

APPLICATION ICT TO RESEARCH THE INFLUENCE OF FLOODING OF THE KISH RIVER ON AGROECOLOGICAL INDICATORS OF IRRIGATION WATER AND SOILS OF NATURAL SENOSES

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ABSTRACT

The presented study explains the scientific approach to the creation of mathematical models based on the concept of a systematic approach to solving the existing problems of the impact of floods on soil ecosystems in the Kish river valley, increasing their adequacy and applying research results to practical problems.

The use of ICT (Information and Communication Technologies) in solving many practical problems, such as assessing soil fertility and forecasting productivity, product quality management, etc. The results are based on the rational use of natural resources and environmental protection.

Keywords: Valley of the Kish river, Floods, Agroecology, Systems approach, Agrophysics, Agrochemistry, Mathematical models.

INTRODUCTION

One of the most important tasks is the management of anthropogenic impacts on natural cenoses and agrocenoses around the Kish River basin, forecasting the ecological processes that can cause these impacts, minimizing harmful impacts, protecting arable lands from salinization and desertification, as well as creating mathematical models for management. To create mathematical models for monitoring and managing the productivity characteristics of civilized cenoses, to ensure their adequacy. It is possible to process the results of the obtained analyzes of water and soil, form an initial database and create a control system. The situation in the Kish River basin is very dire and requires urgent and urgent action. As a result of intensive and uncontrolled deforestation in the upper mountainous part of the basin, there was a strong thinning. Determination of quantitative and qualitative indicators of water resources allows you to effectively manage and use them. Therefore, the study of the current state of water resources should be a priority. Large quantities of suspended particles are supplied to the study area by irrigation water. They contain total humus-2.90, nitrogen 0.08-0.15%; CaCO₃-7.49-11.7%; organic carbon 0.60-1.22%; relative to C:N ranges from 6.60-7.30. The hygroscopic soil moisture is 1.44-3.13%. These indicators play an important role in diagnosing the fertility of irrigated soils.

LITERATURE REVIEW

Sheki region is located in the northwest of the southern slope of the Greater Caucasus Mountains. The southern slope of the Greater Caucasus, especially the Sheki region, is rich in minerals. In this regard, large-scale exploration work is being carried out at a number of ore and non-metallic sediments some of which have been exploited for many years. The use of stones as building materials increases the amount of waste. The situation in the Kish river basin is very deplorable and requires urgent and urgent measures. As a result of intensive and uncontrolled deforestation in the upper mountainous part of the basin, a strong thinning occurred, and the number and area of floodplains increased several times. Along both banks of the river, steep cliffs have been formed as a result of intense erosion of steep slopes and landslides from the Demirkorpu side.

Analysis of objects and events, electronic mapping of the dynamics of anthropogenic impacts and the development of cartographic maps in accordance with various other topics and, as a result, a comprehensive study of our planet require the use of remote sensing and geo information technologies.

Studies have shown that in the process of glazing, especially under the conditions of the water regime of washing the soil surface, most of the organic compounds pass into mobile forms. However, in alluvial-hydromorphic soils with the presence of carbonate-sulfate compounds, this process is relatively weakened and carbonate-sulfate compounds of Iron Oxide (FeO) are formed. A number of researchers have studied the organic and chemical composition of water-dependent substances. The relief of the region is complex and stretches from high mountains to plains within its borders. It ranges from 3000-3600 meters above sea level to 200-700 meters in the plains.

On the basis of stock and cartographic materials, a modern classification of the lands of the Azerbaijan Republic was prepared and a soil map was compiled on a scale of 1:100000.

The soils of the Sheki region were formed mainly as a result of a long historical process on alluvial, proluvial and deluvial sediments. The foothills of the Sheki region are included in the humid subtropical zone due to climatic conditions. The number of sunless days here ranges from 52 to 62. The average annual rainfall in the region is 700-800 mm and a little more.

In the east, the amount of precipitation decreases, and in agrocenoses, the need for irrigation of agricultural crops increases. Relative humidity ranges from 70-80 mm per month. Summer rains often cause erosion on sloped fields. The presented article analyzes the diversity of the land cover due to the change in climatic conditions depending on the natural and ecological conditions of the Sheki region, in particular the hypsometric level. The main diagnostic indicators of soil types in mountainous and lowland territories are characterized, as well as changes in salts in irrigation and river waters in the village of Kish, Sheki region, depending on seasonal factors. The salt content of the water in these areas differs significantly from river networks, canals, distribution networks and small ditches. Minerals are suitable for growing crops in cultivated cenoses and do not pose a risk of salinization and salinization of irrigated soils.

