IRSTI 39.29

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Geoinformation support, analysis, evaluation and forecasting of the use of land resources of Kyzylorda region

Abstract. *Currently, the agricultural activities of almost all developed, civilized countries in the world are carried out on the basis of the design of a system of Agriculture adapted to the landscape and are actively engaged in it. In order to comprehensively substantiate this branch of Industrial Science and identify the possibilities and features of its formation in Kazakhstan, it is necessary to carry out specific research work with a high degree of truth. Therefore, in the proposed work, the best ways to use the modern Geoinformation system in order to select, recognize and analyze the agro-landscapes of the Kyzylorda region and analyze them from the point of view of Geographical Sciences were sought. Kyzylorda region is an administrative region located in the southern part of the Republic of Kazakhstan. The region is distinguished by its agriculture. Agriculture has developed in the region since ancient times. In addition, every year farmers are intensively working in the direction of changing varieties, diversifying crops.*

We can solve the main problems of our country through preliminary design work using modern technologies.

Key words: *cartography, agriculture, research method, landscapes, agrolandscapes, GIS.*

DOI: https://doi.org/10.32523/2616-6771-2023-144-3-105-118

Introduction. The terrain is widely studied and discussed on maps that have special morphometric indicators. However, the method of collecting relief information and, based on it, capturing morphometric maps in the traditional «way» requires a lot of labor and effort to use for large-scale areas.

With the development of modern science and technology, the widespread development of geoinformation systems has made it much easier to obtain quantitative data on the studied area. Therefore, an electronic image of the relief is displayed on the basis of geographic information systems with digital samples of the relief. The main requirement in the process of obtaining this information and using GIS Technologies is the adequacy and high quality of samples.

Currently, in the vast majority of frequently used GIS technologies, although many methods and techniques have been created to create a digital pattern of relief, almost all of them have some limitations and errors. In this regard, the main goal is considered to be the compilation and use of methodologies that reduce the amount of errors. Since morphometry is a scientific area of geomorphology, in order to identify and describe relief, it studies detailed numerical data about it.

He determined the history of the formation and development of the relief through his methods and methods of research, formed the main patterns and morphological foundations that determine the formation of the terrain in the study of the relief in accordance with the research direction of Science. The most important one, including the main method, is morphometric analysis. After determining the quantitative indicators of the relief using special measurements,

the set of their characteristics may differ. It also depends on the purpose of morphometric research and the regional units used. The history of morphometric analysis, in principle, can be divided into three stages. Each of them was widely discussed in the work of subsequent researchers. According to G.I. Yurenkov and I.S. Shchukin, the initial stage includes work related to the compilation of methods for determining Heights, lengths, areas, complex edematous areas of the terrain. It is worth noting that all this data was achieved on the basis of the appearance of various devices. For example, as a result of the initial stage, topographic characteristics of morphometric analysis were compiled. The second stage of development of morphometry was determined in the course of analyzing the obtained quantitative data on the relief.

Among the earliest works published at the beginning of the period, one can name the works of A. Humboldt, who conducted an orometric study in the Andes at the end of the 18th century. The features of morphometric studies of that time are the comparison of simple relief shapes and geometric shapes. At the same time, the first morphometric maps and the first coefficient indicators were compiled and determined. So, in 1826, Karl Ritter introduced the concept of «compactness» (compactness) of continents, that is, the ratio of area to perimeter. These were the first attempts to describe the relief. In addition, there were many researchers who suggested different coefficients in the description of the relief.

Karl Koritzka [1], for example, proposed a new method for determining the average height of a region in 1854. A. Penk defined gypsum curves for individual regions. Among those who contributed the most to morphometric research by the middle of the 19th century was A. Penk. Although there were many successes achieved in the second period, interest in this direction subsided by the middle of the twentieth century. Although the third stage continued in the development of morphometry, it received its full place only towards the end of the twentieth century. It is characterized by an increase in morphometric research; interrelation of morphometric analysis with cartography; mathematical models of relief formed based on the morphometric analysis.

On the basis of these, a mathematical direction was born in geomorphology and a system-structural approach to the study of relief was added to morphometry. The development of cartographic and mathematical modeling led to the development and creation of morphometric thoughts, as well as the emergence and development of new computing, processing and information storage devices. During this period, much attention was paid to morphometric research, and among the scientists, it is worth noting the proposals of K. Efremov and A. I. Spiridonov to «geometrize» simple relief. One of the most valuable offers after this was A.S.Appears in the works of Devdariani. He proved that it is necessary not only to consider the relief itself, but also to take into account its development.The main idea of the third stage is to consider the relief as a zone of heights. From the point of view of theory, it is the coordinate of a given area, the function of two variables.

Materials and methods. Considering a relief as an equation can help a lot in studying and determining its properties. The same xiak at the stage of its development in this direction set the following global goals:

1) description of the object;
2) explanation of its properties;
3) track changes;
4) monitoring the situation;
5) creation of an object, an object that has such properties. In this work, an attempt is made to solve geoecological problems using morphometric relief indicators, describing it, and based on the data obtained. In particular, by determining the slope of the relief, surface exposures, using the data obtained, determining the extent of water erosion of the soil in the studied area, analyzing it, rational use of land, non − destructive use, and increasing fertility were the main issues. In the description of the relief, there are two classes of work that are divided into two large groups: qualitative description of the relief and quantitative description[2].

