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CARTOGRAPHIC SOURCES USED IN THE CREATION OF AGRICULTURAL ELECTRONIC CARDS

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ABSTRACT
The purpose of the study is to develop geoinformation support for electronic maps of agricultural design at the level of an individual agricultural enterprise. Research is carried out in the conditions of the Republic of Uzbekistan. To achieve this goal in a scientific article, the following tasks are solved: to consider the scientific foundations of the territorial organization of agricultural production on a landscape basis using geographic information systems and technologies; to substantiate the conceptual GIS model of electronic maps of agricultural design at the level of an individual agricultural enterprise; to develop a methodology and a general algorithm for creating and using a system of electronic maps in the process of agrolandscape design; develop a geodatabase structure for analysis; to assess the effectiveness of the use of GIS technologies for electronic maps of agricultural design.

KEY WORDS: geodata, electronic maps of agricultural, cartographic sources

INTRODUCTION

Solving the problems of the territorial organization of agricultural production and preserving the ecological framework of natural complexes are considered as the main measures to increase the efficiency of agricultural production systems. One of the main problems of the territorial organization of crop production is the inadequacy of the existing farming system to natural conditions, the imbalance of reproduction processes, including in the field of soil fertility. The rapid downsizing of collective and state farms, the formation of dekhkan farms, the redistribution of land without inter-farm and intra-farm land management led to a violation of the boundaries of crop rotation, a decrease in the general culture of agriculture. These factors made it necessary to clarify the existing farming systems, taking into account the landscape structure and current economic conditions. Improving the efficiency of farming systems is possible by optimizing the main components that ensure the sustainability of the productivity of agrocenoses and the production organization system [1, 2, 3].

As a means of information support for persons making decisions on agricultural production management, it is necessary to create and use a geographic information system for designing agricultural landscapes (GIS ALP), which is a system for collecting, storing, organizing and processing information about the territorial distribution, spatio-temporal functioning of agroecosystems and their components. An analysis of the experience of using GIS technologies for solving problems of agricultural landscape design showed that existing scientific developments do not allow to fully perform a comprehensive analysis of the state of the territory, in addition, there is a need to create a geoinformation technology for designing agricultural landscapes. Considering the above aspects, the research topic is relevant [4, 5, 6].

LITERATURE REVIEW

Applied research aimed at improving the toolkit of digital electronic maps - the basis of efficient agricultural production was carried out by: Vasenev, V., Veretelnikova, I., Brianskaia, I., Demina, S., Romzaykina, O., Pulatov, B., & Pulatov, A. (2020); Ivushkin, K., Bartholomeus, H., Bregt, A. K., Pulatov, A., Kempen, B., & de Sousa, L. (2019); Juliev, M., Mergili, M., Mondal, I., Nurtaev, B., Pulatov, A., & Hübl, J. (2019).

Issues of digital electronic maps in agriculture are reflected in the works of the following scientists: Musaev (2019); Rakhmonov (2018); Narbaev (2019 a, b); Durmanov et al. (2019 a, b); Babazhanov (2019). The main goal of the study was to develop the theoretical and methodological foundations of cadastral valuation of land, assessment of the land resource potential of agriculture in the Republic of Uzbekistan in the context of intensive land use of electronic agricultural maps.

METHOD

Theoretical and methodological foundations of the research. The theoretical material of the study was the works of domestic and foreign scientists, covering the experience of developing GIS technologies and their applications in the field of agricultural production and planning, information and geoinformation systems technology. Databases. To carry out the work, the main provisions of the theory of cartography, processing of spatial information in geographic information systems are used. The research is based on a system of general principles and approaches, general scientific, systemic and ecological, as well as electronic maps of agricultural, as part of geographic approaches. The research was carried out using actual data from the National Center for State Cadastre, Geodesy and Cartography, the State Committee of the Republic of Uzbekistan on Land Cadastre, State Committee of the Republic of Uzbekistan on Statistics.

FINDINGS AND DISCUSSIONS

Documents of any form used to create cards of different mazu are called sources. Sources are divided into different groups with certain conditionality [7].

Thematic cartographic data - this information is mainly used to create thematic maps. Thematic plans and thematic maps of different purposes and scales, formed as a result of geodetic surveys obtained in the field, form the basis of thematic cartographic data. Land use diagrams and forest plans are also included in this content. Depending on the scale coverage of thematic cartographic sources, it serves to create small or large scale thematic maps [8].

Topographic maps - topographic maps form the basis of mapping any area. Topographic maps describe events and happenings in the region very clearly. These maps describe the hydrography of the area, the soils, the topography, the settlements, the roads and other objects [9].

Agricultural maps - In the Republic since 1960, the creation of thematic maps by industry has begun. In particular, in 1961, the cartography factory "Uzgiprozem" created a "map of agriculture of Uzbekistan" on a scale of 1: 1,000,000. In 1963-1965, this organization created maps of agriculture, cotton, livestock, pastures of the Republic [11]. The "Album of the agro-industrial complex of Uzbekistan", created in 1984, is a cartographic work that fully covers and provides information on the agricultural and agro-industrial complex of the republic [10].