Using a soil map in the field and a methodological approach that is the result of large-scale soil studies. It has been established that the number of water-resistant aggregates in the soil varies depending on the slope and the degree of erosion. The greatest number of water-resistant aggregates was noted on the northern slopes, to one degree or another in eroded soils. The density of the studied soils is 1.28 g/cm³ on the northern slope and 1.41 g/cm³ on the southern slope. Analysis shows that deposits of irrigation water are rich in organic and chemical substances, and they play an important role in changing the composition, diagnosing and restoring the fertility of irrigated lands. For an objective analysis and assessment of the ecological state of lands, the degree of suitability of the ecosystem, which will be characterized by a complex of natural factors, as well as the state of fertility have been determined for the purpose of their effective use in agriculture.

The soils of natural cenoses of the southern slope are among the zones of intense erosion in the country. As a result of the degradation of these lands, soil fertility was assessed qualitatively, taking into account the existing ecological situation. Sheki region is one of the important regions for agriculture. The total area of the district is 380.0 thousand hectares. The region has 188.6 thousand hectares of agricultural land. Sheki covers the southern slopes of the natural cenoses of the Greater Caucasus. On the map, the boundaries of the administrative territory were examined and a scheme for future land management works along the indicated route was prepared.

Based on the results of physicochemical analysis of samples taken from the main types of soils in the Sheki region, the main diagnostic indicators of soils were analyzed. The vegetation of the washed mountain forest brown soils of the region consists mainly of higher plants such as beech, hornbeam, oak, fruit trees and bush.

The distance between the bushes is 2-7 meters; the height is 1.5-2 meters. In our time, a clear ecological direction in the protection and use of natural resources has already emerged. The protection of the environment and its correct use are considered top priority.

Centuries-old forests, humid subtropical forests, and special landscapes that are considered accessible natural resources are associated with biological landscapes. The ecological state of soils combines a complex of soil properties. These include the degree of adaptation to climate and natural conditions, the degree of suitability of the ecosystem for existence and the implementation of economic activities.

As in all mountainous regions of Azerbaijan, the natural conditions of the southern slope of the Greater Caucasus are very difficult. Here, especially on its southern slope, there are alpine and subalpine meadows, dense forests, summer pastures and large cultivated areas of great ecological and climatic importance. In the Sheki cadastral region, it was established that the washed mountain-forest brown, mountain-meadow soils used are full-value soils and differ in terms of fertility.

The coordinates of the sites were determined using GPS

Soil Cut 1 N 41 15' 22" E 47' 12' 30"

Soil Cut 2 N 41 15' 24" E 47' 12' 37"

Soil Cut 3 N 41 14' 51" E 47' 11' 49"

Soil Cut 4 N 41 14' 57" E 47' 11' 50"

Soil Cut 5 N 41 14' 36" E 47' 11' 11"

Soil Cut 6 N 41 15' 25" E 47' 12' 37"

Soil Cut 7 N 41 15' 31" E 47' 12' 23"

River valleys, especially its underwater part, are the youngest and most dynamic part of the Earth in terms of geology and geomorphology, with highly variable soil formation conditions and complex soil structure. The morphological features of the genetic layers were determined on soil plots dug at a depth of 1.5-2.0 meters in the research area, and samples were taken from soil, groundwater, surface water, irrigation water for laboratory analysis. (Fig.1)

Since ancient times, people have observed water bodies in order to more effectively use river and lake water in accordance with the level of development of their time, and tried to study the changes that have occurred in them. The recent dynamic impact of anthropogenic, endogenous and exogenous processes on the Earth does not give a fully effective result in the study and management of our planet by traditional methods.

We set the task that the hydrotechnical part of the flood control measures should be developed in such a way as to ensure long-term protection of the city of Sheki from floods. We have comprehensively solved this problem in the Kish river basin, conducting research in different seasons for three years. Studies have shown that soil layers at the top of ravines allow afforestation.

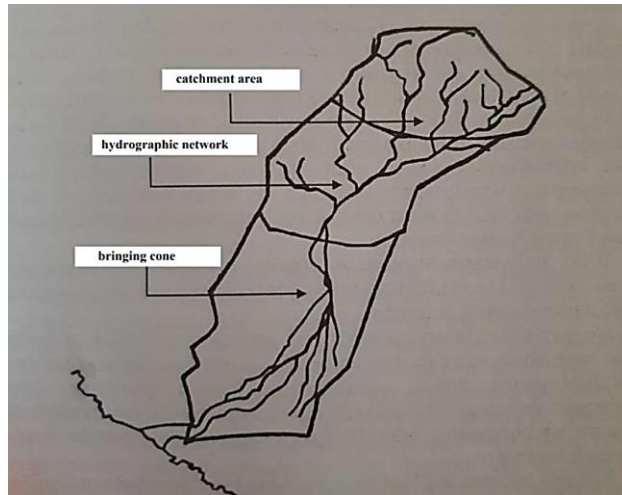


Fig. 1. Schematic description of the recent state of the Kish river basin



Fig. 2. Natural and cultivated cenoses around the Kish river

In the part of the valley parallel to the village of Kish, fences and other floodplains built around various haphazardly created objects that do not contain scientific advice from people and other entrepreneurs raised the level of the river valley. This poses a serious threat to the city of Sheki and the entire eastern part of the village of Kish. One of the important tasks for the future is the integrated management of water resources and the introduction of Geographic Information Systems (GIS) and remote sensing for this purpose. (Fig.2)

