical modeling it is possible to make predicted estimates of efficiency improvements (Figures 2, 3).

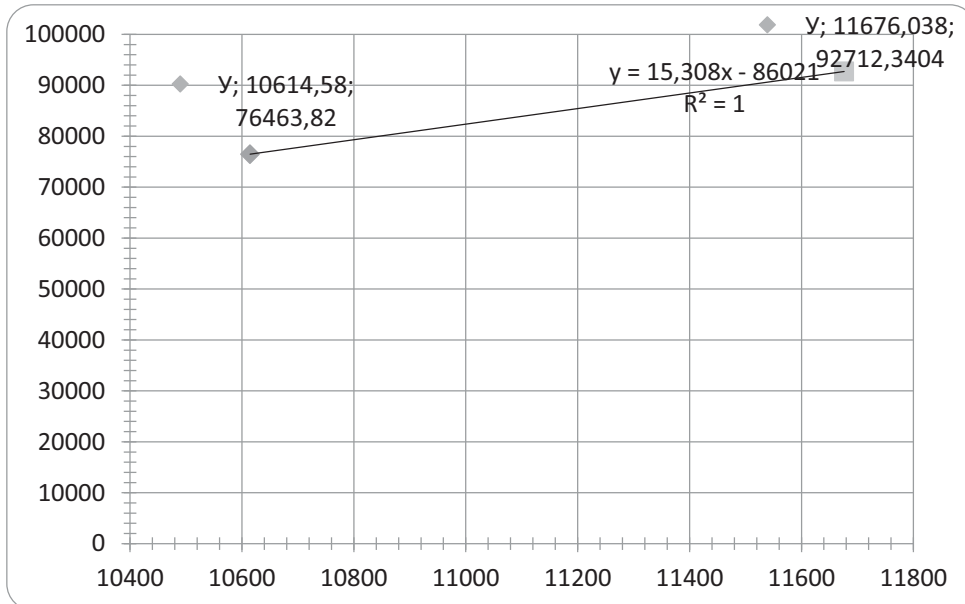


Fig.2. The model of linear regression of the forecast of the relationship between GRP and agriculture.

With improvement of agricultural lands by 10%, GRP will increase by 17% (Fig.2).

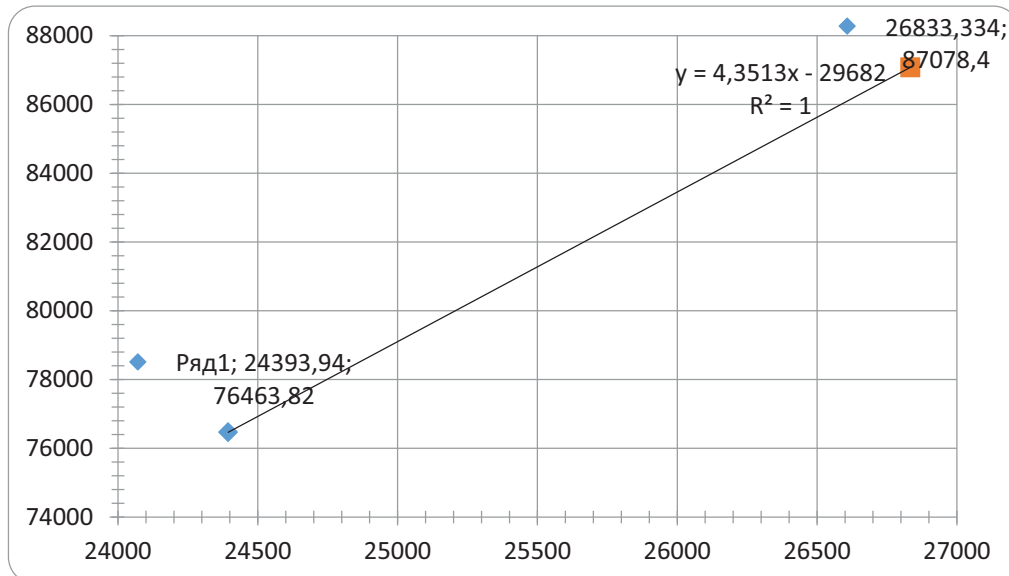


Fig.3. Model of the linear regression of the forecast, graph of dependence between GRP and investment climate.

Here in Fig. 3, if the investment climate increases by 10%, GRP will increase

by 15%. The result of regression analysis allows highlighting priorities and, based on

the main factors, to forecast, plan development of priority areas, making managerial decisions.

Based on the forecast calculations, the following conclusion can be made: by applying innovative methods for agricultural development, optimizing land tax collection, as well as by improving investment attractiveness, high yield can be achieved.

Conclusions

Analysis of the research shows that the main shortcomings of the existing regulatory and legal framework at the regional level in the implementation of the rights of landowners are the following:

- disorderly relations of control over effective land use of land that is withdrawn from circulation, which leads to the loss of soil fertility;
- poorly regulated process of transfer of land shares into ownership of persons who are not members of agricultural organizations and are not connected with agricultural production at all.

In particular, it is necessary to move to a new stage in land relations - the stage of formation of an effective owner of agricultural land, which should become a form of support:

- deprivation of lands from inefficient owners in case of their non-use or improper use;
- differentiation of land tax rates upwards in case of inefficient land use;
- assistance to agricultural enterprises in accumulating a fund of unclaimed land shares with subsequent redistribution among employees;
- incentives for lease forms of agricultural land use [12].

It is necessary to introduce modern and effective land management methods that increase agricultural production while preserving the environment and biodiversity.

In our opinion, such tools can include land consolidation, drip irrigation, greenhouse development and organic production.

In addition, it is necessary to closely monitor agricultural land and create an

information database on the state of the district's land fund.

This will make it possible for a reasonable judgment on the degree of cumulative impact of negative processes and phenomena, reveal the regularities of their development and timely diagnose, evaluate these processes and phenomena, and monitor the condition of land, its use and protection at a higher quality level.

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RATIONAL WATER USE IN THE RIVER BASIN BASED ON ANALYSIS OF THE WATER BALANCE OF THE TERRITORY

Abstract: *In this article description is given sustainable water distribution in the irrigation systems of the sub-mountain zone of the River Basin, which will influence sustainable water resources management in the Chui Valley of Kyrgyzstan.*

Keywords: *improving water distribution, irrigation systems, sub-mountain zone, sustainable use, natural resources*

1 Introduction

In Central Asia water resources have always been considered to be the basis of the economy, politics and ecology, or, in other words, an integral of people's lives. Land irrigation, dating back to the 10-11th C, has been one of the main uses of water resources in the region. By regularly improving and increasing the scale of irrigation, by the beginning of the 20th Century the people of the region had between 2.5-3.5 million hectares of fertile irrigated land, this land being the economic base of society and by the end of the 20th Century the area of irrigated land was about 7.9-8 million hectares, i.e. 2.3 times more than at the beginning of the century. However, during the past 100 years the area of irrigated land on the planet increased by 8 times. So, Central Asia is considerably behind other countries in the growth rate of using new irrigated land (<http://www.rus.gateway.kg/vodn>).

The hydrographic network of Central Asia highlights the extremely uneven distribution of water resources, including the river network. Such an uneven distribution of the river network in Central Asia can be explained by the climatic and hydrological characteristics of this area. The vast plains covering 70 % of Central Asia have very few

rivers and these rivers have no tributaries from the source in the mountains to the estuary. The branchy river network is within the Central Asian sub-mountain plains, but it is of a very special character here: these are mainly man-made irrigation canals, which do not runoff into the beds of the main rivers, but, on the contrary, spread it away from the river network and scatter it locally within the management area.

2 Materials, methods and results

The main condition for the rational use of water resources for any purpose is accurate information about their availability and qualitative characteristics, though at first sight obtaining this information does not seem to be difficult, just requiring organizing regular hydrometric observation of the existing rivers and reservoirs. The real situation is much more difficult: as a result of the massive influence of people on the majority of water collection basins, river basins with original natural conditions helping form surface and subsoil outflows have actually disappeared. The intensive economic activity of people could not but influence the ratio of the water balance elements in those regions where this activity is being carried out; it also influenced the spatial and temporal features of water resources distribution. A quantitative assessment of the anthropogenic changes to water resources and water balance, which have taken place in recent years and are expected in the future, is of great scientific interest and importance in developing measures for rational water system management, protecting natural water from pollution and exhaustion, future planning of the water

resources use system and regulation of water runoff and its territorial redistribution (Provisional methodological instructions for stations regulating the water balance on improved land regarding the supervision of processing material, 1981).

The hydrological cycle reflecting the interconnection between its main elements is shown in Figure 1 (Hanspeter Liniger, 1995:4).