The ArcGIS 10.4 program was used to compile a slope map of the terrain, which is represented primarily by Heights from a topographic map, obtaining various indicators, creating tables, etc. In particular, as part of this program, the main components of ArcGIS 3D Analyst, which is an additional module, are compiled maps of the terrain of the Kyzylorda region using 3D visualization, relief creation and analysis. In addition, the regional and volumetric characteristics of the relief, slope, surface exposures and the level of surface leaching were also determined [3]. The use of these maps in determining spatial bundles is very effective: using this model, it is very helpful in determining how these processes relate to mountains, valleys, high institutions, and other three-dimensional objects . The course of cartographic studies used to obtain information on any information provided on the maps consisted of 4 stages :

Stage 1 - promotion of issues to be solved with the participation of data available on the map;

Stage 2-the preparatory stage;

Stage 3-conducting the study;

Stage 4-examination, processing of the received data.

In comparison with the corresponding date of February 1, 2023, the number of horses in all categories of farms increased by 13.4 and 134.7 thousand heads; poultry increased by 13.0% and 126.4 thousand heads, respectively; camels – by 7.9%-A and 45.2 thousand heads; sheep-by 6.2% and 445.5 thousand heads; cattle – by 4.7% and 324.5 thousand heads; pigs-by 2.2% and 2.2 thousand heads. Goat heads-decreased by 0.1% and amounted to 155.6 thousand heads. As of February 1, 2023, 67.7% of cattle were counted in public farms;30.2% – in peasant or farm farms and individual entrepreneurs; 2.1% – in agricultural enterprises; sheep – 55.8%, 39.7% and 4.5%, respectively; goats – 87.0%, 12.9% and 0.1%; pigs – 87.9%, 12.1%; horses – 60.9%, 37.1% and 2.0%; camels – 61.9%, 34.7% and 3.4%; poultry – 74.8%, 5.6% and 19.6% [4].

Results. In January 2023, all types of livestock and poultry were slaughtered or slaughtered on the farm in live weight amounted to 2.9 thousand tons, which is 1.4% higher than in the corresponding period last year, cow's milk production increased by 1.7% and amounted to 5.4 [5] thousand tons, chicken egg production-by 65.2% and amounted to 0.6 thousand pieces. Statistical data of animal husbandry in the ArcGIS program are mapped as follows:

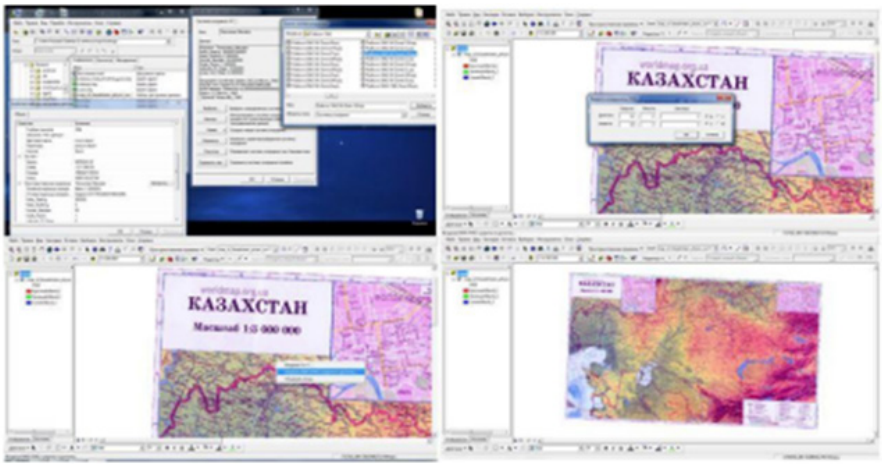

Fig.1. Works in the ArcGIS program

Figure 1 linking the map to the coordinate system - collecting, analyzing and evaluating information sources; - studying the phenomena of the mapped area included in the map content; includes the processes of compiling the first vector layers (shape file) and starting editing work. Shown in Figure 4.

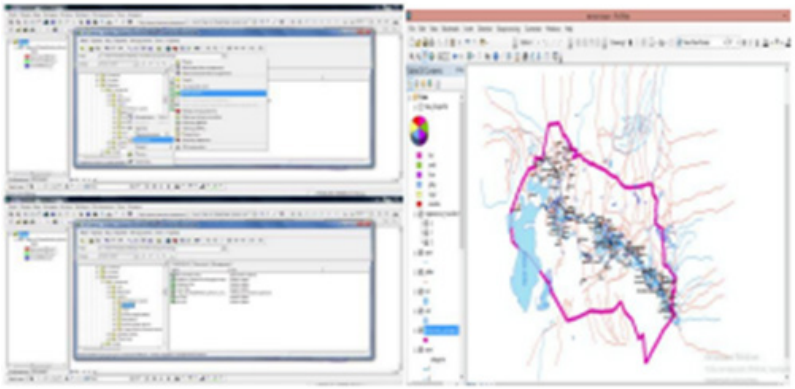

Fig.2. Editing vector layers

Figure 2 development of vector layers, editing process if the first version of the prepared map does not meet the requirements of the customer, an additional version is developed. At the stage of preparing the same card for printing, small printing works are introduced. All this work on the compilation of the map map

