

## FEATURES OF GIS APPLICATION IN AGRICULTURE

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**Abstract.** GIS - geographic information systems is a product of modern technology, designed for visualization and analysis of everything around us, also for the storage and analysis of data. The agricultural sector, where the key link is land, has a connection with geographic visualization, namely, there is a need to compile maps and analyze them. Before the introduction of GIS, tables, plans and schemes provided on paper were used. In this case, it was hard to reconcile all the data with each other, and in case of a change in an indicator, it was necessary to redo everything all over again. In maps created with the help of GIS along the land itself, there are such layers as rivers, roads, settlements and much more. It all depends on the quantity and characteristics of the data provided. Using just an ordinary electronic map of the area, with the help of data, you can create a blank map, topographic or thematic map. GIS is becoming an increasingly integral part of our lives and agriculture. For an ordinary farmer, for example, there are many advantages of GIS. One of these advantages is that, when buying or renting a land plot, he can look at the electronic map in the cadastral offices, which will take into account the location of the plot, the location of passing channels, soil structure and so on. The second advantage is that the map will show all the advantages and disadvantages of the site, such as soil quality, climatic conditions, this will lead to the correct selection and distribution of crop rotation, which will help reduce the cost of fertilizers, machinery and labor. All these aspects are described in more detail in the article.

**Keywords.** GIS, management, efficiency, costs.

**Introduction:** Advanced technology has become an integral part of our daily lives. Scientific and technological progress is observed in all areas, whether it is engineering, or the field of education. This all positively affects the economy of the country as a whole.

One of the fruits of scientific and technical progress was GIS (geographical information system), which is a graphical representation of the area and its characteristic information. GIS has gained great popularity in Uzbekistan, and is used in many fields. The starting point was the signed resolution by the former President Islam Karimov on measures to implement the investment project "Creation of the National Geographic Information System" in September 25, 2013 "PP-2045. After that, GIS systems began to be introduced more and more actively in all areas.

So agriculture was not left aside. The vast territory of agricultural land, a large number of people living and employed in the agricultural sector, a large number of vehicles, all this served as an impetus for the approach to land management and agricultural production.

In the past, ownership of operational information was limited. With the advent of GIS, it became possible to identify complex patterns, to get an unconventional forecast.

GIS has a different classification. The most popular is the territorial size. GISs are divided into global, regional and local, and so on.

**Materials and research methods.** GIS in the agricultural sector is based on Remote Sensing of the Earth, and not only people involved in agricultural activities are interested in it, but also the state itself. Farmers will be able to correctly and efficiently plan the activities carried out on the agricultural plot, thereby reducing costs and increasing the quantity and quality of the crop.

And the state uses the data obtained with the help of GIS systems for the purpose of compiling inventories, assessing and monitoring the targeted use of land. There is also a third group of interested people, these are investors. Created maps in the GIS system using Earth sensing will be able to convey to investors the attractiveness of the selected area, and will allow for the correct calculation of payback, risk, profit, taking into account all the features of the land.

The agricultural sector of Uzbekistan since ancient times has been important in the country's economy. As in any other field, the goal of the state is to achieve high profitability of production, but at the same time not to harm the environment. You can achieve your goals by making the right managerial decisions, the basis of which should be reliable information. In almost all enterprises, production information is stored in programs such as Excel, 1C, etc. However, this information and indicators is difficult to associate with important parameters, such as weather, for example. Modern geographic information systems allow not only to relate this data to each other, but also to try it on the field and make it possible to view changes in the field by day, week, month.

Information on agriculture is more of a geographical nature, so it is advisable to use geographical information systems (GIS). The GIS program allows you to reproduce the real form of agricultural land, only on a certain scale. The reconstruction of such a graphic picture is based on information from external databases. GIS allows you to make an informed decision. Say we have a certain land acquired for the purpose of growing crops, the question arises of the distribution of crops in the agricultural land. In this case, GIS can play an important role, theoretical knowledge must first be implemented on a reduced scale. Creating such plans in a GIS will save time and reduce losses.