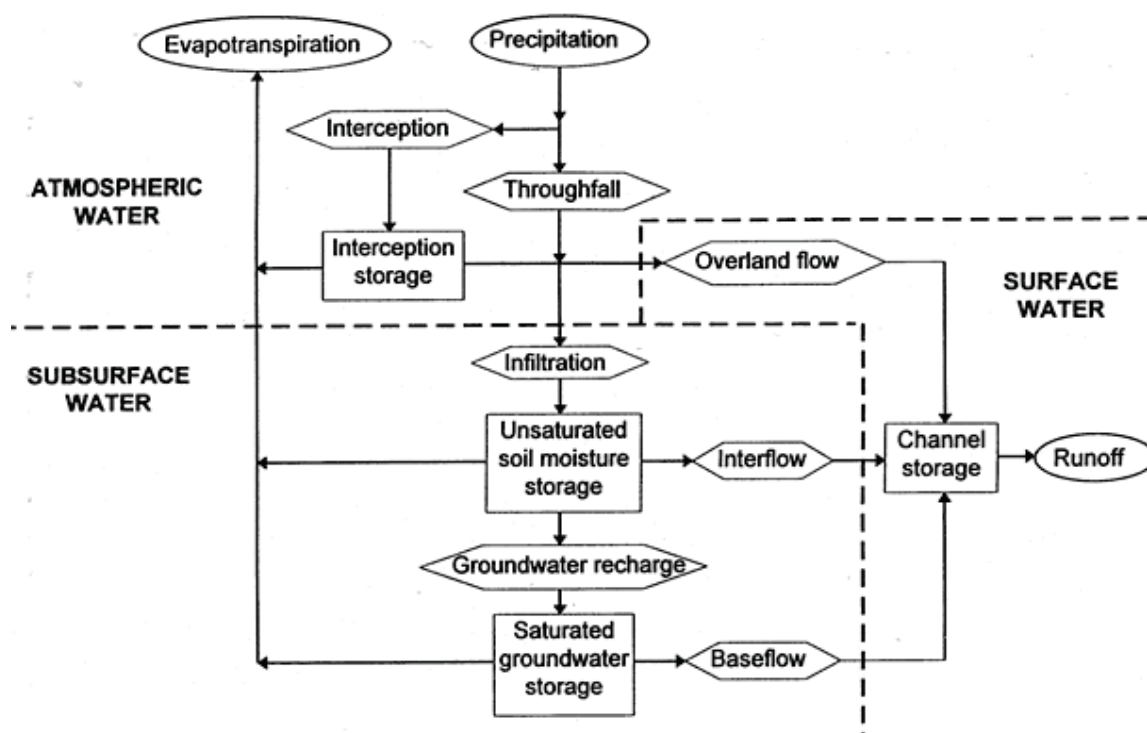


Figure 1 The hydrological cycle scheme

The ratio of water inflow and outflow with the change of its reserve for the established time period for the area being taken into account, can be shown as follows: $P = RO + ET \pm SWC$, where P is the total rainfall on this area; ET is the quantity of moisture there, SWC – Soil water change in the area («+» or «±» sign indicates whether the amount of moisture increased or decreased during the calculation period).

The rainfall forms runoff on the surface of the area and the total moistening of soil. The soil moisture evaporates from the soil surface and by transpiration by growth and replenishes the moisture and subsoil waters, which form the subsoil runoff. Water balance data are used to assess the water resources of the area, calculate the irrigation norms and determine the reasons for increased water-logging and inflow of water to canals and absorbing wells (Ljvovich

M.I., 1969; Bulavko A.G., 1971; Kaplinskij M.I., 1977; Vuglinskij V.S. and others, 1981; Chow, V.T., D.R. Maidment, L.W. Mays. 1988).

The hydrometric balance, which is part of the water balance (Tsytchenko K.V., 1990), makes it possible, together with the water balance of the area, to establish a quantitative assessment of the irrigation systems' water resources, for their efficient use. It helps study the actual system of irrigation water supply and discharge, to assess irretrievable water consumption within the framework of the researched irrigation systems and to compare the measured elements with their calculated or projected figures.

Rational use of water depends on a number of factors, first and foremost on the state of the irrigation system and its design characteristics. They define water losses for

filtration and the volumes of non-productive discharges, which depend on technologies; operational and precise water distribution management, poor quality of machinery, and organisation methods of watering. Water losses for filtration and discharge are as follows: in mainline canals – 6...18 %, emergency discharge – about 2 %; filtration losses in the inter-farm network of canals are more significant, approaching 45 % of the total water volume within the whole

irrigation systems, whilst discharges amount to 40 % of the total amount (Kovalenko P.I., 1981. P.74-78). The processes taking place on the irrigated land can be studied and monitored with the help of the water balance of the land aeration zone shown in Figure 2 (Hanspeter Liniger, 1995). Figure 2 indicates the water balance elements within the closed land area, taken or not taken into account.

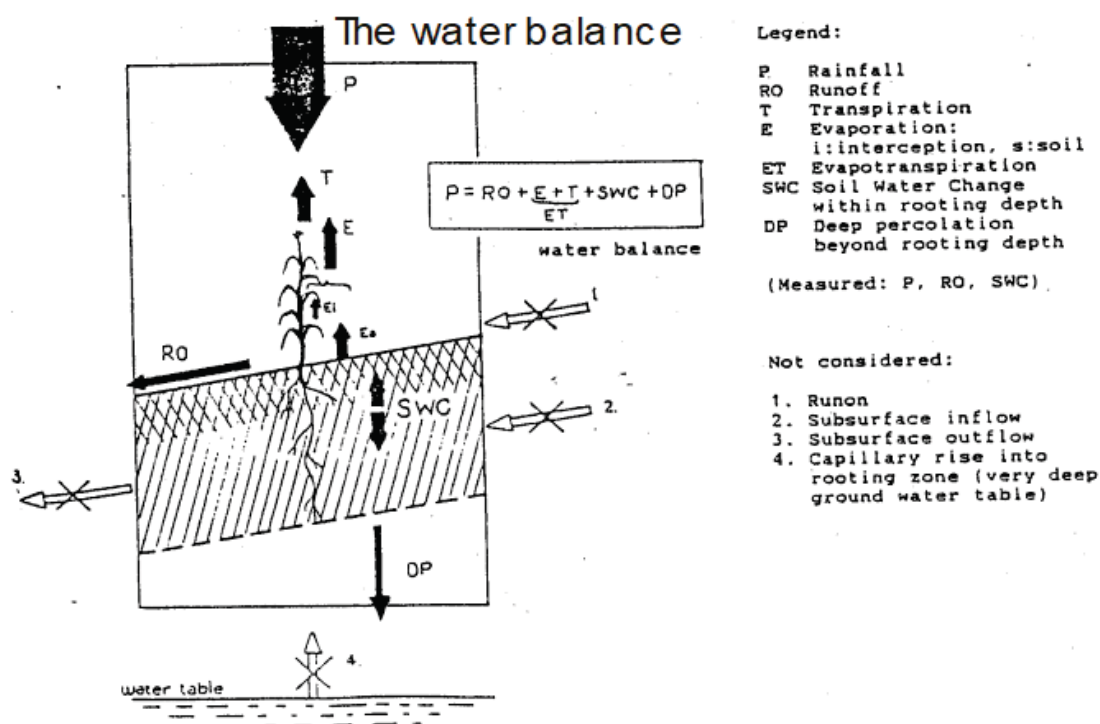


Figure 2 Water balance of the aeration zone

An analysis of literature and research on the majority of the rivers in Kyrgyzstan showed the incongruence of river hydrographs with the irrigation water needs (Schultz V.A., 1963; Bolshakov M.N., 1974; Haan, C.T., H.P. Johnson and D.L. Brakensiek (ed.) 1982). That is why it is necessary to adjust the hydrograph of the water source to the workings of the irrigation system. Adjusting the irrigation regime, especially for extracting the water from rivers, is vitally important for the normal working of the irrigation system. It is necessary to take into account the fluctuations of both expenditures and water level in the source while adjusting the source and irrigation regimes. This task

is most difficult during the periods when there is little water. Broad development of improvement measures is impossible without conducting measures to stabilise the natural regime of the rivers, the majority of which have a clearly expressed unevenness of flow and volume fluctuations according to the time of year

3 Conclusions

We shall note the following major factors determining the presence of unsafe – in terms of melioration - land and the deterioration of the technical condition of the IS and CDS:

- Absence of scientifically proved and authorised ways of irrigation adapted

to the new management conditions in the Republic;

- Exceeding the designed irrigation norms of water supply, especially in the zones with unsatisfactory and unstable ameliorative conditions;
- Low efficiency of the irrigation systems, which is 0.56 in the Chui Valley;
- Absence of recording system to keep account of the water supply to inter-farm irrigation networks;
- Absence of an appropriate technical operation system for inter-farm IN and CDS, which belong to the state.

The problem of effective water distribution to IS for sustainable water management in the Chui Valley of Kyrgyzstan is especially topical in connection with all the above-stated.

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STRESS STATE OF MOUNTAIN SLOPE WITH A STEP UNDER EXTERNAL LOAD WITH DECLINING TRIANGULAR EPURA

Abstract: *In this article description is given and calculations are carried out using the computer system of the soft MATCAD, the stress state of a mountain slope with a ledge under the action of gravitational, horizontal tectonic forces and a distributed external load with a decreasing triangular diagram, this conclusion is described by analytical relations.*

Regularities of stress distribution in the massifs of a mountain slope with a scarp from the action of an external load have been established, where the actions of gravitational, horizontal tectonic forces were taken into account each separately.

The general stress state of a mountain slope with a scarp from all the listed forces is determined by preliminary summing only the ratios $BN(\zeta) + B(\zeta)$, $AN(\zeta) + A(\zeta)$ and calculations of stress components were performed using the functions $\Phi(\zeta)$ u $\Psi(\zeta)$.

Keywords: *Stress state, rock massifs, ledges, gravitational forces, horizontal tectonic forces, stress distributions, Muskhelishvili relations, isolines.*

1 Introduction

The stress state of the crustal massifs as an urgent problem attracts the attention of many

researchers [1,6]. The influence of the relief [1] on the stress state of the massif within the framework of the method [3] was considered in works [4,7]. The influence of an external load with a triangular diagram on the stress state of the river canyon walls was studied in [7]. The effect of a uniformly distributed load on the stress state of mountain slope massifs with ledges has been studied in recent years in works [8,10]. Below, in a similar setting [8,10], the problem of the influence of an external load with a linearly decreasing triangular load on the stress state of a mountain slope with one ledge is considered.

2 Materials, methods and results

Massifs of a mountain slope with a scarp undergo in natural conditions the combined action of the force of gravity and horizontal tectonic compression and are in conditions of plane deformation.

The force of gravity is determined by the volumetric weight of rocks $\gamma = \rho g$. Here: ρ - rock density; g - gravitational acceleration. Tectonic force T_x , directed horizontally and has a constant intensity along the depth of the mountain massif with a ledge. In plane XOY the topography of a slope with symmetrical ledges is modeled using a display function [11]:

$$\begin{aligned} \omega(\xi, \eta) &= \alpha \zeta(\xi, \eta) + \omega_0(\xi, \eta) & \omega p_1(\xi, \eta) &= \omega_0 p_1(\xi, \eta) + \alpha \\ \omega_0(\xi, \eta) &= a_1 / \zeta(\xi, \eta) - i + b_1 / \zeta(\xi, \eta) + tb - i \\ \omega_0 p_1(\xi, \eta) &= a_1 / (\zeta(\xi, \eta) - i)^2 - b_1 / (\zeta(\xi, \eta) + tb - i)^2 \end{aligned} \quad (1)$$

To simulate a mountain slope with symmetric ledges in (1):

$$a = 160, \quad a_1 = 500, \quad b_1 = 250, \quad d_1 = 250, \quad tb = -2,$$

The shape of the mountain slope with ledges looks like in Fig. 1.