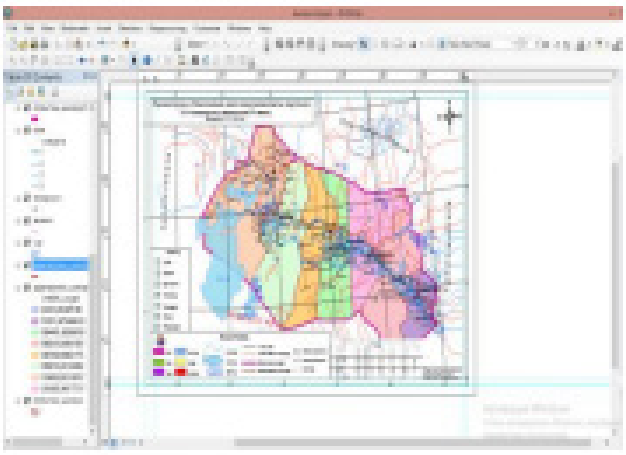

Fig.3. Preparing the card for printing

Figure 3 Preparation of the card for printing refers to the stage of preparation for printing. That is, it is the processing or reproduction of the finished card using a printing or other method. This stage includes the preparation of the printable version and the sections for printing cards. The result obtained during the implementation of these stages on the diploma topic is shown in Figure 3. In cartographic production, maps are developed by various teams of specialists, which is why this work requires scientific and technical guidance, which is called map editing. The process that checks the work at all stages is called proofreading.

In 2023, agricultural formations received a gross income of 2316299 tenge from the sale of crop production (the level of profitability was 11.5%), including wheat - 94074 thousand tenge (33.0%), forage crops-352941 thousand tenge (27.2%), vegetables-54083 thousand tenge (26.4%), potatoes-19836 thousand tenge (24.4%), barley-1444 from the sale of melons-205663 thousand tenge (28.5%), oilseeds-36949 thousand tenge (13.4%) and rice-1527994 thousand tenge (8.9%). Agricultural formations of all districts successfully sold crop production. In 2018, the largest income was accounted for by agricultural formations of Zhanakorgan district (736752 thousand tenge, 25.3%), Shieli district (376573 thousand tenge, 12.2%), Kyzylorda city (266656 thousand tenge, 20.1%), Zhalagash district (272946 thousand tenge, profitability level 5.7%).Agricultural

enterprises received income from the sale of crop production in the amount of 476046 thousand Tenge (the level of profitability was 5.6%), peasant or farm farms-in the amount of 1840253 thousand tenge (15.8%).

Fig.5. Animal husbandry map of Kyzylorda region

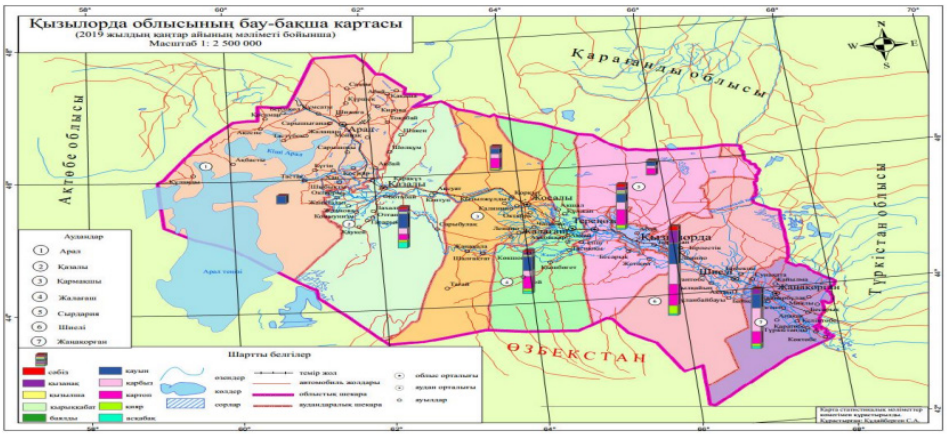

Fig.6. Garden map of Kyzylorda region

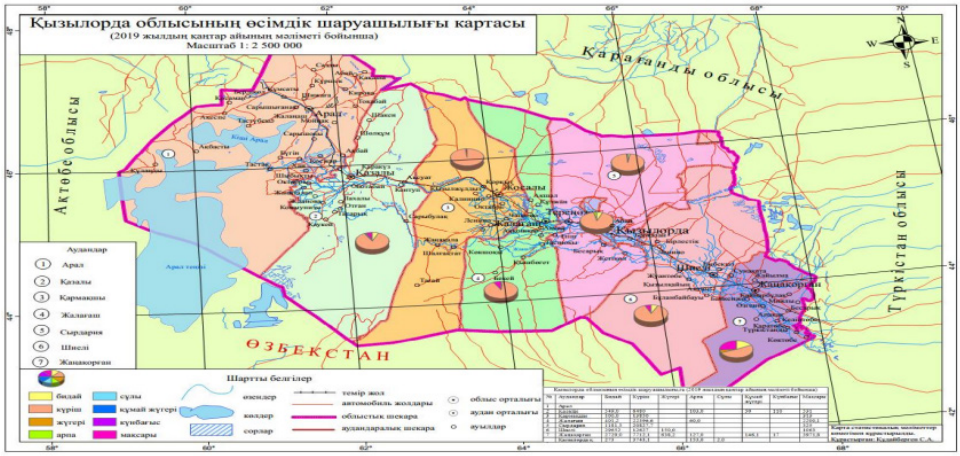

Fig.7. Map of crop production of Kyzylorda region

Kazakhstan has long been known all over the world as an agrarian country. The main task of agricultural production is to fully provide the population of the Republic with types of food that are adjusted to medical standards. For this purpose, 1.4 million tenge per year is allocated in the Republic. More than a ton of meat, about 7.0 million tons of milk and dairy products, 4 billion tons. It is necessary to produce eggs, 2.4 million tons of vegetables, 640 thousand tons of sugar and about 2.0 million tons of bread and bakery products [6]. However, at present, the main types of food, including animal products, are not produced in sufficient quantities. Meat, dairy products, vegetable oils, sugar up to 30-40% are imported from foreign countries. In order to eliminate such gaps, the intensive development of animal husbandry in the field of Agriculture is the responsibility of today.