The main cartographic sources mentioned above (topographic, thematic and agricultural maps) have not lost their relevance to date. They are the basis for creating various types of themed cards as well as agricultural maps. In addition, these maps serve as a comparative resource for the analysis of agricultural sectors, resources, agro-climatic conditions, assessment research.

Electronic maps - Since 2008, the State Committee for Geodesy and Cadastre has been creating electronic digital maps of agriculture on a scale of 1:10 000 in the wetlands of the Republic of Uzbekistan in the software ArgGIS. Earlier, in 2006-2007, the Central Aerogeodesy and Geoinformkadastr state unitary enterprise used these maps with the help of Panarama and Oasis software. These maps are the main source for the creation of electronic agricultural maps to determine the territorial distribution of agricultural crop species, the boundaries of farmland, district and district massifs.

Remote sensing data - the development of modern techniques and technologies has not bypassed this area either. In our country, mapping using remote sensing data has not been studied in a wide or complex range. Some research in this area can be seen in the research conducted by several scientific or governmental organizations in their respective fields [12, 13].

Depending on the scale, purpose, and content of the themed card, additional space photographs may be used. These space images allow you to get reliable information about the object and events depicted on the map being created. In addition, the spatial characteristics of space images make it possible to determine the scale of the map covering the area being studied.

Statistical data. It is one of the main sources for creating agricultural maps. These statistics are formed by the State Statistics Committee of the Republic of Uzbekistan in accordance with the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan dated September 2, 2017 No 690. The Committee prepares statistical data on all sectors of the Republic, covering 26 types of sectors. Agricultural data is mainly presented in 5 different formats (pdf, .xls, .csv, .json, .xml) covering 8 areas. The structure of agricultural statistics is illustrated in Figure 1.

In addition, there are sites of the statistical office of each region, which contain 18 types of industry and analytical data. The so-called "Agricultural Indicators" includes statistical and analytical data on the agriculture of the region for the last 3 years. It provides information on rural, forestry and fisheries areas of the region and its administrative districts (districts, cities, towns). Another aspect of this site is that you can find agricultural statistics in the "Press Releases" section of the site [15].
In general, the analysis of agricultural statistics shows the trend of production and regional distribution of agricultural and livestock sectors in agriculture in the republic, regions and districts [17]. This information can be used to create electronic maps, interactive maps, and web maps to link and visualize regions, to describe the geographical relationship of agricultural facilities to each other.