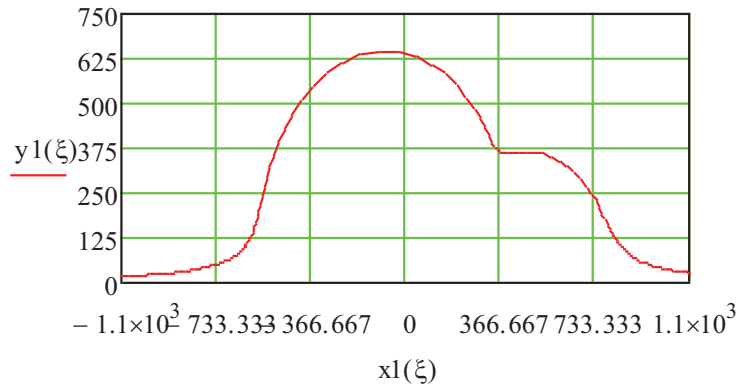


Figure: 1. Mountain slopes with one ledge

External load $N(\xi)$ distributed on the contour points of the ledge and graphically shown in Fig. 2.

It is customary to designate the area of action of the load: L_3 and L_4 the beginning and end of the section of the contour, where the load diagram decreases; P_0 is the maximum load value. Figure 2.

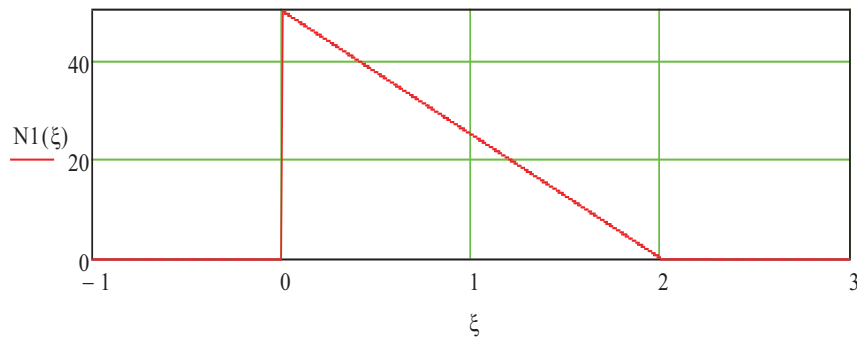


Figure: 2. Diagram of the distributed load, for illustration, conditionally assigned

$$L_3=0, \quad L_4=2$$

According to the accepted works [1] two-dimensional theory of elasticity at an arbitrary point of the massif for stresses, it is customary to denote by $(\sigma_x, \sigma_y, \tau_{xy})$. These components are at the same point in the array in the adopted transformed coordinate system (1) indicated through $(\sigma_\xi, \sigma_\eta, \tau_{\xi\eta})$.

There is a connection between the components in Cartesian and curvilinear coordinates in the form [8]:

$$\sigma_\xi + \sigma_\eta = \sigma_x + \sigma_y, \quad \sigma_\eta - \sigma_\xi + 2i\tau_{\xi\eta} = e^{2i\alpha}(\sigma_y - \sigma_x + 2i\tau_{xy}), \quad (2)$$

$$\text{where } e^{2i\alpha} = \frac{\omega'(\zeta)}{\overline{\omega'(\zeta)}}, \quad (3)$$

Stress components $(\sigma_\xi, \sigma_\eta, \tau_{\xi\eta})$ defined through functions $\Phi(\zeta)$ и $\Psi(\zeta)$, as proved by N.I. Muskhelishvili [8], from the boundary conditions following from the relations:

$$\begin{aligned} \sigma_\eta + i\tau_{\xi\eta} &= \Phi(\zeta) + \overline{\Phi(\zeta)} + \frac{[\overline{\omega(\zeta)}\Phi'(\zeta) + \omega'(\zeta)\overline{\Psi(\zeta)}]}{\omega'(\zeta)} \\ \sigma_\eta - i\tau_{\xi\eta} &= \Phi(\zeta) + \overline{\Phi(\zeta)} + \frac{[\omega'(\zeta)\overline{\Phi'(\zeta)} + \overline{\omega'(\zeta)}\Psi(\zeta)]}{\overline{\omega'(\zeta)}} \end{aligned} \quad (4)$$

$$\text{in } \zeta=\xi+it, \eta=0 \text{ и } \sigma_\eta(\xi,0) = N(\xi), \tau_{\xi\eta}(\xi,0) = T(\xi).$$

The quantities $T(\xi)$ and $N(\xi)$ normal and tangent lines on the contour of the studied load area. The initial stress state of a mountain massif with a symmetrical scarp in natural conditions is formed under the combined action of gravitational, horizontal tectonic forces and external distributed loads with a triangular diagram (see Fig. 1). It is required to find the stress distribution laws if the differential equilibrium equations are satisfied at each point of the array:

$$\frac{\partial \sigma_x^{\text{II}}}{\partial x} + \frac{\partial \tau_{xy}^{\text{II}}}{\partial y} + \rho_x = 0, \quad \frac{\partial \tau_{xy}^{\text{II}}}{\partial y} + \frac{\partial \sigma_{yy}^{\text{II}}}{\partial y} + \rho_y = 0, \quad (5)$$

Where, $\rho_x=0$, – horizontal and vertical $\rho_y=\gamma=\rho \cdot g$ volumetric force components; integrals of (5)

$$\text{have the form: } \sigma_x^{\text{II}} = A_1 \cdot y + T_x; \quad \sigma_y^{\text{II}} = A_2 y; \quad (6)$$

Where, the notation $A_1=\lambda\gamma$; $A_2=\gamma$; λ – coefficient of lateral thrust according to Dinnik [1,5]; tectonic force T_x directed horizontally [2,5]; y - the vertical distance of the point in question in the array. In the absence of external loads at the contour points, the stress components will be equal:

$$\sigma_\eta(\xi,0) = 0, \tau_{\xi,\eta}(\xi,0) = 0. \quad (7)$$

Determination of stresses from the action of an external load, when the distribution law has the form (see Fig. 1):

$$N(\xi) = \frac{L_4 - \xi}{L_4 - L_3} * p_0 \quad (L_3 \leq \xi \leq L_4) \quad (8)$$

Taking into account in (8), where on sections of the contour the load $N(\xi)=0$. Then we use the following (4) boundary conditions equalities [3];

$$\begin{aligned} \Phi(t) \cdot \overline{\omega'(t)} + \overline{\Phi(t)} \cdot \omega'(t) + \overline{\omega(t)} \Phi'(t) + \omega'(t) \Psi(t) &= \overline{\omega'(t)} [N(t) + iT(t)] \\ \Phi(t) \cdot \omega'(t) + \overline{\Phi(t)} \cdot \overline{\omega'(t)} + \overline{\omega'(t)} \Phi'(t) + \overline{\omega'(t)} \Psi(t) &= \omega'(t) [N(t) - iT(t)], \end{aligned} \quad (9)$$

Integrals of the Cauchy type [1] taken in the range from "-" infinity to "+" infinity from the boundary conditions (9) have the following form:

$$\Phi(\xi, \eta) = \frac{(B(\xi, \eta) - G(\xi, \eta))}{\omega p_1(\xi, \eta)}, \quad \Phi p_1(\xi, \eta) = \frac{B p_1(\xi, \eta) - G p_1(\xi, \eta) - \Phi(\xi, \eta) \cdot \omega_0 p_2(\xi, \eta)}{\omega p_1(\xi, \eta)}, \quad (10)$$

$$\omega(\xi, \eta) = \alpha \zeta(\xi, \eta) + \omega_0(\xi, \eta) \quad \omega p_1(\xi, \eta) = \omega_0 p_1(\xi, \eta) + \alpha$$

$$\omega_0(\xi, \eta) = a_1 / \zeta(\xi, \eta) - i + b_1 / \zeta(\xi, \eta) + tb - i$$

$$\omega_0 p_1(\xi, \eta) = a_1 / (\zeta(\xi, \eta) - i)^2 - b_1 / (\zeta(\xi, \eta) + tb - i)^2$$

$$G_1(\xi, \eta) = \frac{-\bar{K}_1}{(\zeta(\xi, \eta) - i)^2} + \frac{-\bar{K}_2}{(\zeta(\xi, \eta) + tb - i)^2}$$

$$G_1 p_1(\xi, \eta) = \frac{2\bar{K}_1}{(\zeta(\xi, \eta) - i)^3} + \frac{2\bar{K}_2}{(\zeta(\xi, \eta) + tb - i)^3} \quad K_1 = a_1 \Phi_0 \quad K_2 = \bar{b}_1 \Phi_0 tb \quad \Phi_0 = \wedge_{0,0}$$

$$\Phi_0 tb = \wedge_{1,0} \quad BN(\xi, \eta) = BBn(\xi, \eta)(L_4 - \zeta(\xi, \eta))$$

$$BBn(\xi, \eta) = Nc 2 \omega p_1(\xi, \eta) \cdot \ln \left(\frac{L_3 - \zeta(\xi, \eta)}{L_4 - \zeta(\xi, \eta)} \right) - bd_1 L(\xi, \eta) + bd_2 L(\xi, \eta)$$

$$BN_1(\xi, \eta) = -BBn(\xi, \eta) + (L_4 - \zeta(\xi, \eta)) \cdot Bn_1(\xi, \eta)$$

$$Bn_1(\xi, \eta) = Nc_2 \cdot (\omega p_2(\xi, \eta) \cdot u_{21}(\xi, \eta) + bd_{11} L(\xi, \eta) + bd_{21}(\xi, \eta)),$$