To do this, first of all, it is necessary to fully provide animal husbandry with nutritious and high – quality feed with the harmonious use of our rich resources-natural Meadows and arable land. After a thorough analysis of the structure and tasks of the feed production industry, we will find out that its main sources are natural Meadows and arable land. In addition, waste from field fields (grain, industrial crops) is also used as animal feed.

The share of animal feed can also include products produced in the microbiology and chemical industries (vitamins, yeast, enzymes and other biologically active substances). However, 95% of the total volume of feed used in livestock and poultry farms is made up of plant-based feeds. Therefore, the development of feed production from natural Meadows and pastures and forage Fields plays a key role in creating a solid supply of animal feed for animal husbandry in the Republic. Natural pastures and Meadows occupy the vast expanses of the Republic.

The area of pastures is 182 million hectares, hayfields – 4.7 million hectares, or about 1 hectare of hayfields per 39 hectares. The main reason for this contradiction lies in the fact that fertile Meadows are plowed and turned into fields to increase the volume of grain production. In this regard, in most farms of the Republic, especially in grain-growing regions, there is a shortage of winter feed. For this, in the 70-80s of the last century, Hay began to be prepared from forced Natural Pastures. Such «mowed pastures» were included in the government's plan, the size of which reached 15-20 million hectares.

Of course, the yield of such» hayfields « was low, and the cost of hay increased, and the efficiency of animal husbandry in most areas decreased. In those days, a large number of forage crops began to be grown on the arable land. Its volume is up to 10 MLG hectares in the Republic, a third of the volume of hay, silage, succulent and fodder feeds were completely removed from the fields. However, the production of natural pastures and fodder forage and arable land still does not meet the current demand. Feed production is a large and complex branch of the agricultural economy. Its intensive development and prosperity in accordance with the requirements of today is due to the introduction into production of the humiliated scientific and technological achievements in this area. The main ones include the following areas:

1. Effective and rational use of the main sources of animal feed, natural grasslands and pastures and fodder fields, taking into account the bioclimatic capabilities of each region and the peculiarities of economic formation;

2. Collection of high-quality, nutritious feeds, increasing the yield of natural Meadows and pastures and forage fields with the introduction of achievements of Science and advanced production practices in farms (farms, Joint-Stock complexes, etc.);

3. Implementation in farms of advanced technologies for the preparation of animal feed and planning of daily, monthly and annual feed menus based on science for each type of animal, age and obtained animal products;

4. Reducing the cost of feed through the improvement, efficient use of fodder land on farms and the introduction of new equipment and machines for the production of feed [7]. Forage production as a branch of Agriculture and science is engaged in the cultivation of forage crops on arable land, cultivation and use of natural pastures and hayfields.

The goals set by this industry are the maximum intensification of animal feed production in the Republic. The main source of cheap and highly nutritious food is natural forage lands.

Such lands occupy 70% of the land area of the Republic, as mentioned above. However, the volume of feed from these natural pastures and hayfields accounts for only about 40% of the total volume of feed used in animal husbandry throughout the year. The main reason is the low yield of natural fodder lands. Irregular use and untimely maintenance of natural pastures leads to the degradation of Meadow soils, the disappearance of valuable plant species from the plant community,the replacement of other infertile grass species, arugula, the invasion of Meadows by bumps and shrubs, as a result of which the yield decreases.

To eliminate such shortcomings, it is important to properly use natural forage lands with improvement. As shown by the achievements of Science and advanced farms, it turned out that in all regions of the Republic, with the radical improvement of natural pastures and fly agarics (sowing perennial grasses instead of destroying natural grasses), the yield can be increased up to 3-5 times and higher. Methods of light improvement (removal of bumps, bushes, spraying of fertilizers, sowing of grass seeds, etc.) increased the yield of meadowsweet by 1.5-3.0 times. A progressive new method is widely introduced in the field of feed production in the summer season, creating irrigated pastures in each farm. It has been known from many experiments that on irrigated pastures , the milk yield of cows increases to 15-30%, and the meat content of cattle in Bordak increases to 25-35%.

It was found that the effective use of Natural Pastures in Steppe, semi-desert and desert zones can preserve valuable grass species and increase yields, as a result of which livestock products (meat, wool) from each hectare can be doubled. In many studies, it has been proven that the creation of grass-planted pastures in the southern and south-eastern regions of Kazakhstan is very effective both economically and ecologically. The cultivation of arable fodder has been carried out in the Republic for a long time. But his current position is not critical. The amount of feed per hectare of arable land where forage crops are grown is lower than the yield obtained from sown fields with grain crops. The main reason for this is the non-compliance with the technology of cultivation of feed crops, and the study of the technology of cultivation of some crops is not adapted to each region. In the future, the production of feed from arable land should be carried out in the following main areas: improving the structure of feed fields in each region; increase the yield of fodder crops; widespread introduction of intermediate, legendary and compacted fields in farms; widespread use of green conveyors; preparation of feed from the field according to new technologies; scientific establishment of feeding. For the intensive development of animal husbandry in the Republic, in the future, the volume of sowing of fodder crops in the field will be increased by at least 3 times and the yield per hectare to 2.0-2.5 tons of agricultural products. The cultivation of forage crops in intermediate and compacted fields should also be significantly introduced into production. It is established that by growing 2-3 crops per year from one arable land, the yield per hectare can be increased to 20-50%.

