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IMPROVING DIGITAL MAPPING FOR LAND MONITORING

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ABSTRACT
The purpose of the research is to create digital maps for monitoring agricultural land areas and to implement navigation surveying works based on them using a mobile application and to improve the method of summarizing field work through a server. The object of the research: agricultural land in the territory of Fergana region. The subject of the research is the monitoring of cultivated land areas, the analysis of land information by creating and updating electronic digital maps in the ArcGIS program .
KEYWORDS: *land area monitoring, ArcGIS software , mobile application, field work server.*

INTRODUCTION

From the developed countries of the world, the share of agricultural land in Canada, Finland and Sweden is 7.4% of the total land area. This figure is 9.7% in our republic. Therefore, effective use of irrigated agricultural lands and their control through regular monitoring are among the urgent issues of today. Due to the digitization of agricultural land, the need to use modern software, online platforms and mobile gadget applications for monitoring land areas, systematic control of land accounting is emerging. In this regard, it is important to improve the method of creating digital maps for land monitoring.

In the world, the monitoring of agricultural land and the inclusion of information about land in the geodatabase based on innovative methods, the acquisition of land information using online platforms, and the integration of field research into the geodatabase are being carried out. In this regard, special attention is paid to studies aimed at obtaining quick information on agricultural land monitoring and forming a unified geodatabase on land and land users.

Implementation of a number of measures in the fields of land formation, cadastre and land monitoring, in particular, digitalization of all data collected as a result of land monitoring, development of the agricultural land control system, and certain results are being achieved. In particular, the Decree of the President of the Republic of Uzbekistan of January 28, 2022 No. PF-60 "On the development strategy of the new Uzbekistan for the period of 2022-2026 " sets important tasks for " developing an electronic database for inventory and monitoring of their implementation". given In the implementation of these tasks, it is important to carry out scientific research on the formation of a geodatabase by monitoring agricultural land using modern methods and keeping land records.

Decision of the President of the Republic of Uzbekistan dated February 24, 2021 No. PQ-5006 "On additional measures to improve the system of use and protection of agricultural lands", Cabinet of Ministers of the Republic of Uzbekistan dated January 14, 2022 No. 22 "Monitoring of agricultural lands This thesis serves to a certain extent the implementation of the tasks defined in the Decision "On approval of regulatory legal documents regulating the activities of land protection and land creation" and other regulatory legal documents related to this activity.

LITERATURE REVIEW

The level of study of the problem. To the industry belongs to scientific literature analysis that's it shows that the village In addition to foreign scientists, scientific researches were carried out in our republic on land monitoring, land formation, land cadastre, use and control of land resources. Therefore, the theoretical and methodological foundations of the land resources management and land formation aspects of the problem were obtained from foreign scientists - S.Thenkabail, M.Thomas, W.Ralph, W.Jonathan. A study by Lam Dao Nguyen et al. Also, S.N. Volkov, V.V. Vershinin, A.S. Cheshev, A.O. Khomutov, M.V. Maksumova, G.E. Larin, and other scientists of land cadastre and land monitoring researched the theoretical and methodological foundations, while V.A. Evsegneev, N.V. Koryagina, N.Yu. Ulskaya, V.B. Jarnikov, Yu.S. Larionov, G.L.

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Zemlyakova studied the theoretical and methodological foundations of digitalization of processes , S.A. Lipsky, P.M. Sapojnikov and others developed.

Scientific research on land formation, land cadastre, land monitoring, accounting and geovisualization of land information in the geodatabase in Uzbekistan S.Avezboev, M.I.Rozimetov, R.A.Turaev, A.R.Babajanov, Q.Rakhmonov, M. Scientific works were carried out by M. Bozorov, F.R.Khamidov, A.N.Inamov, S.B.Roziboev and other local scientists. Scientific studies on mapping information in a geodatabase and creating agricultural maps E.Yu. Safarov, I.M. Musaev, O.R. Allanazarov, S.N. Abdurakhmonov, R.Q. Oymatov, A.N. Inamov and other scientists those who conducted their research and achieved positive results.

Today, researches are carried out on modern methods of land monitoring in different regions of our country, connecting field work to a geodatabase, increasing work productivity based on the type of navigational survey, monitoring field work using online platforms, and integrating information about arable land directly into the server based on mobile applications. not sufficiently studied. Therefore, there was a need to improve the method of creating digital maps for agricultural land monitoring.