$$u_2(\xi, \eta) = \ln \left(\frac{L_3 - \zeta(\xi, \eta)}{L_4 - \zeta(\xi, \eta)} \right) \quad u_{21}(\xi, \eta) = \frac{-1}{L_3 - \zeta(\xi, \eta)} + \frac{1}{L_4 - \zeta(\xi, \eta)},$$

$$AN_1(\xi, \eta) = An_1(\xi, \eta) \cdot (L_4 - \zeta(\xi, \eta)),$$

$$An_1(\xi, \eta) = Nc 2 \omega p_1 c L(\xi, \eta) \cdot \ln \left(\frac{L_3 - \zeta(\xi, \eta)}{L_4 - \zeta(\xi, \eta)} \right) + bd_1 c L(\xi, \eta) + bd_2 c L(\xi, \eta)$$

$$\begin{aligned}
 bd_1 L(\xi, \eta) &= \frac{ha_2 L}{(\zeta(\xi, \eta) - i)^2} + \frac{ha_1 L}{(\zeta(\xi, \eta) - i)}, \\
 bd_2 L(\xi, \eta) &= \frac{hb_2 L}{(\zeta(\xi, \eta) + tb - i)^2} + \frac{hb_1 L}{(\zeta(\xi, \eta) + tb - i)}, \\
 bd_{11} L(\xi, \eta) &= \frac{-2ha_2 L}{(\zeta(\xi, \eta) - i)^3} + \frac{-ha_1 L}{(\zeta(\xi, \eta) - i)^2}, \\
 bd_{21} L(\xi, \eta) &= \frac{-2hb_2 L}{(\zeta(\xi, \eta) + tb - i)^3} + \frac{-hb_1 L}{(\zeta(\xi, \eta) + tb - i)^2}.
 \end{aligned}$$

To determine the constants K_1 and K_2 in the first equation (10), we successively represent that $\zeta_1 = i$ и $\zeta_2 = -tb - i$. As a result, we will have a system of two linear equations with complex coefficients. Let's add two more conjugate equations to them. The resulting system of four linear equations with coefficients $M_{k,m}$ in the left and M_{0k} on the right and look like:

$$\begin{aligned}
 M_{0,0} &= \omega p_1(0, -1), \quad M_{0,1} = 0, \quad M_{0,2} = n_1(0, -1), \quad M_{0,3} = nb(0, -1), \\
 M_{1,0} &= 0, \quad M_{1,1} = \omega p_1(-tb, -1), \quad M_{1,2} = n_1(-tb, -1), \quad M_{1,3} = nb(-tb, -1), \quad M_{2,0} = \overline{M_{0,2}}, \\
 M_{2,1} &= \overline{M_{0,3}}, \quad M_{2,2} = \overline{M_{0,0}}, \quad M_{2,3} = \overline{M_{0,1}}, \quad M_{3,0} = \overline{M_{1,2}}, \quad M_{3,1} = \overline{M_{1,3}}, \quad M_{3,2} = \overline{M_{1,0}}, \\
 M_{3,3} &= \overline{M_{1,1}}
 \end{aligned}$$

The right side of the system are:

$$M_{0,0} = B(0, -1) \quad M_{0,1} = B(-tb, -1) \quad M_{0,2} = \overline{B(0, -1)} \quad M_{0,3} = \overline{B(-tb, -1)},$$

For the coefficients of the system, we denote by:

$$n_1(\xi, \eta) = \frac{-a_1}{((\zeta(\xi, \eta) - i))^2} \quad nb(\xi, \eta) = \frac{-b_1}{(\zeta(\xi, \eta) + tb - i)^2}$$

The functions sought from the boundary conditions (9) then have the form:

$$\Phi(\xi, \eta) = \frac{(B(\xi, \eta) - G(\xi, \eta))}{\omega p_1(\xi, \eta)}, \quad \Phi p_1(\xi, \eta) = \frac{B p_1(\xi, \eta) - G p_1(\xi, \eta) - \Phi(\xi, \eta) \cdot \omega_0 p_2(\xi, \eta)}{\omega p_1(\xi, \eta)}, \quad (11)$$

$$\begin{aligned}
 \text{где } G(\xi, \eta) &= n_1(\xi, \eta) \overline{\Phi_0} + nb(\xi, \eta) \overline{\Phi_0} tb \\
 G p_1(\xi, \eta) &= n_1 p_1(\xi, \eta) \overline{\Phi_0} + nb p_1(\xi, \eta) \overline{\Phi_0} tb
 \end{aligned}$$

$$n_1 p_1(\xi, \eta) = \frac{2a_1}{(\zeta(\xi, \eta) - i)^3} \quad n b p_1(\xi, \eta) = \frac{2b_1}{(\zeta(\xi, \eta) + tb - i)^3}$$

$$G_1(\xi, \eta) = \frac{-\bar{K}_1}{(\zeta(\xi, \eta) - i)^2} + \frac{-\bar{K}_2}{(\zeta(\xi, \eta) + tb - i)^2}$$

$$G_1 p_1(\xi, \eta) = \frac{2\bar{K}_1}{(\zeta(\xi, \eta) - i)^3} + \frac{2\bar{K}_2}{(\zeta(\xi, \eta) + tb - i)^3}, \quad \Psi(\xi, \eta) = \frac{D_3(\xi, \eta) + D\Psi_3(\xi, \eta)}{\omega p_1(\xi, \eta)}, \quad (12)$$

Relations (12) due to the presence of poles in the vicinity $\zeta_1=i$ и $\zeta_2=-tb-i$ calculated by alternative relations. To check the boundary conditions with a load of a decreasing triangular diagram (see Fig. 1), the stresses were calculated for the contour points in the vicinity of the loaded section of the contour.

Table 1 - Calculation of stress with load

#	«x(ξ,0)»	«y(ξ,0)»	«σ η(ξ, -0)»	«τ ξ η (ξ, -0)»
1	379.1	378.5	-1.6*10 ⁻¹²	1.2*10 ⁻¹²
2	386.5	377.4	-47.6	-7.2*10 ⁻¹⁵
3	394.4	376.7	-45.1	2.2*10 ⁻¹⁴
4	402.9	376.4	-42.5	8.3*10 ⁻¹⁵
5	412.1	376.4	-39.9	-1.2*10 ⁻¹⁴
6	422	376.6	-37.4	0
7	432.7	376.8	-34.8	5.5*10 ⁻¹⁵
8	444.1	377	-32.3	-1*10 ⁻¹⁴
9	456.2	377	-29.7	-1.3*10 ⁻¹⁴
10	469	376.7	-24.6	11*10 ⁻¹⁵
11	482.5	375.9	-22.1	-6*10 ⁻¹⁵
12	496.5	374.5	-19.5	2.9*10 ⁻¹⁴
13	511.1	372.5	-16.9	0
14	525.9	369.7	-14.4	-1*10 ⁻¹⁴
15	541	366.1	-11.8	3.6*10 ⁻¹⁵
16	556.1	361.7	-9.3	4.6*10 ⁻¹⁵
17	571.2		-6.7	-2.9*10 ⁻¹⁵
18			-4.2	3.9*10 ⁻¹⁵
19			-1.6	0
20		...	1*10 ⁻¹⁴	1.4*10 ⁻¹⁴
21				4.3*10 ⁻¹⁵

From Table 1. in the columns for stress components, which are perpendicular to the contour points of the mountain slope massif, it can be seen that the numerical values decrease linearly and duplicate the law of variation of the external load diagram (Fig.1), where the tangent component

at all points of the contour is zero. The calculation of the stress components was also performed and the regularities of the stress distribution were obtained, which are presented in the form of

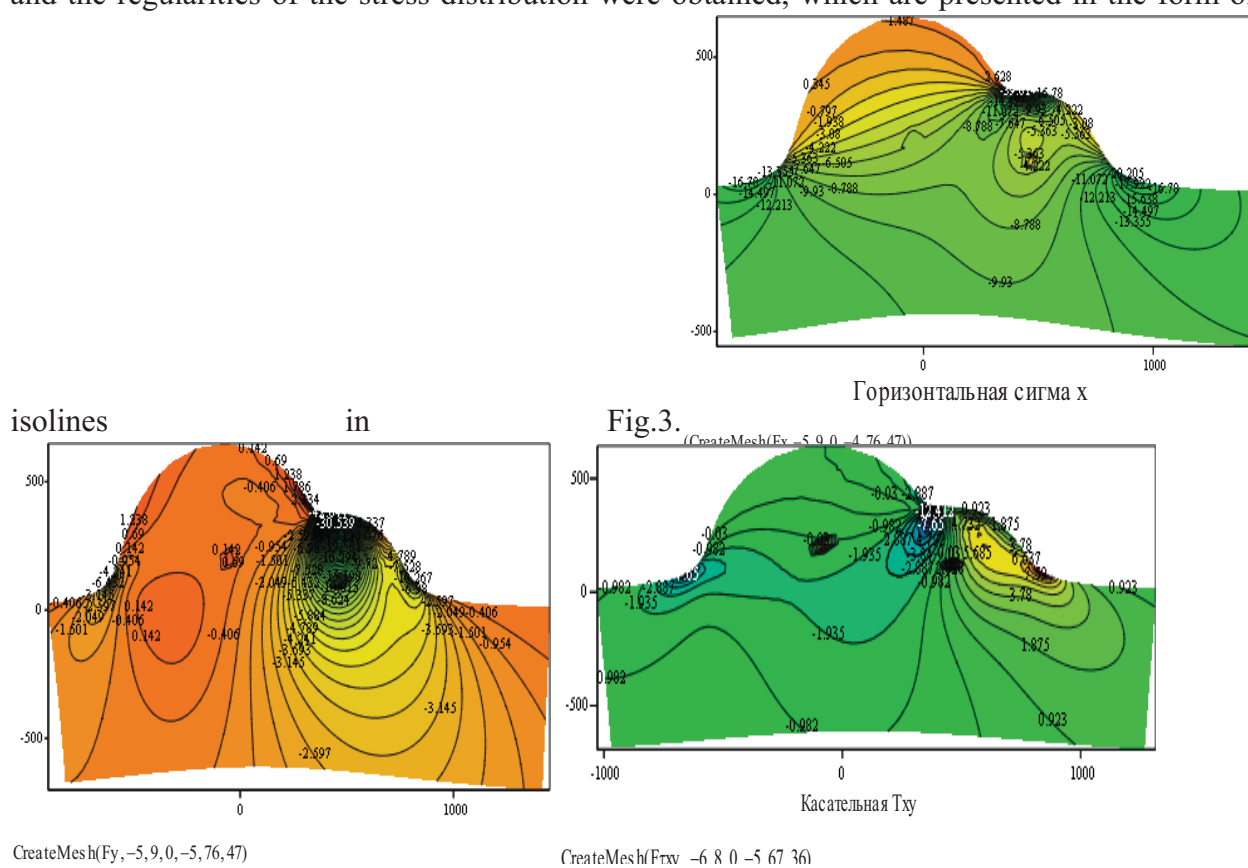


Fig. 3. Isolines of stress distribution

Fig. 3. It can be seen that the stress isolines indicate the influence of the mountain slope protrusion, where the law of distribution of external load leads to a very complex stress distribution law, which is difficult to predict without performing calculations with specific parameters of the mountain slope with a protrusion at the places of external load application.