For example, experiments have shown that high-yielding feed grain crops are effective if they are sown with protein-rich legumes. In general, the science of animal feed production in the former Union dates back to the end of the 18th century. The first Russian scientists were I. I. Levshin, I. T. Bolotov, A.V. Sovetov, I. A. Stebut, P. A. Kostychev, etc. He studied the fodder land of different regions of Russia, studied ways to improve it, the quality of fodder plants, the possibilities of their acclimatization, cultivation in the field. However, the widespread, planned development of the feed production industry in 45 dates back to the beginning of the 20th century.

The famous Russian scientists V. R. Williams [8] and A.M. Dmitriev were in charge of these works. During these years, special expeditions were organized to Kazakhstan from the Center (Research Institute in Moscow, Leningrad) to study the state of natural pastures and meadows, their location in each region, groups, main plant communities, plant species, products and Feed values. Among the scientists who led such research and did a lot, one can single out academician I. V. Larin, professors L. G. Ramensky [9], I. A. Tsatsenkin, S. P. Smelov. Among the scientists of Kazakhstan of that time, one can name the works of D. A. Zykov, B. A. Bykov, K. K. Kurmanov, I. V. Matveev, K. D. Postoyalkov, P. A. Salyukov. In the 60s of the last century, at the Kazakh Scientific Research Institute of hayfields and pastures, which was opened again in the Republic,

the problems of improving and efficient use of natural forage lands began to be studied in depth and comprehensively in all regions. The current conditions of natural pastures and hayfields located in each region of the Republic were identified, and ways to improve and effectively use dilapidated land were proposed. Among the scientists who led the scientific work and did a lot, one can name zh.a.Dzhambakin, S. N. Pryanishnikov, K. A. Asanov, E. Sh.Shakhanov, G.T. Meyrmanov, K. A. Aubakirov, I. I. Alimaev, K. A. Baitkanov [10], E. L. Bekmukhamedov, K.Sh.Smailov, U. H. Almishev. Among the scientists who scientifically investigated the problems of animal feed production in agriculture, we can mention Yu.d.Zykov, N. I. Mozhaev, V. A. Benz, a.m. Sveshnikov, G. M. Chasovitina, A. Akhmet.

It is known that relief is considered the determining factor in the development of various natural processes occurring on earth. Basically, it emits radiation from the sun and determines the features of the formation of all types of surface currents and surface processes on them. All this contributes to the definition of landscape classification in both local and regional areas. Digital data is essential to determine the extent to which relief in Geosystems takes place. The most effective way to solve this problem is the morphometric method.

Most often, this method is widely used in geomorphology and is widely used in determining the studied objects, their quantitative indicators using the basis of GIS technology. However, the scope of the morphometric method is not limited to this, but the scope of its research is very wide and is also used to solve other geoecological problems. At the same time, today, Fast and optimal solutions are solved through the digital features of GIS technology. The Earth is the most basic natural asset. He is the source of all life, the habitat. Now people get 88% of the nutrients they need from arable land, 10% from forests and pastures, and 2% from sea and ocean waters. Therefore, the protection and effective use of the Land Fund is the most basic and urgent issue that never ceases to be relevant.

The development of industry, the construction of cities, roads, hydraulic structures destroy the surface of the Earth and lead to a change in natural landscapes.

The changed lands are undervalued economically, polluting the environment with toxic substances, reducing the sanitary and hygienic conditions of human life. Considering the changes in the structural and qualitative state of the Land Fund, we can see that the direction of their development, especially agricultural land, is negative. Such negative processes lead to a reduction in the resource potential of the land, as a result of which agricultural production decreases and pose a threat to the national security of the state. The most basic way to stop this process quickly is to use the land efficiently. This is especially important in modern economic conditions, that is, at a time when there is a shortage of industrial resources and a decrease in soil productivity. The lack of an economic mechanism of economy and land use leads to a shortage and degradation of land resources. In this regard, the economic basis for the effective use of land resources by moving from a free form of land use to a paid one has been developed. The Land Fund is the most important national asset of our people, so its value is calculated in monetary terms as part of the national wealth. On the basis of determining the magnitude of all this, the value of land is an economic assessment. Like all natural riches, the economic valuation of land has three main different functions :

1. Calculation. Land is counted as a national wealth, as the production and material Fund of Regions, enterprises, individual landowners and land users. Land is also taken into account as a place of production, other structures, residential buildings, etc., as a place of economic activity.

2. For an economic incentive to effectively use the land fund, it must have a price and thereby be included in market relations.

3. Qualitative properties of land units — productivity, location efficiency are different. There are not enough fertile, efficient lands, so even those with low productivity and efficiency are used, and good (efficient) users, regardless of the Labor spent, earn additional profit. Depending on the efficiency, different land units are evaluated differently, creating more uniform conditions for land users. As a result, the population is encouraged to use less efficient, but economically necessary land. All services of economic assessment of the Land Fund are inextricably linked,

serve to protect, effectively use the land as a whole. In general, the Land Fund in the region can be divided into three natural and economic zones, depending on soil and climatic and other economic conditions. The first Zone (South) includes two administrative districts (Zhanakorgan and Shieli), the second (central) zone includes four administrative districts (Zhalagash, Karmakshy, Syrdarya and Kyzylorda), and the third zone (north) includes two administrative districts (Aral and Kazaly) . Due to the specialization of the region in rice farming, taking into account the peculiarities of the soil and climate and other conditions, natural irrigated arable land can be divided into three natural Spurs: Zhanakorgan-Shieli, Kyzylorda and Kazaly-Aral. In recent years, small rice fields have begun to form in agricultural areas of the Aral region.