METHODOLOGY

Tasks of the research: improvement of the method of updating digital cards of agriculture ; improvement of the method of integration of monitoring field research works into the geodatabase through the server ; development of a type of navigation camera for monitoring agricultural land areas ; Development of a method of monitoring agricultural land areas using the " Land Surveying " mobile application .

Research methods. In the research process , methods such as land monitoring , geospatial linking of vector layers , geovisualization of thematic layers based on cartographic methods , remote sensing of agricultural lands , coding using JavaScript programming language, and digitalization of information were used.

The scientific novelty of the study:the method of updating existing electronic digital maps of agricultural lands on a scale of 1:10,000 based on decoding has been improved; in order to improve the effectiveness of field research work, the method of integrating the monitoring work carried out on the ground with the help of the GSM network into the geodatabase has been improved; taking into account the format unit of the thematic layers, a method of navigational photography in the area of land users has been developed; Land Surveying " mobile application was developed for monitoring agricultural land based on JavaScript programming language.

Practical results of the study: available electronic digital maps of agricultural land at a scale of 1:10,000 improved decryption update ; Monitoring of land areas using the GSM network was integrated into the geodatabase ; in order to improve the efficiency of field research in the area of land users, the method of navigational surveying was improved ; " Land Surveying " mobile application was developed for monitoring agricultural land areas by regional experts based on modern technologies.

Reliability of research results. The conducted scientific researches were conducted using the geoinformation system, research was conducted on improving the accuracy of agricultural maps by using geodetic- cartographic methods, field work was carried out based on systematic analysis , the scientific basis of the obtained results, the created mobile application was used in practice, it was carried out on the basis of methodological manuals, the Republic and it is explained by the fact that scientific innovations were discussed at international scientific-practical conferences , scientific articles were published in foreign and local journals recommended by OAK, and the results were applied to production organizations.

Research of the results scientific and practical importance . Research of the results scientific importance village modern farm land areas improving the method of monitoring based on techniques and technologies, navigational surveying method legal and organizational based on documents i methodology work exit and of them use with explained. Research of the results practical significance , carried out Server-based integration of field research into a geodatabase and village economy him by monitoring his land control digitized method to implement directed state programs work on the way out use for service does _

RESULTS

In order to ensure the stability of relations related to agricultural land, to fundamentally improve the system of state monitoring, use and protection of agricultural land, and to widely introduce information and communication technologies in the field, the President of the Republic of Uzbekistan dated September 7, 2020 "Fundamentally improving the system of land accounting and state cadastre management" Decree No. PF-6061 on measures" was signed. This decree organizes work on monitoring agricultural land and crops, placing agricultural crops, ensuring the protection of agricultural land, determining the standard value and quality indicators of agricultural land, conducting soil inspection, increasing soil fertility, conducting research on soil science and geobotany. issues have been put forward. At the same time, the foundation for full digitization of agricultural lands has been created by establishing the Department of Development of Digital Technologies in the Agricultural Sector and the Department of Development of Geo-Information Technologies. In order to expand the scope of use of digital maps of agriculture, the independent researcher has conducted large-scale scientific research on creating agricultural maps and systematizing them into a format unit.

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To date, agricultural maps have been created using decoding, correction and decoding methods. These processes created problems related to manpower, costs and duration of work. If we take the example of a specific research object, the total land area of Fergana district of Fergana region is 620 sq. km. In addition, there are enclave and exclave regions (Fig. 1).

Figure 1. Statistical data on regions and the scheme of administrative-territorial division in the section of districts of Fergana region

**Source:* https://fergana.uz/

Based on these conditions, 10 experts are required to conduct field research within 30 days to create an agricultural map of this district. 30 million on average for bed and food for 10 specialists for 30 days. soum is required. In addition, a total of 10 million for transport costs. soum should be allocated. After the fieldwork decoding process, it takes 10 personnel to digitize the fieldwork in camera conditions for 15 days. 10 specialists were paid an average of 30 million for their work during 15 days. Soum funds should be allocated. Therefore, it is required to conduct field work within 6 days for the correction of digitized maps by experts who conducted field work above. For this, a total of 6 mln. Soum funds are required. These economic calculations were determined by the researcher using the timing method (Table 1).