There are many problems in agriculture, one of which is land degradation. Land degradation is the quantitative and qualitative deterioration of soils, which lead to a decrease in land fertility. Thanks to satellite data, it is possible to analyze the composition of the earth at the global level, which will allow using the comparison method. To measure soil degradation, the NDVI indicator (vegetation activity index) is used. Using NDVI and satellite data, it is estimated that for the period 1981-2006, the world economy received less than \$ 300 billion of agricultural products. Satellite data, as a rule, are informative in nature, and are most reliable, since a routine soil survey is carried out once every 3 or 5 years.

The location of rivers and canals plays a special role in the development of agriculture. Sources of water resources, the amount of water in river beds, the direction of the channels, all this information can be found thanks to satellites. Information obtained from remote sensing of the earth is analyzed using GIS technology. This can be most clearly expressed in ArcGIS. Images of the earth's surface taken from space are taken as a raster basis, and information on hydrological networks from a database, for example, the Ministry of Water Resources of Uzbekistan, is taken as a vector basis. In constructing this type of map, it is advisable to use the Hydrology tool. Using such a compiled map, you can correctly place a new farm or think about supplying water to existing ones.

Fig. 1: Distribution of crops on the map



### Research results and discussion.

Important components in the GIS system for agriculture is the database management system and spatial analysis tools. They allow you to identify the terrain, soil type, hydrological regime, in the area where it is planned or where there is an agricultural organization.

For the further development of the agricultural sector, it is necessary to replenish the database with computer interactive maps and fresh statistics, create a cell to collect geodata information. All this will allow to regulate legal relations on land plots, to take into account and control the targeted direction of land for agricultural needs, to analyze the current state of land resources, to rationally use land resources.

For agricultural enterprises, relevant programs are ALGIS, Arc / Info, ArcCAD, ArcView, AtlasGIS, AutoCADMap and others. The most convenient program for visualizing agriculture is ArcView GIS. In this program, based on images from space, additional cartographic layers are created, such as vector soil layers, crop distribution, cartographic statistical information regarding harvesting data, livestock, birds and so on.

ArcGis can take, as the basis of the Database program 1 C, SAP, Excel. From these programs, digital data is taken, which translate into visual boundaries on a digital map. After you can include temperature and humidity data, in ArcGis these weather data are stored in a geodatabase for future analysis. To represent the vegetation cover on a digital map, one can apply satellite images of the Landsat, Sentinel programs. ArcGis processes these images automatically. ArcGis also exists in the mobile version, it creates convenience for field trips and comparisons with real problematic areas, their pictures are created and uploaded to the program, this allows you to create reports, and visualize and associate them with the applied solutions. The Landsat, Sentinel programs contain an archive of images from space, but you can analyze them only in the ArcGis program, there is such a function as viewing old and new images at the same time and comparing them.

**Conclusions.** Prediction using GIS systems will increase the efficiency of agricultural production, almost twice, due to the timely implementation of agricultural work, such as:

- measurement of the agricultural plot using GPS equipment, which will give maximum accuracy, and will reduce unnecessary costs (for example, the calculation of fertilizers for every centimeter of sown area)
- use of an electronic map in vector format for structuring the sown area and crop rotation
- calculation of the necessary, machinery and the amount of fertilizer required
- the creation of a regime, a schedule of tillage, fertilizing and other various crop protection products.

Monitoring of geographic information support systems involves solving the following problems: - Observing the long-term trend of land property change; Timely detection of problems will enable targeted prevention work;

- analysis of the relationship between environmental and economic factors and agricultural problems;
- remote control;
- comparative analysis of regions, districts and their grouping by soil type, as salinity, degradation, etc.

Planning agricultural work will not only reduce costs, but also save time. Every day, on the basis of these agrotechnical works, you can draw up a schedule of ongoing work for each day.

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