The main cultivated plant in these ranges, rice, is sown in the former engineering — ready lands together with the cultivated plant corresponding to it. 9193.0 thousand hectares or 74.0% of the total land fund of the region is irrigated pasture land. At the same time, the area of vacant land increased by 129.8 thousand hectares.

This is mainly due to the deterioration of the financial situation of Agriculture, the lack of mineral and organic fertilizers, the lack of seeds, as well as the dilapidated material and technical base.

Due to the different natural and economic conditions on the territory of the region, specialization in the placement of agricultural production, a different type of agricultural development has developed near the island (a type of self-financing, specializing in various specialties and self-financing). In the northern zone, in recent years, due to a lack of irrigation water, the volume of fields growing rice and other cultivated plants has decreased.

However, the remoteness of the settlements from each other is conducive to the development of animal husbandry. It is especially convenient for the development of sheep, camel and horse breeding. In the southern zone, due to the favorable temperature conditions, it is convenient for farming, especially for growing vegetable and garden, fruit, oil and technical crops and grapes. Therefore, in recent years, the main cultivated plant has been cultivated here, along with rice, cotton, etc. in the development of cultivation. Due to the favorable economic development in the central zone, rice and other cultivated plants belonging to the rice family, grain, oilseed, horticultural, fruit crops are planted here. Any land fund is distinguished by fertility. The soil cover, formed on the basis of climate, flora, hydrology and hydrogeology characteristic of the Kyzylorda region, has a special impact on the qualitative state of land resources. Based on this, the soils on the territory of the region can be divided into two large groups:

- Atyrau moist soils with developed irrigated agriculture;

- in the semi-desert part there is a trace of irrigated agriculture from ancient times and dry soils used for grazing livestock. Changes in soil fertility are also influenced by human activity. If it acts scientifically, it increases soil fertility, and if it is treated irresponsibly, it reduces or destroys soil fertility. The main agronomic, agrotechnical, agromeliorative, organizational measures to improve soil fertility, land use efficiency are as follows:

1.protection of soil from erosion (fangs). There are three main types of erosion: wind, water and technical. In uneven, barren areas, precipitation washes away the fertile soil layer. Open areas without forests, especially those where productivity is deforested (plowed), are subject to wind erosion, the fertile soil layer is blown away by the wind. Tillage of land with heavy equipment, year-on-year sowing of one crop, the movement of equipment on off-road areas increases soil erosion. In desert and semi-desert regions, excessive grazing of livestock without compliance with the order of seasonal use, the movement of equipment leads to the destruction of vegetation, especially valuable ones. Exposed soil is subject to wind, sun, water erosion. The main way to protect against this threat is the cultivation, irrigation, regulatory use of Groves.

2. Protection of soil from salinization (salinization). Soil salinization occurred when the amount of precipitation was less than the amount of evaporating moisture. Many years of irrigation of crops cause salinization of the soil. The evaporation of rainwater from the surface of the earth is saline. The use of advanced effective methods of irrigation of fields and pastures protects the soil from salinization.

3. Ways to protect the soil from sandblasting — planting trees (saxaul, Genghis), shrubs, sowing perennial grasses.

4. Protecting the land from waterlogging, it will be necessary to carry out hydro-reclamation works, improve irrigation systems.

5. For the preservation of nutrients in the soil, reclamation works, treatment of salt marshes with lime, gypsum, plowing by special methods, fertilizing, re-grazing, etc. agronomic works are carried out.

6. Protection of soil from poisoning — regulation of the amount of use of pesticides, herbicides, fertilizers, protection from production, household waste, sanitary rehabilitation measures.

7. Restoration (reclamation) of lands damaged as a result of construction, road construction, subsoil exploration, mineral extraction, waste disposal will significantly improve the subsoil of the Republic.

8. Measures to prevent the exclusion of arable fertile land from agricultural circulation require legalization. In recent years, the distribution of fertile flat lands, forests, suitable for arable land for various construction, summer cottages, roads, retail outlets, has become widespread. It is also necessary to legalize it. These works are carried out based on achievements in the field of special Sciences. At the same time, these are economic measures. After all, it is necessary to determine the economic efficiency of measures, taking into account the financial, material costs spent. For the implementation of measures for the protection, effective use of land, economic calculations, assessments are carried out. Assessment of land fertility, determination of the costs of restoration, protection, improvement, inclusion of land in market relations, etc.require economic calculations, assessments. In short, land as a source of production reserves and a medium for placing production applies to all areas of production. As the rate of development of production increases, the amount of use of land wealth and Land Resources also increases. In this regard, the decline in the quality of effective reserves of land resources negatively affects the increase in the costs of society for production. The negative impact on production efficiency caused by a decrease in the quality of land resources is also not eliminated by the results of scientific and technical achievements. Therefore, the economical and efficient use of land resources is becoming an urgent problem that must be solved. To solve it, it is necessary to organize new economic conditions in accordance with the current economic mechanism of effective land use and choose from such complex ways the most effective, most suitable, specific.