The primary stress state of the mountain slope is a ledge.

The initial stress state of the mountain slope massif with a ledge experiencing the action of the forces of gravity and tectonic compression (without external loads) satisfy the equilibrium equations (5) and the boundary conditions (7) at all points of the mountain range. In order for conditions (7) to be satisfied at all points of the array contour, it is necessary to apply fictitious loads N and T, which arise from stress fields (6). Fictitious loads are calculated by the ratios:

$$N + iT = \frac{\sigma_x^n + \sigma_y^n}{2} + \frac{\sigma_y^n - \sigma_x^n}{2} * e^{2i\alpha} \quad N - iT = \frac{\sigma_x^n + \sigma_y^n}{2} + \frac{\sigma_y^n - \sigma_x^n}{2} * e^{-2i\alpha} \quad (13)$$

$$\text{For contour points } e^{2i\alpha} = \frac{\omega'(\xi)}{\overline{\omega'(\xi)}} \quad e^{-2i\alpha} = \frac{\overline{\omega'(\xi)}}{\omega'(\xi)} \quad y = (\omega(\xi) - \overline{\omega(\xi)}) / (2 * i).$$

we introduce the notation: $T_1 = T_x / 2$ $T_2 = \alpha * i * A_2 / 2$ $T_3 = i * (A_1 + A_2) / 4$ $T_4 = -i * (A_1 - A_2) / 4$

Relationships for $\Phi(\zeta)$ and $\Psi(\zeta)$ will be determined from functions (11) and (12), if we replace AN (ζ) to A(ζ) and BN(ζ) to B(ζ).

Calculations of the initial stress state of a mountain slope massif with a ledge were performed according to the above accepted scheme, first for the contour points of the massif, where the boundary conditions (7) must be met, and then for the entire mountain slope massif with a ledge. The values of the contour stress components are listed in Table 2.

The first column 0 contains the values of the variable ξ ; the second and third columns are the coordinates of the contour points x and y; the fourth and fifth columns contain the values of the main normal stress components; the sixth and seventh columns contain the normal and tangential stresses contour; the eighth column shows the values of the maximum shear stress.

Table 2 - Values of contour stress components

#	« ξ »	«x»	«y»	« σ_1 »	« σ_2 »	«N»	«T»	«Tmax»
1	-5-	-899,7	27,9	$2,1 \cdot 10^{-14}$	-122	$8,4 \cdot 10^{-15}$	$4,4 \cdot 10^{-14}$	-118,7
2	-4	-780,8	41,7	$1,4 \cdot 10^{-14}$	-207,6	$1,4 \cdot 10^{-14}$	$4,3 \cdot 10^{-14}$	-186,1
3	-3	-676,8	69,1	$2,8 \cdot 10^{-14}$	-418,2	$2,8 \cdot 10^{-14}$	$2,8 \cdot 10^{-14}$	-204,2
4	-2	-596,9	133,7	$5,7 \cdot 10^{-14}$	-540,6	$2,8 \cdot 10^{-14}$	$7,1 \cdot 10^{-14}$	-92,9
5	-1	-522,1	322,9	0	-156,7	$7,1 \cdot 10^{-15}$	0	-77
6	0	-95,6	644,5	$5,7 \cdot 10^{-14}$	-59	$5,4 \cdot 10^{-14}$	$-4 \cdot 10^{-15}$	-58,5
7	1	326,2	407,6	$8,5 \cdot 10^{-14}$	-208,8	$8,5 \cdot 10^{-14}$	$4,2 \cdot 10^{-14}$	-24,8
8	2	503,3	364,5	$2,1 \cdot 10^{-14}$	-69,4	$2,5 \cdot 10^{-14}$	$2,2 \cdot 10^{-14}$	-67,7
9	3	753,4	205,1	$2,8 \cdot 10^{-14}$	-142,5	$3,6 \cdot 10^{-14}$	$1,8 \cdot 10^{-14}$	-16,8
10	4	845,8	91,8	$8,5 \cdot 10^{-14}$	-349,1	$8,5 \cdot 10^{-14}$	$-5 \cdot 10^{-14}$	-33,2
11	5	943,5	50,8	$7,1 \cdot 10^{-14}$	-216,2	$8,2 \cdot 10^{-14}$	$7,1 \cdot 10^{-15}$	-170,9
12	6	$1,1 \cdot 10^3$	32	$2,1 \cdot 10^{-14}$	-125,1	$2,4 \cdot 10^{-14}$	$1,8 \cdot 10^{-14}$	-119,5
13	7	$1,2 \cdot 10^3$	22,2	$1,4 \cdot 10^{-14}$	-83,1	$1,6 \cdot 10^{-14}$	$1,6 \cdot 10^{-14}$	-82
14	8	$1,3 \cdot 10^3$	16,3	$7,1 \cdot 10^{-15}$	-60,9	$8,6 \cdot 10^{-15}$	$4,4 \cdot 10^{-15}$	-60,6
15	9	$1,5 \cdot 10^3$	12,5	$1,4 \cdot 10^{-14}$	-47,7	$1,7 \cdot 10^{-14}$	$2,3 \cdot 10^{-14}$	-47,6
16	10	$1,6 \cdot 10^3$	9,9	0	-39,2	$3,5 \cdot 10^{-15}$	$10 \cdot 10^{-15}$	-39,1
17	11	$1,7 \cdot 10^3$	8,1	$3,6 \cdot 10^{-15}$	-33,3	$2,3 \cdot 10^{-15}$	$1,6 \cdot 10^{-14}$	-33,3
18	12	$1,9 \cdot 10^3$	6,7	$3,6 \cdot 10^{-15}$	-29,1	$4,4 \cdot 10^{-15}$	$9,1 \cdot 10^{-15}$	-29,1
19	13	$2 \cdot 10^3$	5,6	$1,8 \cdot 10^{-15}$	-25,9	0	$4,7 \cdot 10^{-15}$	-25,9
20	14	$2,2 \cdot 10^3$	4,8	$1,8 \cdot 10^{-15}$	-23,5	$1,7 \cdot 10^{-15}$	$3,3 \cdot 10^{-15}$	-23,5
21	15	$2,3 \cdot 10^3$	4,2	$1,8 \cdot 10^{-15}$	-21,6	$3,8 \cdot 10^{-15}$	$1,5 \cdot 10^{-14}$	-21,6
22	16	$2,5 \cdot 10^3$	3,6	$1,8 \cdot 10^{-15}$	-20,1	0	$7,5 \cdot 10^{-15}$	-20,1
23	17	$2,6 \cdot 10^3$	3,2	$3,6 \cdot 10^{-15}$	-18,9	$1,6 \cdot 10^{-15}$	$1,5 \cdot 10^{-14}$	-18,9
24	18	$2,7 \cdot 10^3$	2,8	0	-17,8	0	$1,3 \cdot 10^{-14}$	-17,8
25	19	$2,9 \cdot 10^3$	2,5	0	-17	0	$1,2 \cdot 10^{-15}$	-17

The contents in the fourth, fifth, sixth and seventh columns indicate that the boundary conditions in (7) are satisfied very accurately, where the error is not more than ten to the thirteenth power (10^{-13}).

The distribution patterns of the initial stress state of a slope massif with one step are shown in Fig.4, for each stress component in the form of stress isolines.

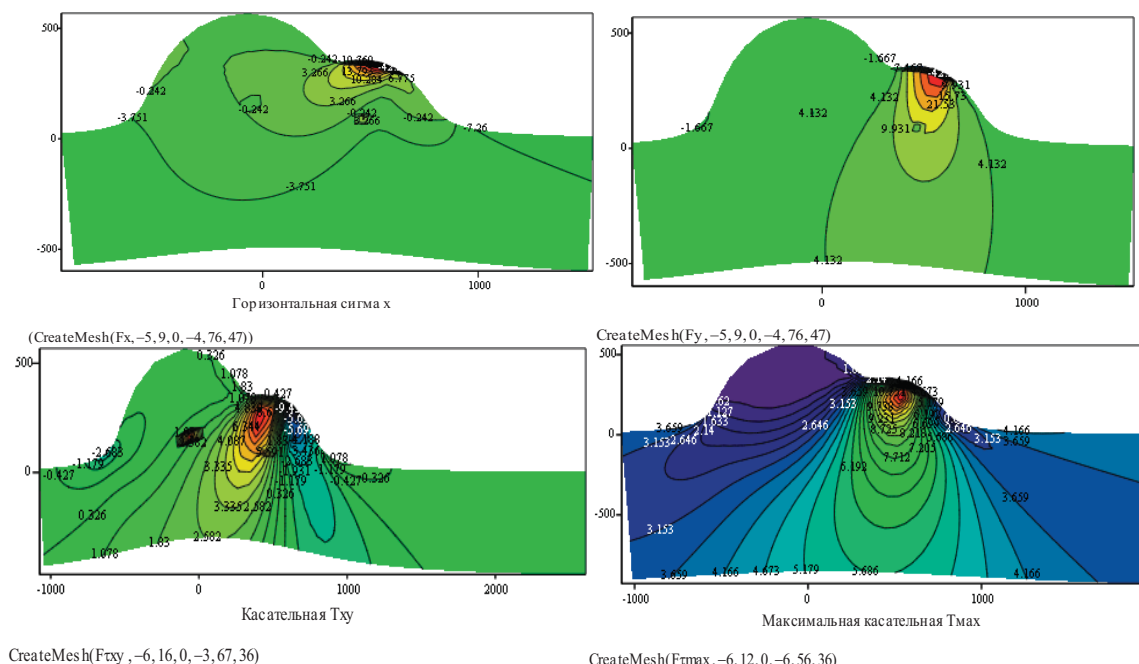


Figure: 4. Distribution of stresses from the action of gravitational forces

Thus, all calculations were carried out and the distribution patterns of the initial stress state of a slope massif with one step were obtained.