Table 1.Economic indicators for carrying out field research in decoding, correction and decryption methods (available)

T/r	Research method	Number of specialists, people	Required time, day	Funds for expenses, soums	Salary for employees, soum
1	Decoding and correction	10	36	30,000,000	50,000,000
2	Digitization	10	15		30,000,000
3	Transportation costs			10,000,000	
4	Electricity costs			5,000,000	
5	Total	10	51	51,000,000	80,000,000
		General		**131,000,000**	

**Developed by researcher*

131 mln. was spent on the field and camera work carried out using these methods to create agricultural maps in electronic form. Soum funds are required. In addition, on average, 10 specialists will have to work for 51 days to digitize the land area of 620 square kilometers.

In order to expand the scope of creation and use of agricultural maps by an independent researcher, he developed a method with high economic efficiency, unlike the above methods, and introduced it to production organizations.

The proposed method is based on the creation of high-resolution electronic maps by surveying, surveying and digitizing agricultural land based on remote sensing material. Using space photographs of the researched area, orthophotoplanes are created

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and entered into the coordinate system by performing geospatial mapping in the ArcGIS program. In the implementation of this process, it is required to carry out field research in the section of the orthophoto plane area using the GNSS (Global Navigation Satellite Systems) geodetic device (Fig. 2).

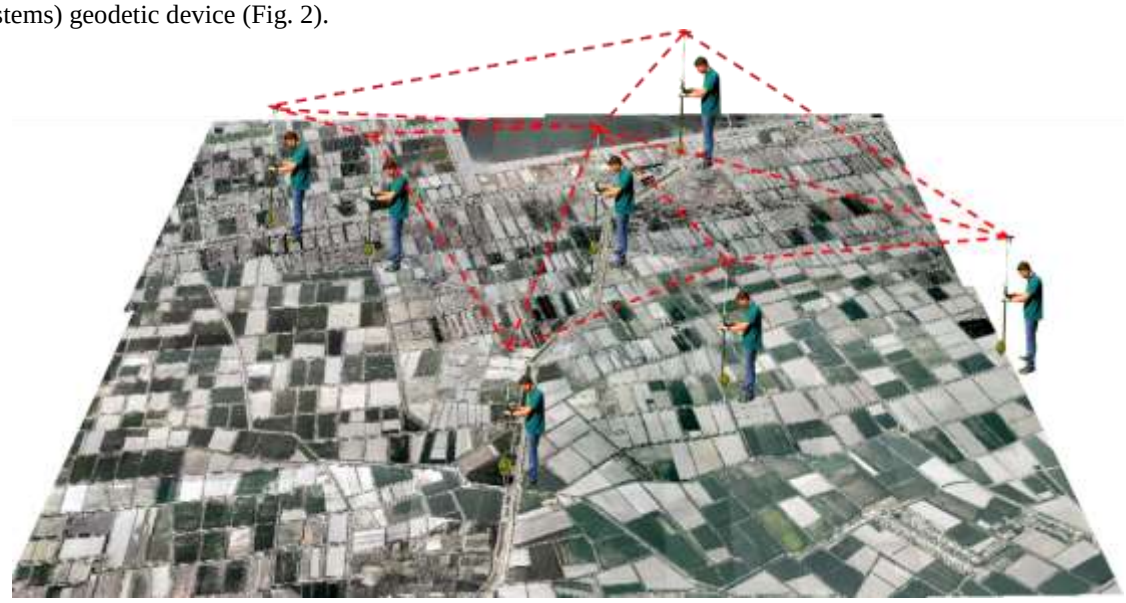

Figure 2. Field survey work carried out using the GNSS geodetic device

**Developed by the author*

Using the GNSS geodetic device, the coordinate values of the characteristic points were determined based on the geographic coordinate system (Table 2).

Table 2. The catalog of coordinates of fixed points determined according to the results of field research

id	*Layer type*	*Wide*	*Go away*
0	Tochka	71° 27' 16.082" E	40° 35' 51.103"N
1	Tochka	71° 31' 25.018" E	40° 36' 41.246"N
2	Tochka	71° 33' 43.221" E	40° 34' 10.202"N
3	Tochka	71° 31' 20.381" E	40° 33' 56.791"N
4	Tochka	71° 29' 33.426" E	40° 33' 18.450"N
5	Tochka	71° 28' 17.319" E	40° 35' 25.477"N
6	Tochka	71° 30' 23.707" E	40° 35' 21.712"N

**Identified by the author*

Examples of characteristic points are duikers, aqueducts, buildings and structures (fixed objects) (Fig. 3).