The normalized vegetation index NDVI (NDVI) is a standardized index that reflects the existing and condition (relative biomass) of a plant. This index uses the contrast of two channel characteristics from a multispectral raster data set – absorption of chlorophyll pigment in the red channel and high reflectivity of plant raw materials in the infrared channel (NIR). NDVI is often used worldwide for drought monitoring, agricultural production monitoring and forecasting, assistance in predicting fire risk zones, and desert occurrence mapping. NDVI is suitable for global plant monitoring as it helps compensate for changes in lighting conditions, surface slope, exposure and other external factors.

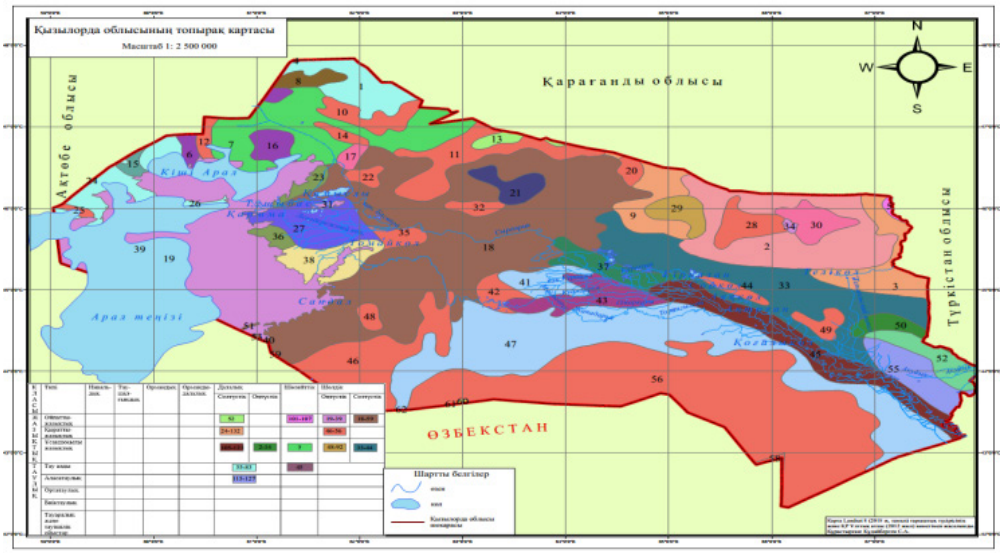

Fig.8. Soil map of Kyzylorda region [11]

NDVI is often used worldwide for drought monitoring, agricultural production monitoring and forecasting, assistance in predicting fire risk zones, and desert occurrence mapping. NDVI is suitable for global plant monitoring as it helps compensate for changes in lighting conditions, surface slope, exposure and other external factors. Different visibility in red and infrared (IR) channels allows you to monitor the growth density and intensity of green plants using spectral reflection of solar radiation. Green leaves usually show better visibility in the near range of infrared waves than at visible wavelengths. If the leaves are flooded or dead, they will be yellow and will be significantly less visible in the near infrared range. Clouds, water and snow provide better visibility in the visible range than in the near infrared range, and the difference is zero for rock and bare soil. NDVI processing creates a single-channel dataset that is mostly green. Negative values mean clouds, water and snow, and values close to zero mean rocks and bare soil. Default NDVI documented equation:

$$NDVI = ((IR-R) / (IR + R)) \quad (1)$$

IR = values of pixels from the infrared channel R = values of pixels from the red channel this index is formed mainly from clouds, water and snow, while values close to zero are formed mainly from rock and bare soil. Very small values (0.1 and less) the NDVI function corresponds to free areas of rock, sand or snow. Average values (from 0.2 to 0.3) indicate shrubs and meadows, and large values (from 0.6 to 0.8) indicate medium and tropical forests. ArcGIS equation used to generate output data:

$$NDVI = ((IR - R)/(IR + R)) * 100 + 100 \quad (2)$$

Discussion. This results in a range of 0-200 values and fits the 8-bit structure, allowing them to be displayed using a color scale or color map. If you need specific pixel values (-1.0-1.0), select the NDVI method using the channel arithmetic function (Band Arithmetic function) function. When you use the Add function button in the image Analysis window to use NDVI: you can open the image analysis Options dialog box, click the NDVI tab, and then select scientific output data. Also on this tab there is an option to use the wavelength, which will try to determine the correct channels if there is information about the wavelength (use Wavelength). If not, the number of channels is used. Below are examples of combinations of Landsat 7,4,3 channels (left) and NDVI channels that highlight the field of agricultural activity (right).