3 Conclusions

- The stress state of a mountain slope with a scarp under the action of gravitational, horizontal tectonic forces and a distributed external load with a decreasing triangular diagram are described by analytical relationships.
- Regularities of stress distribution in the massifs of a mountain slope with a scarp from the action of external load by a decreasing triangular diagram and from the action of gravitational, horizontal tectonic forces were established each separately.

- The general stress state of a mountain slope with a scarp from all the listed forces is determined by preliminary summing only the ratios $BN(\zeta) + B(\zeta)$, $AN(\zeta) + A(\zeta)$ and calculated stress components using the functions $\Phi(\zeta)$ и $\Psi(\zeta)$.
- The computer soft MATHCAD was used to calculate the stresses [11].

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НАПРЯЖЕННОЕ СОСТОЯНИЕ СКЛОНА ГОРЫ С УСТУПОМ ПРИ ДЕЙСТВИИ ВНЕШНЕЙ НАГРУЗКИ С УБЫВАЮЩЕЙ ТРЕУГОЛЬНОЙ ЭПЮРОЙ

*Кыскача мазмуну: Бул макалада
MATCAD программасынын
компьютердик тутумун, гравитациялык,
горизонталдык тектоникалык
күчтөрдүн таасири астында тоо
боорунун стресстик абалын жана
кыскарган үч бурчтук диаграмма менен
бөлүштүрүлгөн тышкы жүктөмдү
колдонуу менен сүрөттөмө берилген
жана эсептөөлөр жүргүзүлгөн, бул
тыянак аналитикалык талдоолор менен
сүрөттөлгөн. Тыш каптаган тоо
массивдериндеги стресстин тышкы
жүктүн таасиринен скари менен
бөлүштүрүлүшүнүн закон
ченемдүүлүктөрү белгиленди, мында
гравитациялык, горизонталдык
тектоникалык күчтөрдүн иш-
аракеттери ар бири өзүнчө эске алынган.
Бардык келтирилген күчтөрдүн скари
менен тоо боорунун жалпы стресстик
абалы $BN(\zeta) + B(\zeta)$, $AN(\zeta) + A(u)$
катыштарын гана алдын-ала суммалоо
менен аныкталат жана стресс
компоненттеринин эсептөөлөрү $\Phi(\zeta)$
жана Ψ (функциялары) аркылуу
жүргүзүлгөн. ζ).*

*Негизги сөздөр: Чыңалуунун
абалы, тоо тектери, тоо кыркалары,
тартылуу күчтөрү, горизонталдык
тектоникалык күчтөр, чыңалуунун
бөлүштүрүлүшү, Мусхелишвили
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**НАПРЯЖЕННОЕ СОСТОЯНИЕ
СКЛОНА ГОРЫ С УСТУПОМ ПРИ
ДЕЙСТВИИ ВНЕШНЕЙ НАГРУЗКИ
С УБЫВАЮЩЕЙ ТРЕУГОЛЬНОЙ
ЭПЮРОЙ**

***Анотация:** В данной статье дано описание и проведены расчеты с помощью компьютерной системы программы MATCAD, напряженного состояния склона горы с уступом при действии гравитационных, горизонтальных тектонических сил и распределенной внешней нагрузки с убывающей треугольной эпюрой, данный вывод описан аналитическими соотношениями. Установлены закономерности распределения напряжений в массивах склона горы с уступом от действия внешней нагрузки где учитывались действия гравитационных, горизонтальных тектонических сил каждые в отдельности. Общее напряженное состояние склона горы с уступом от всех перечисленных сил определяются предварительным суммированием только соотношений $BN(\zeta) + B(\zeta)$, $AN(\zeta) + A(\zeta)$ и выполнены расчеты компонентов напряжений с помощью функций $\Phi(\zeta)$ и $\Psi(\zeta)$.*

Ключевые слова: Напряженное состояние, горные массивы, уступы, гравитационные силы, горизонтальные тектонические силы, распределения напряжений, соотношения Мухелишвили, изолинии.

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WATER HAMMER MODULATOR WITH SEDIMENT FLUSHING SYSTEM

Annotation: The article describes an improved ram type water hammer modulator with sediment flushing system and the results of its laboratory research. The modulator can pump great amounts of water to high elevations. Besides, launching of the modulator does not require significant effort, and the sediment flushing system simplifies operation of the device.

Keywords: water hammer modulator, sediment flushing, water discharge, relief valve

Introduction

The water hammer modulator with a sediment flushing system, for which patents of the Kyrgyz Republic were obtained, was developed by E. B. Bekboev and R. S. Bekboeva [3, 4]. The design allows to launch the device of any size and under any load on the discharge valve, to pump water to a height of up to 300 m using the energy of the water flow moving in the pipeline, as well as flushing the sediments accumulated in the pallet and elbow bend that greatly simplifies operation.

The water hammer modulator with a sediment flushing system is installed in the structure **1** and contains a percussion tube **2** with a valve in the middle of the tube installed in the downstream part of the structure and connected by its one end to the upstream part of the structure (Fig.1), the second end of the tube is connected to the working cabinet of the ram pump which contains a central tube **4** and a water-intake chamber **5** installed in the middle of the

working cabinet. Besides, the central tube **4** has a system of holes **6** which connect its cavity with the cavity of the water-intake chamber **5**, while the water-intake chamber, in its upper part, has the escape hole **7**. The device also contains a waste valve **8** installed in the cavity of the water-intake chamber **5** under the escape hole **7**, a drawdown chamber **9** installed on the water-intake chamber **5** above the escape hole **7**, a drawdown tube **10** with a valve **11** in the middle connected by its one end to the drawdown chamber **9**, the second end of the tube is installed in the downstream part of the structure **1**, a water-intake tube **12** with a valve **13**, an air tap **14** installed on the drawdown chamber **9**, an elbow bend **15** connected to the end of the central tube **4**, an air pressure tank **16** installed on the other end of the elbow bend **15** with a hole **17** and a pressure valve **18** fits into hole **17**, a pressure tube **19** with a valve **20** one end of which is connected to the air pressure tank **16**, and also a pallet for bottom sediments accumulation **21**, flushing tube **22** with a valve **23**. The device can also contain a supplemental sediment takeoff tube **24**.

In the considered device, the primary water hammer is created by the energy of the water flow contained in the device cavity. In this case, the starting (launching) water hammer, as in existing hydraulic rams, is the first water hammer which creates a single high-pressure wave (+ ,+) which launches the operation of the hydraulic ram

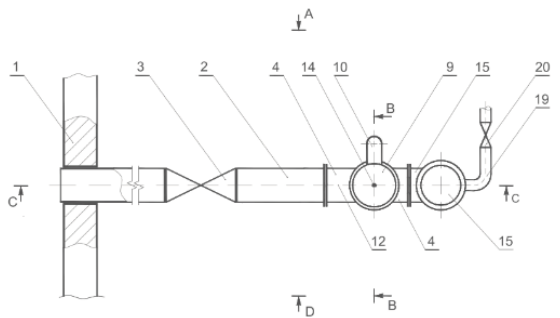


Fig. 1. Planned location of the modulator in the structure

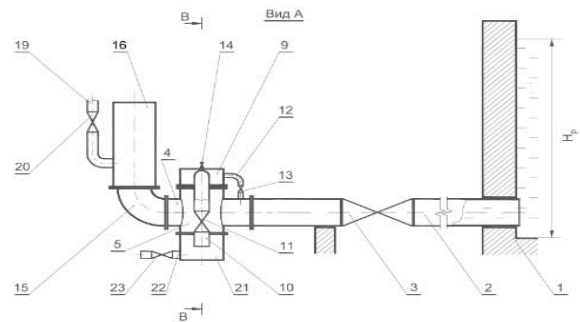


Fig. 2. View A of the modulator in the structure

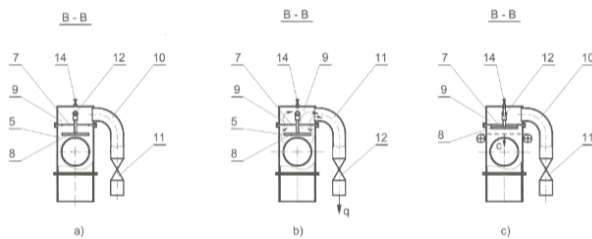


Fig. 3. Pressure valve operation when the device is turned on

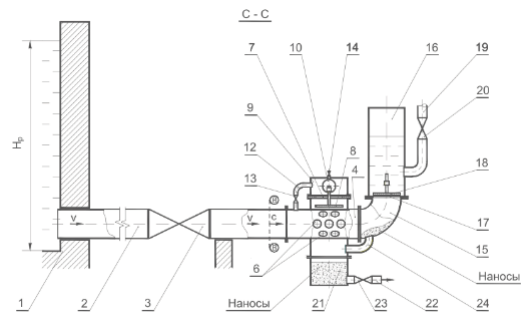


Fig. 4. Sediment flushing of the pallet and elbow bend.