Humus, total nitrogen, hygroscopic humidity, calcium carbonate, pH and other parameters were determined according to the methods generally accepted in soil science. The proportions of organic substances and chemicals in the dependent particles of irrigation and river water-nitrogen, calcium carbonate, organic carbon (C) and C:N-are not the same, they can vary depending on the years of research and the duration of water intake, river valley.

Table 1. Qualitative and quantitative indicators of some water samples by season

| Organic substances and chemical indicators | May | July | October |
|--|-------|------|---------|
| Humus | 2.89 | 2.95 | 1.85 |
| Hygroscopic humidity | 3.19 | 1.78 | 2.18 |
| CaCO ₃ | 10.56 | 8.18 | 9.14 |
| C | 1.05 | 1.01 | 0.8 |
| N | 0.15 | 0.13 | 0.1 |
| C:N | 7.33 | 6.98 | 6.63 |

Determination of quantitative and qualitative indicators of water resources allows you to effectively manage and use them. Therefore, the study of the current state of water resources should be a priority. An analytical analysis of the data and corresponding maps on the dynamics of changes in the groundwater level shows that there is a need to repair the existing collector-drainage networks on irrigated lands, as well as to build new collector networks on new irrigated lands. The article provides information on seasonal changes in the chemical composition of suspended particles in the waters of Kish chay (Table 1).

Large quantities of suspended particles are supplied to the study area by irrigation water. In their composition, the total nitrogen is 0.08-0.15%; CaCO₃ 7.49-11.7%; organic carbon 0.60-1.22%; relative to C:N ranges from 6.60-7.30. The hygroscopic soil moisture is 1.44-3.13%. These indicators play a significant role in diagnosing the fertility of irrigated soils. Internal sources are pre-accumulated bedrocks in river valley.

The movement of these mixtures during a flood is expressed by differential equations describing the washing processes. Integration of this equation gives the following expression for the change in the diameter of a rock element during movement.

$$D = D_0 \exp(-mx) \quad (1)$$

Here D_0 is the average particle diameter at the moment $x=0$. Change in the numerical value of the coefficient x $m: m \in [5 \cdot 10^{-6}; 10 \cdot 10^{-6}]$ and is determined from experiments carried out in natural conditions. According to Stokes theory, the forces acting on a particle immersed in a liquid during its regular motion are:

$$F_c = F_{sJam} = 3\pi\mu Ud \quad (2)$$

Here d is the particle diameter, F_{sJam} is the hydraulic resistance, u is the deposition rate, and F_c is the force of gravity.

The development of methods for calculating the hydrography of Mountain Rivers and studying the water balance in areas prone to flooding is of great importance for determining the amount of atmospheric precipitation entering river valley through the surface.

DISCUSSION AND CONCLUSION

The amount of humus is distributed along the soil layers. This indicator varied from 4.3- 7.37% in the 0-30 cm layer of washed mountain-forest brown soils to 3.78-6.36% in typical mountain-forest brown soils and 4.17-7.66% in mountain meadow soils. The reaction of the environment in the studied soils is pH 5.7-6.5, respectively, changed between 6-7.2 and 6.5-7.1. A change in the environment from slightly acidic to neutral indicates that the environment changes depending on the direction of the soil formation process. Despite the different degrees of salinization and waterlogging of soils of natural and civilized cenoses of the area around the Kish River, a sufficiently powerful accumulative humus layer, high reserves of humus, etc. has potential fertility. This region is considered one of the most irrigated regions in the country. During a three-year period, water and silt samples were taken from the Kish River and its tributary, small irrigation ditches and collectors at different times of the year. The salt content of the water in these areas differs significantly from river networks, canals, distribution networks and small ditches. The minerals are suitable for growing crops in cultivated cenoses and do not pose a risk of salinization and salinization of irrigated soils. Humus, nitrogen, hygroscopic humidity, calcium carbonate, pH and other parameters were determined according to the methods generally accepted in soil science. The proportions of organic substances and chemicals in the dependent particles of irrigation and river water-nitrogen, calcium carbonate, Organic Carbon and C:N are not the same, they can vary depending on the years of research and the duration of water intake, river valley.

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