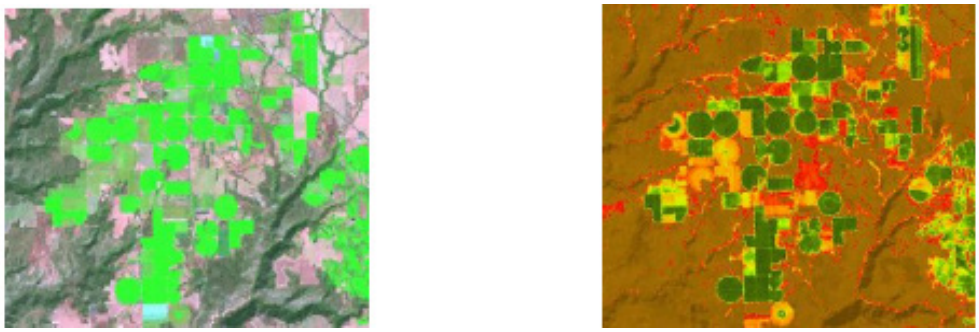

Fig. 9. NDVI indicator

Conclusion. The agricultural system of Kazakhstan developed on the basis of the long-term Agrarian Policy of the Soviet Union, which was formed in the 30s. It was subordinate to the goals of industrialization and urbanization of the state and considered agriculture only as sources of raw materials, labor, financial and other resources of the city. This intensive work was carried out in extensive ways under the strict supervision of the administrative system, and the achievements of scientific and technological development did not reach significant indicators in villages, farms. Such a system was the same for all regions of the USSR. As a result, the volumes of arable and pasture land were increased, fertilizing many lands and increasing the volume of irrigated land. Agriculture was not properly implemented, and plant protection measures were not satisfactory. This project» increasing arable land and providing the population with food in full « has many, if not many, controversial aspects. So, this new agrolandscape direction should also be in our state. To implement this system, a special order has now been placed by the state to compile a system for adapting agriculture to landscapes. To implement this, first of all, systematize them by analyzing the methodological foundations of compiling maps that determine the features and characteristics of landscapes in Kazakhstan. By classifying the territory into landscapes, brief descriptions of the terrain, climate, composition of the underlying rocks, vegetation, surface and underground are made. After they are identified, it is necessary to analyze them, using the optimal options for GIS technologies in accordance with the objects under study and the problems being solved, and then embed them into the computer. GIS technologies underlie Geoinformatics. It studies natural and socio-economic Geosystems at various hierarchical levels through computer processing of specially created databases. The object of my research was the Kyzylorda region. Kyzylorda region is one of the leading agricultural regions of the country. Changes occur in this region every year. For example, agricultural land replacement, sowing of another farm crop due to lack of water, breeding of another type of livestock in animal husbandry, hybridization work, etc. We need to intensively study all these situations and organize mapping measures. Monitoring of the terrain, as well as agriculture, will greatly contribute to the rapid development of land.

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Қызылорда облысының жер ресурстарын пайдалануды геоақпараттық қамтамасыз ету, талдау, бағалау және болжам жасау

Аңдатпа. Қазіргі уақытта әлемнің дамыған, өркениетті елдерінің барлығында дерлік ауылшаруашылық қызметі ландшафттарға бейімделген ауыл шаруашылығы жүйесін (ASR) жобалау негізінде жүзеге асырылады. Өнеркәсіптік ғылымның бұл саласын жан-жақты негіздеу және оның Қазақстанда қалыптасу мүмкіндіктері мен ерекшеліктерін анықтау үшін жоғары сенімділікпен нақты ғылыми-зерттеу жұмыстарын жүргізу қажет. Сондықтан ұсынылып отырған жұмыста Қызылорда облысының ауылшаруашылық ландшафттары таңдалып, географиялық ғылымдар тұрғысынан зерттеліп, сарапталып, қазіргі заманғы географиялық ақпараттық жүйені бейімді пайдаланудың оңтайлы жолдарын іздеуге бағытталды. Сондықтан ұсынылып отырған жұмыста Қызылорда облысының ауылшаруашылық ландшафттары таңдалып, географиялық ғылымдар тұрғысынан зерттеліп, сарапталып, қазіргі заманғы географиялық ақпараттық жүйені бейімді пайдаланудың оңтайлы жолдарын іздеуге бағытталды. Қызылорда облысы — Қазақстан Республикасының оңтүстік бөлігінде орналасқан әкімшілік аймақ. Облыс өзінің ауыл шаруашылығымен ерекшеленеді. Өңірде егін шаруашылығы ерте заманнан дамыған. Сонымен қатар, шаруалар жыл сайын сорт ауыстырып, дақылдарды әртараптандыру бойынша қарқынды жұмыс істейді.

Карта жасау барысында Қызылорда облысының әкімдігінен негізгі мәліметтерді жинаймыз, картаны құрастыру үшін деректерді ArcGIS бағдарламасына енгіземіз. Заманауи технологияларды пайдалана отырып, біз алдын ала жобалау жұмыстары арқылы еліміздің негізгі мәселелерін шеше аламыз.

Түйін сөздер: картографиялау, ауылшаруашылық, зерттеу әдісі, ландшафттар, ауылшаруашылық ландшафттары, ГАЖ.

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Геоинформационное обеспечение, анализ, оценка и прогнозирование использования земельных ресурсов Кызылординской области

Аннотация. В настоящее время аграрная деятельность практически всех развитых, цивилизованных стран мира осуществляется на основе проектирования системы земледелия (ЛНР), адаптированной к ландшафтам. Для того, чтобы всесторонне обосновать эту область производственной науки и определить возможности и особенности ее формирования в Казахстане, необходимо выполнить реальные исследовательские работы с высокой степенью достоверности. Поэтому в предлагаемой работе были выбраны агроландшафты Кызылординской области, изучены и проанализированы с точки зрения географических наук, направлены на поиск оптимальных путей адаптивного использования современной геоинформационной системы. Кызылординская область - административная зона, расположенная в южной части Республики Казахстан. Область отличается своим сельским хозяйством. Сельское хозяйство в области развито с давних времен. В ходе данной статьи мы рассмотрим пути решения проблем и картографирования сельскохозяйственных земель

Кызылординской области. Кроме того, ежегодно аграрии интенсивно работают по направлению смены сортов, диверсификации культур.

В ходе картографирования мы собираем основные данные из акимата Кызылординской области, вводим данные с составлением карты в программе ArcGIS. Используя современные технологии, мы можем решить главные проблемы нашей страны с помощью предварительных проектных работ.

Ключевые слова: картографирование, сельское хозяйство, метод исследования, ландшафты, агроландшафты, ГИС.

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