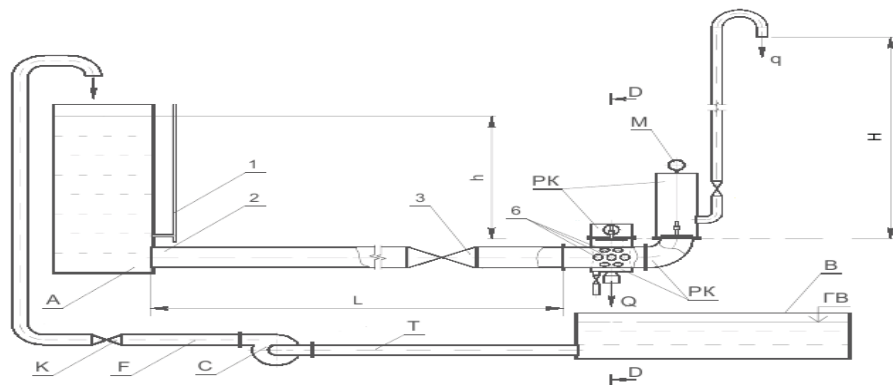


Fig.5. Installation for hydraulic research of the ram pump

Materials and Methods

The device was studied in the laboratory of hydraulics of the Hydraulic Engineering Department using generally accepted methods

of physical modeling in accordance with the criteria of hydraulic similarity.

The research was conducted to study the main characteristics of the modulator: the dependence of the discharge valve speed (the

number of valve strokes per minute) on the effective pressure, water supply on the discharge flow, and the design efficiency on the waste valve speed.

The water discharge was determined using the volumetric method. The tank volume made up of $V=22.7$ liters.

The modulator's efficiency was determined using the formula:

$$\eta = qH/Qh$$

Here: q is the supplied water flow rate, l / s,

Q is the discharge water flow, l / s,
 H is the effective pressure, cm,
 h is the pressure above the relief valve, cm.

Results

The graphs reflecting the main characteristics of the modulator were drawn on the results of the device laboratory hydraulic research.

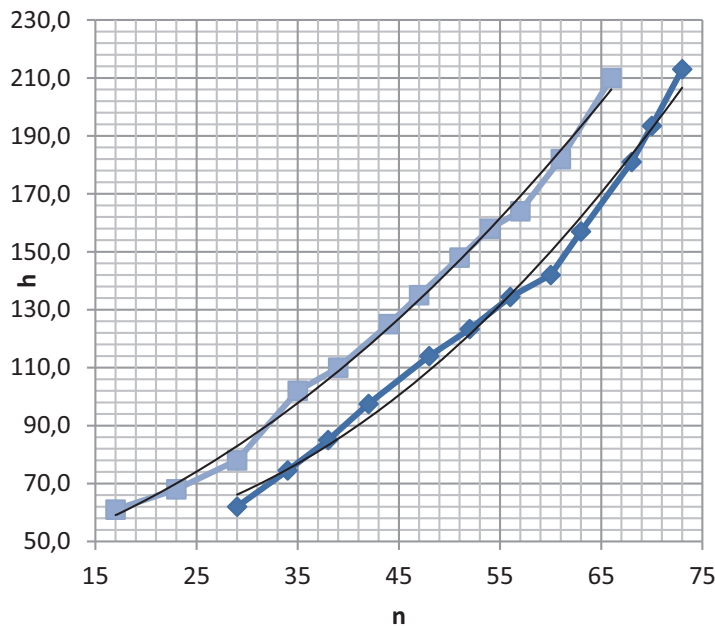


Fig.6. Dependence of the discharge valve speed on the effective pressure

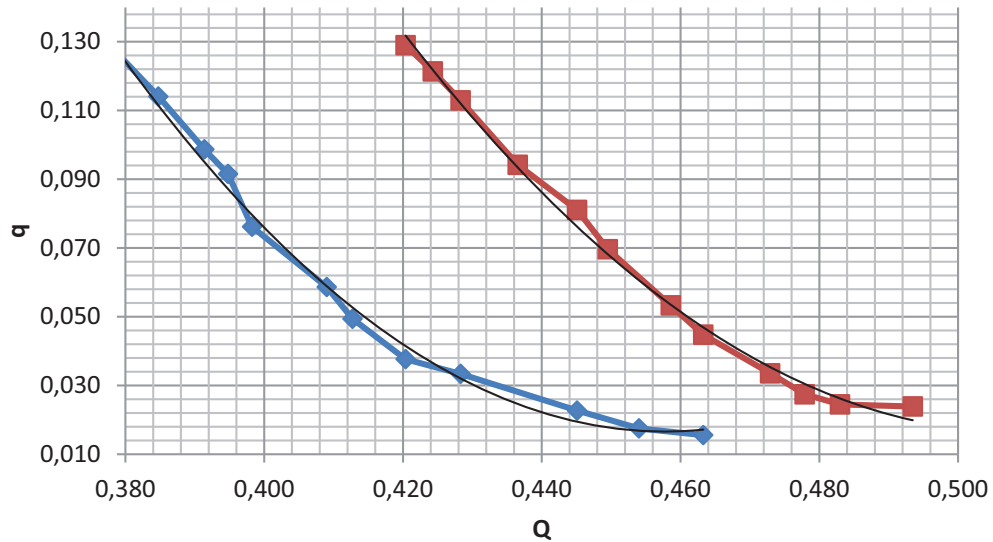


Fig.7. Dependence of the water supply flow q on the discharge flow Q .

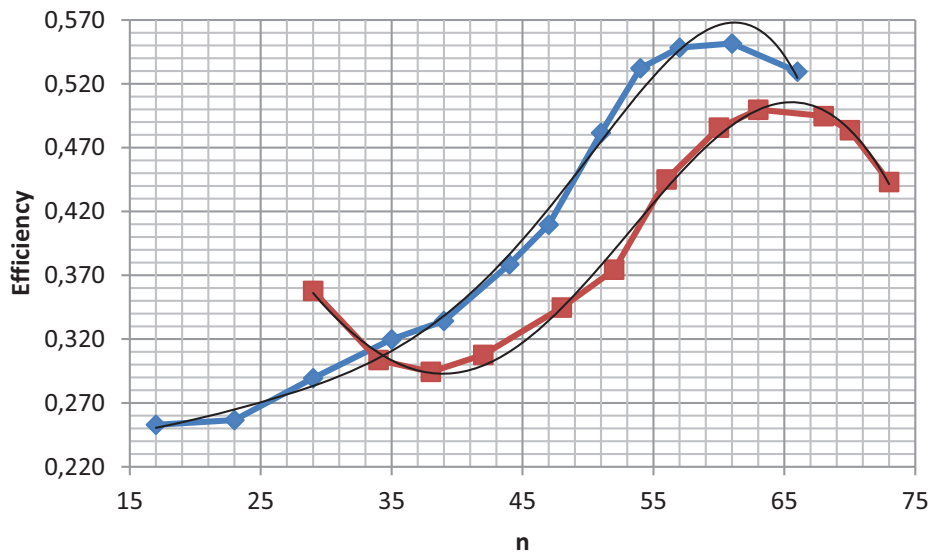


Fig.8. Dependence of the design efficiency on the waste valve speed n , strokes per min

Discussion

Laboratory studies of the improved design of the water hammer modulator with a sediment flushing system show that the main characteristics of the device, such as efficiency, the dependence of the speed of the hydraulic ram discharge valve on the pressure h , the ratio of water supply and discharge flow, do not decline, and the distinctive features of the proposed design increase its reliability and other operational characteristics.

Conclusion

This water hammer modulator is an environmentally friendly ram type water pump, it does not demand water quality and does not depend on entrained and suspended sediments, such as sand, gravel, organic impurities, floating objects.

The water hammer modulator of advanced design with a sediment flushing system is reliable in operation, does not

require constant maintenance and only needs preventive measures.

The device can be turned on easily by opening the valve. When working, the area around and near the device remains dry, since water is discharged not outwards, but into the cavity of the closed discharge chamber, and then into the downstream part of the structure.

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ШИЛЕНДИЛЕРДЕН ЖУУП ТАЗАЛОО СИСТЕМАНЫ КАМТЫГАН ГИДРАВЛИКАЛЫК СОККУЛАРДЫН МОДУЛЯТОРУ

Аннотация: Бул макалада шилендилерден жууп тазалоо системаны камтыган гидравликалык соккулардын модуляторунун жакшырылган конструкциясы жана анын лабораториялык изилдөөнүн жыйынтыгы келтирилген. Бул түзүлүш чоң өлчөмдөгү сууну бийик көтөрүп алат, аны аракетке

келтирүү бир кыйла күчтү талап кылбайт, ал эми шилендилерден жууп тазалоо системасы конструкциянын эксплуатациясын жеңилдетет

Өзөктүү сөздөр: гидравликалык соккулардын модулятору, шилендилерди жууп тазалоо, суунун чыгымы, суу таштоочу сарпбашкаргыч

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МОДУЛЯТОР ГИДРАВЛИЧЕСКИХ УДАРОВ С СИСТЕМОЙ ПРОМЫВКИ НАНОСОВ

Аннотация: В статье рассмотрены особенности конструкции, принципа работы и результаты лабораторных исследований модулятора гидравлических ударов. Устройство предназначено для подъема больших расходов воды на большую высоту,

причем, включение его не требует значительных усилий, а система промывки наносов упрощает эксплуатацию конструкции.

Ключевые слова: модулятор гидравлических ударов, промывка наносов, расход воды, сбросной клапан.

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SECTION VI. MECHANIZATION

UDC: 631.301

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MODERN APPROACHES TO THE FORMATION OF AN AGRICULTURAL MACHINERY PARK

Annotation: The article presents the current state and prospects of the formation of a fleet of agricultural machines in the modern economic conditions in the Kyrgyz Republic.

Key words: agricultural sector, agricultural machinery, linking technology, machine complex, co-operative economy.