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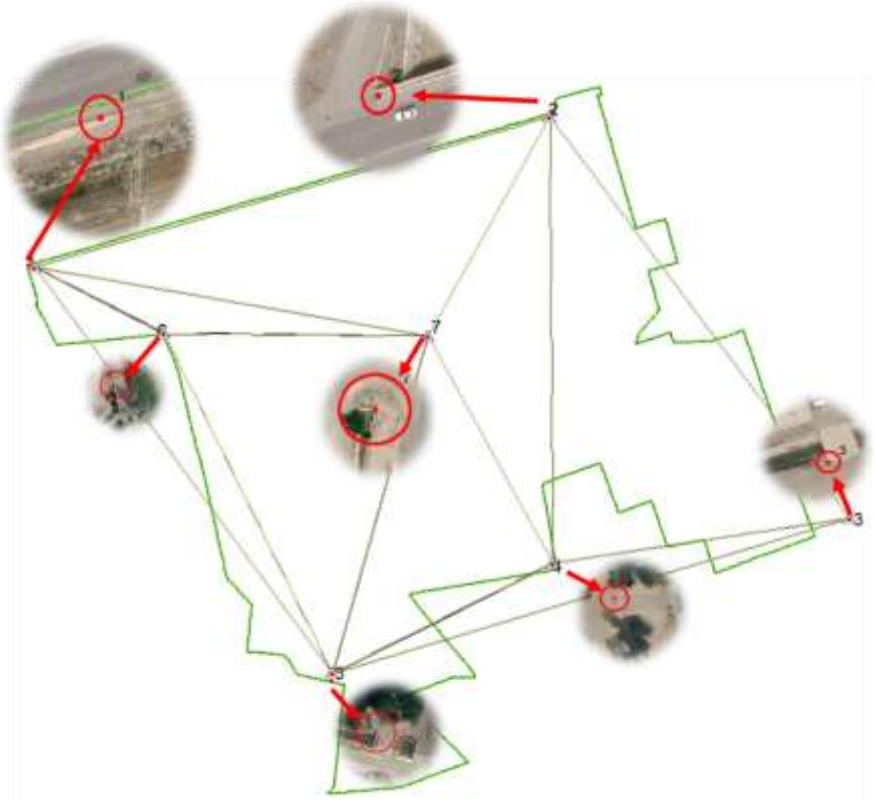

Figure 3. Characteristic points whose coordinates are determined using the GNSS geodetic device
**Developed by the author*

After the fieldwork was completed, software alignment was carried out. Reduction and centering errors in a total of 7 control points were identified and eliminated. The identified 7 control points were found from the orthophoto plane and transformed by geospatial linking. During the transformation, the orthophoto plane was stored in the computer memory, and when using the software belonging to the family of the geoinformation system, it was ensured that it fell into the coordinate system. Therefore, one of the important tasks is to include orthophotoplanes in the coordinate system (Fig. 4).

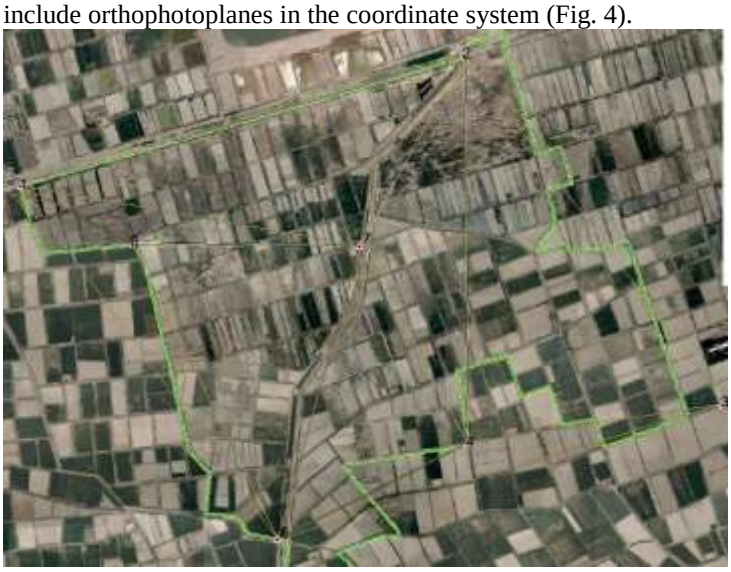

Figure 4. The process of geospatial linking of orthophotoplanes based on the coordinate system
**Developed by the author*