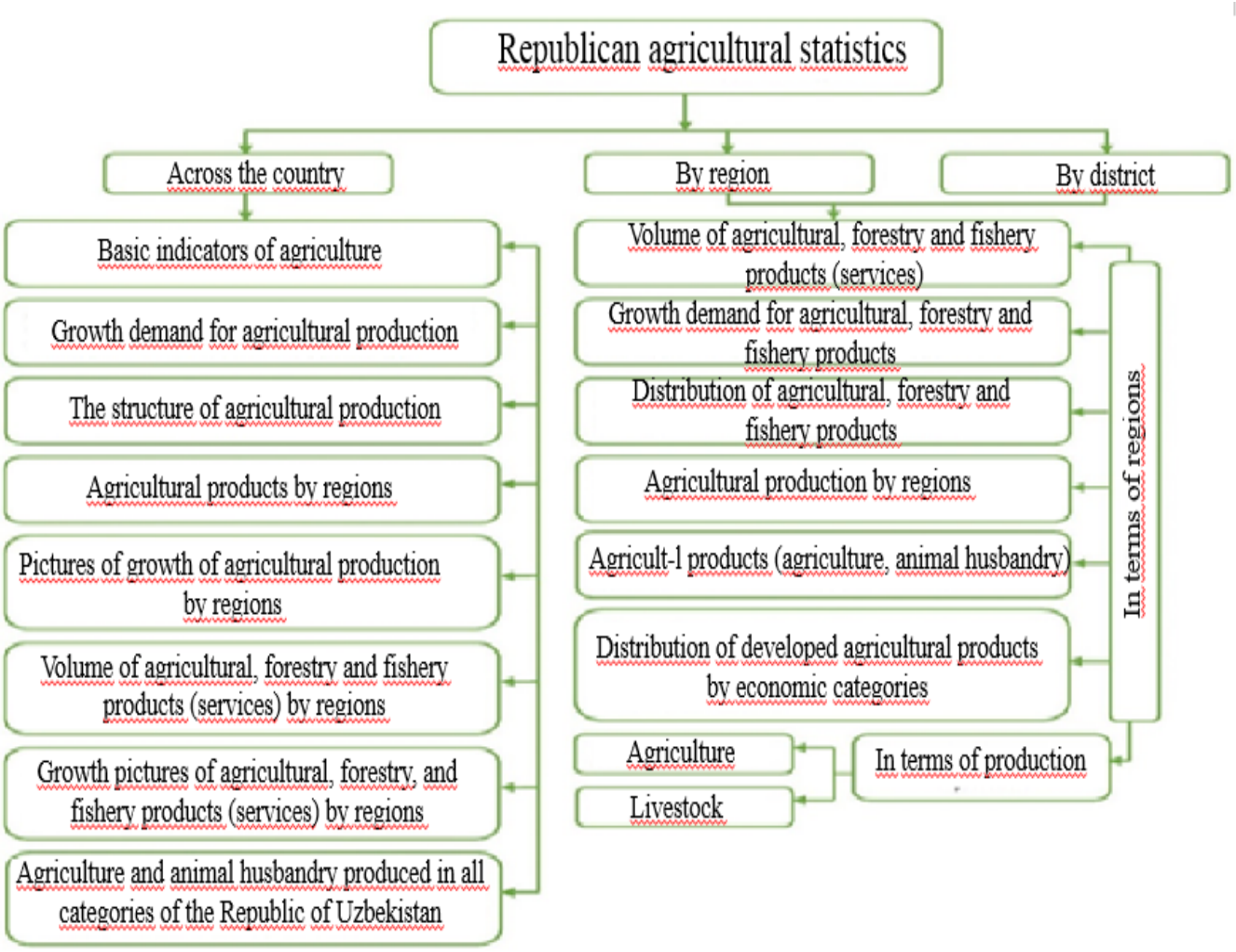

Figure 1: Systematic structure of statistical data on agriculture (developed on the basis of data from the site https://stat.uz).

The technology of analysis, processing and storage of computer information in a geographic information system (GIS) requires a certain form of systematization of descriptions in the form of a specific database (geodatabase) the use of a geodatabase allows you to quickly track all changes occurring in the land use area, to form spatial procedures for processing geodata [16].
The composition of the geodatabase used for afolandscape design is shown in the table.

Table 1: Composition of the ALP GIS geodatabase

No.	Name of cartographic materials	Content of cartographic materials	Scale	Form card
1	Soil map	Contains the outline of the variety soils and their composition	1 10000	Vector
2	Geobotanical map	Areas of vegetation types		
3	Climate map	Macro- and microclimate data		
4	Agrochemical survey card	Comte in RA distribution of trace elements in soil		
5	Topographic map	Objects hydrographic (river streams e stestvennye and artificial water emy) roads and others. objects		
6	Retief area map	Display elevation and horizontal		
7	Slope exposure map	Slope exposure contour		
8	Map ugtov tilt	Tilt angle contour		
9	Land degradation	Data on the areas affected aqueous wind erosion gullies, etc . etc.		
	Remote zoning data	Space images		

RECOMMENDATIONS

The algorithm for the development of GIS software for LSA is shown in the figure:

1.The main stages of the development of GIS software for technology agrolandscape design are as follows

- Preparation of the initial cartographic materials (basic topopafic map, soil map, materials of agrochemical surveys, data on the macro- and microclimate of the study area, geobotanical map with the distribution areas of plant species)
- Creation on the basis of a topopafic map horizontally and to elevation points or remote sensing digital elevation model (DEM) Based on DEM is produced with the help of GIS technologies, construction of angle maps slope, slope exposure
- Bringing maps to a single classifier using positional coding system

2. Synthesis of cartographic information. As a result of processing systems of maps by synthesis using the software used in GIS modules, maps of intersection of various contours are formed, containing attribute data obtained from all intersected layers (fig. 4),

3. Clustering sites. To form common borders contours, the clustering method is used, which allows to combine plots are similar in a set of attributive features.

4. Based on information extracted from the knowledge base, or from with the involvement of experts, areas are formed that are used in agricultural production and determines the direction of their uses, for example, withdrawn from production of crop products which are subject to tinning.

5. Making recommendations on the organization of agricultural production and reporting cartographic materials.

CONCLUSION / SUMMARY

For the input and processing of information, a specialized software module that extends standard capabilities. ArcView software package with the following features:

- Maintaining a system of reference books (appraisal and rank scales, reference book of land users, soil differences, etc.);

- Mapping of surveyed land plots using the principle of allocation of elementary sections (used functions of combining, cutting, copying, taking into account recalculation data of attribute tables), maintaining a database of agrochemical data on elementary plots with further recalculation of the values of the required indicators as weighted averages for a larger area, calculation of indicators, reflecting the dynamics of the state of soils according to different criteria;

- Automated registration of thematic electronic maps both for the areas displayed on the display and for a sample with given condition (land user, type of land use, crop rotation and so forth);
- Preparation of reports on the survey site and in general on land user or district (passport of fields, report on the state of land by land user and the region as a whole).

Electronic maps have been developed for this farm crop rotations by fields for 2006-2010, taking into account the production development plan and the qualitative characteristics of the soil cover, on their recommendations were formulated for the placement of crops within crop rotations, the amount of mineral fertilizers required to ensure expanded reproduction of soil fertility, needs for seeds, herbicides and the required agricultural machinery.

In the conclusion, the main results of the dissertation work and an assessment of the possibility of their application in practice.

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