The Kyrgyz Republic is an agrarian country. The agrarian sector has been and remains the main one in ensuring food security and food independence of the country. Currently, this sector of the economy forms almost one-third of the gross domestic product (GDP). The development of agriculture contributes to the development of other sectors since it allows to provide these sectors with raw materials, especially the industrial enterprises.

As a result of reforms in the agricultural sector, the methods and ways of farming have radically changed, covering economic, organizational, technological, legal, social, and other aspects. The land and property of 400 collective farms (kolkhozes), which make up 75% of arable land, were privatized. More than 300 thousand peasant, farm, and individual farms have been organized, as well as more than 460 agricultural cooperatives (cooperative

farms). About 90% of food production is provided by agricultural cooperatives and small farms, peasant, individual farms, a land market has been formed, and in recent years opportunities have been created for getting loans from the bank using land and other property as collateral.

In general, there are some positive aspects, but the latest agrarian reform led to a deep crisis in agriculture. The crisis has a predominantly technical and technological nature. The physical infrastructure of agriculture has been completely destroyed in the country. There is a contradiction between the need to improve the efficiency of agricultural production and the effectiveness of possible ways of its implementation. Due to a large number of small farms and agricultural cooperatives and the limited size of their shared land, the maintenance and operation of agricultural machinery have become a serious problem. The proposed credit terms, which provide a short time for repayment, are unacceptable for agricultural machinery (especially for the main types: combines, tractors, seeders, etc.). As a result, there is an acute shortage of equipment during the agricultural season, as well as high costs for its operation.

Table 1.

The availability and needs of the industry in agricultural machinery [1].

№	Name of agricultural machinery	In stock	Required additionally
1.	Tractors total:	22 704	5 347
2.	Combines:		
3.	Grain harvesting	2 979	1 851
4.	Forage harvesting	99	411
5.	Trailed forage harvesters	253	1 210
6.	Seeders	2 765	1 176
7.	Cultivators	2 208	5 530
8.	Tractor plows	7 267	300
9.	Disc harrows	191	1 933
10.	Tractor mowers	1 550	744
11.	Tractor rake	645	648
12.	Balers	926	221
13.	Grain cleaning machines	383	200
14.	Potato planters	114	60
15.	Potato diggers	351	3 000
16.	Sprayers	515	200
17.	Disc cultivators	71	900
18.	Seed treaters	30	200
19.	Roller headers	116	600
20.	Beet lifters	150	150
21.	Pickers	12	200
22.	Milking machines	72	200
23.	Grain feed crushers	188	300

In recent years, there has been an annual decline in the country's agricultural production. The share of agriculture in GDP in 2014 was 14.7, by 2018 it fell to 11.7, but in the last two years, there has been a tendency for the share to rising and in 2020 it was 15.4% [2].

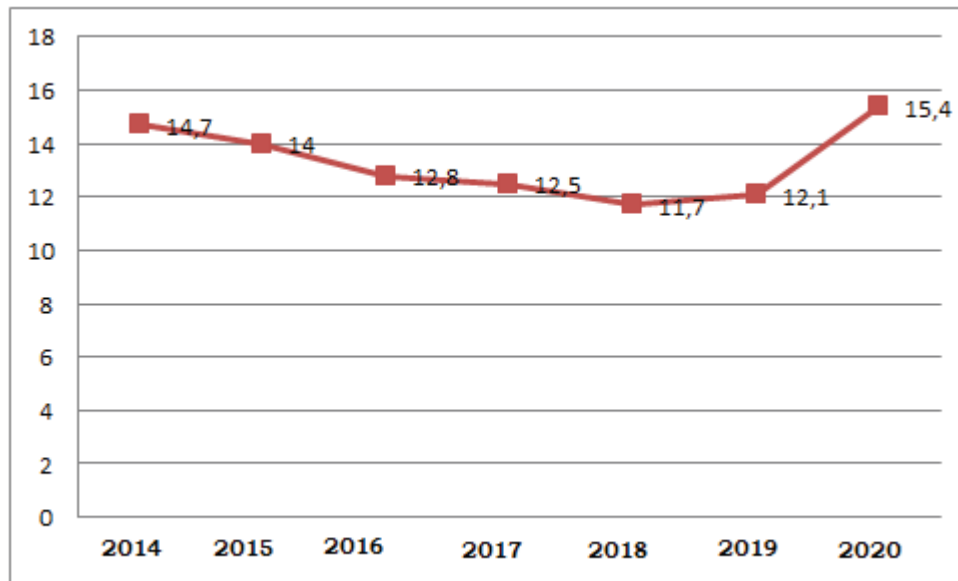


Fig. 1. Share of agricultural production in the country's GDP

The scale of the shortage of agricultural machinery in the republic is estimated from 30 to 50% (for the main types of machinery). The wear of equipment reaches 80%. With an average service life of the main types of agricultural equipment of 8-10 years, the age composition of tractors over 10-12 years of operation is about 90%, grain harvesters 80% [3].

Attempts to update the physical infrastructure of agriculture at the expense of imported equipment creates a problematic situation, since when such equipment is imported, their expertise, testing, and certification are not carried out. Performance, local adaptability, reliability, and other characteristics are not tested. Although, if the purchase price was lowered due to concessional loans, then further operation due to the rise in the cost of spare parts and consumables, the lack of service centers does not bring the expected effect to agricultural workers. The government, through grants for huge amounts of money, purchases agricultural machinery, which turns out to be of poor quality, not reliable, not adapted to the conditions of the republic, which ultimately turns out to be ineffective.

Not only the imported agricultural equipment does not pass testing and technical expertise, but spare parts (imported mainly from China) are also not controlled, the quality, reliability, and service life of spare parts are significantly lower than required.

With regard to the use of imported agricultural machinery, there is good practical experience in the Republic of Uzbekistan, where a prototype of imported machinery is tested, its operability is checked under economic conditions for a certain time, and only after a positive conclusion of the expert commission, the machinery is introduced into production.

The conclusion is obvious: imported agricultural machinery is not adapted to the conditions of certain regions of the republic; due to the difference between manufacturers of agricultural machinery, there is no mutual technological linkage (compatibility).

When there is no mutual technological linkage, there is a cut of plants at the butt-row spacings occur during cultivation or the introduction of mineral fertilizers and, accordingly, it leads to the loss of yield. For example, all technical means in the technology of corn cultivation should

have the following mutual technological coordination: the SPCh-6 seeder sows corn in 6 rows with a row spacing of 70 cm, the KRN-4.2 cultivator processes 6 rows with a

row spacing of 70 cm. And the Khersonets combine removes also 6 rows with between 70 cm.

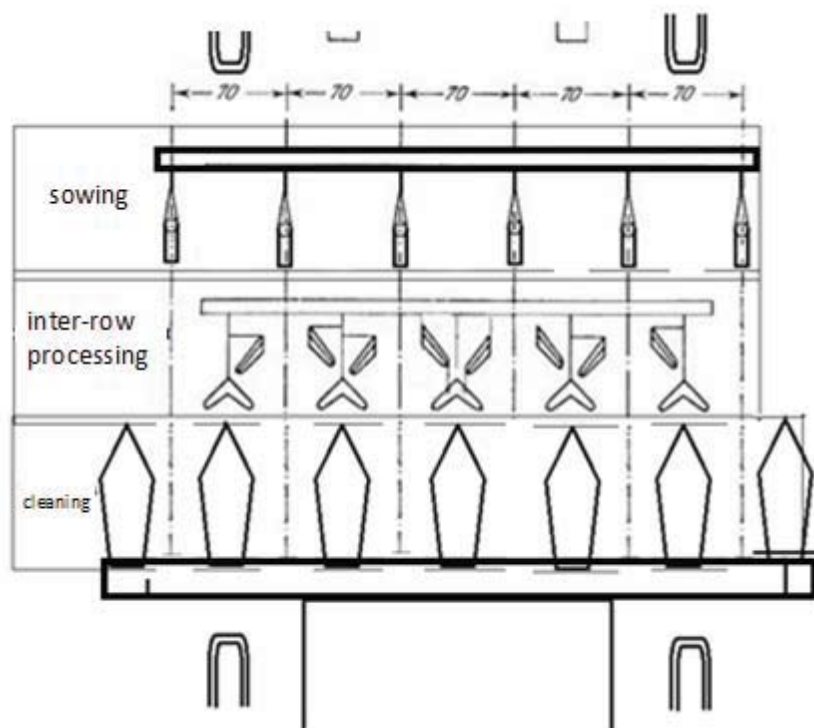


Fig. 2. Scheme of the formation of interconnected technological operations.

The analysis shows that a simple replacement of decommissioned equipment with similar ones does not allow solving the existing problems of agricultural mechanization. As a country that does not have a branch of agricultural engineering, but has its own scientific developments and inventions in the field of agricultural mechanization, when forming the physical infrastructure of agricultural production, it is necessary to be based on the following fundamental principles: borrowing foreign promising agricultural technologies, adapting them to local conditions by conducting appropriate tests and examinations and commercialization of domestic scientific developments in agricultural mechanization.

The formation of a complex of machines according to this principle provides

for the development of scientific and methodological foundations of this formation of appropriate market conditions of management and is a prerequisite for creating

the material and technical base of agricultural production. This principle forms the basis of an integrated approach, takes into account the variety of climatic and organizational and economic features of the functioning of agricultural machinery in conditions of different types of farms, for the timely implementation of work on the cultivation and harvesting of agricultural crops.

In the existing structure of agriculture, cooperative farms are promising. Practice shows that the efficiency of the introduction of agricultural production, especially the use of agricultural machinery

in these farms, is higher than that of small farms. Therefore, at present, there is a tendency for the formation of new cooperative farms, as well as associations of peasant (farmer) farms on a voluntary basis with a rational choice of areas of management, i.e. these are modern collective farms.

Such dynamism of the structures and directions of modern farms is explained by market relations and, in turn, requires appropriate changes and adjustments in the brand composition of the types of agricultural machinery that is used. Therefore, when justifying a complex of machines for cooperative (collective) farms, it is advisable to use forecasting methods in combination with other optimization methods.

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