Geospatially linked orthophotoplanes were first subjected to the decoding process in camera conditions. Then the field work was carried out and the decoding work was completed in camera conditions. The decoded study area was decoded in ArcGIS software

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and the location details were digitized. When entering location details, highways, field roads, irrigation and irrigation networks, hydrotechnical structures, residential areas, and land types were included in the geodatabase. At the end of the work, experts introduced changes in the recommendations of the place by the method of correction. Correction As a result, an electronic digital map of the research area was created (Fig. 5).

Figure 5. Electronic digital agricultural map of Dostlik massif, Argona district, Fergana region.

**Developed by the author*

Land contours, land users, land types and crop types were included in the created electronic digital map of agriculture. At the same time, point, area and line layers were used to create the agricultural map. The names of agricultural objects were entered into the attributive data table of the used vector layers. Based on the names of agricultural objects, a database of conditional characters was created, and the appearance of agricultural objects was geovisualized according to the requirements of the state standard on semantics. This created database of conditional symbols is being used in production organizations for geovisualization of agricultural maps of our republic. In this way, the agricultural map of the research object was created in digital form on a scale of 1:10,000 (Fig. 6).

Figure 6. Digital digital map of agriculture on a scale of 1:10,000.

**Developed by the author*

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The recommended method for creating electronic digital maps created on the basis of these orthophotoplans differs from the existing method in terms of time efficiency and economic efficiency.

According to the economic analysis, 10 specialists conducted field research for 20 days to create an agricultural map of 620 square km. soum is required. A total of 8 million for transportation costs. 10 employees were involved in digitalization of field work for 10 days. 10 specialists were paid 20 mln. for their work during 10 days. 100000 soums of funds are allocated, and at the same time, it is required to carry out field work for 10 days to correct the digitized maps by the experts who carried out field work above. A total of 10 mln. soum funds should be allocated (Table 3).

Table 3. Economic indicators for carrying out field research in decoding, correction and decoding methods (proposal)

T/r	Research method	Number of specialists, people	Required time, day	Funds for expenses, soums	Salary for employees, soum
1	Decoding and correction	10	30	30,000,000	50,000,000
2	Digitization	10	10		20,000,000
3	Transportation costs			8,000,000	
4	Electricity costs			3,000,000	
5	Total	10	40	41,000,000	70,000,000
		General		**111,000,000**	

**Developed by researcher*

As a result of the comparison of the existing method and the traditional methods, it was found that the cost and time efficiency of digitizing the land area of 620 sq. km.

Table 4. Comparative table on conducting field research in decoding, correction and decoding methods

T/r	Research method	Number of specialists, people		Required time, day		Funds for expenses, soums		Salary for employees, soum	
		Available	**Offer**	**Available**	**Offer**	**Available**	**Offer**	**Available**	**Offer**
1	Decoding and correction	10	10	36	30	30 mln	30 mln	50 mln	30 mln
2	Digitization	10	10	15	10			30 mln	
3	Transportation costs					10 mln	8 mln		8 mln
4	Electricity costs					5 million	3 mln		3 mln
5	Total	10	10	51	40	51 mln	41 mln	80 mln	41 mln
	Available					131 mln			
	Offer					111 mln			

**Developed by researcher*

According to the results of the analysis, the proposed scientific research is based on modern techniques and technologies, while the decoding and correction work is carried out using the modern " Land Surveying " mobile application, and the decoding work is carried out in the ArcGIS software. As a basis, field research was carried out using space photographs and aerial photographs.

CONCLUSIONS

In order to standardize the results of the research and expand the scope of use, a server memory cabinet was created for the mobile application " Land Surveying ". Thematic layers of electronic digital maps have been brought into a single format unit for common use in the memory server. This format unit is KMZ, which made it possible to use thematic layers not only with software belonging to the family of geoinformation systems, but also with the help of mobile applications. Authorized users, specialists and

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scientific researchers will be able to obtain relevant information and conduct analytical research from the data warehouse in this server's storage cabinet. Based on the information in this server cabinet , scientific research was conducted by an independent researcher and reliable results were obtained.

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