

USE OF CROP-ZOOM OPPORTUNITIES FOR THE INVESTIGATION OF THE QUANTITY AND QUALITY OF AGRICULTURAL LAND ON THE TERRITORY OF VINNYTSIA REGION

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Abstract

The article is disclosed the method of study of the classification of crops in the automatic mode, the dynamics of the index ndvi, the calculation of the areas under separate crops, all at the level of each field and the state as a whole. The speed of the required information is obtained at the same speed as in the Land Viewer software product, which is based on the merging of the satellite data Landsat - 7.8 and Sentinel-2. The selection of the data of the research area of Vinnytsia district is carried out in the CROP-ZOOM software interface with the choice of the best resolution and visibility of the studied objects simultaneously with the public cadastral map of Ukraine. Selected data is generated on request of the user in real time, which allows to use the most diverse data in further investigation and to achieve the perfect result of the study.

Key words: CROP-ZOOM, the classification of crops, the dynamics of the index ndvi

Introduction

The development of new research technologies for the quantitative and qualitative state of land is being made thanks to the development of technologies offered by the developers of the Land Viewer interface. Crop zoom software the product of EOS Data Analytics was founded by a native of Ukraine Maxim Polyakov, and is specialized in the analysis and processing of large GIS data. The tasks set out to be implemented in the future are applied in practice as in science, related to the reflection of differences in the state of vegetation in the process of their germination and predicting of their yields. Crop zoom ensures the automatic reproduction in diagrams or spectral profile the crop growth during their maturation over a certain period with dynamics over the last 3 agricultural years. If it is also possible to use the function of measuring the area in the visible contour of the area.

Problem formulation

The research of the quantitative and qualitative state of agricultural land in Vinnytsia region is carried out thanks to the development of technologies. The Crop zoom software provides a number of new operations that are required to perform specific tasks in a separate area study.

The analysis of previous research

Scientists of Ukraine are engaged in the study of the territories according to the data received from satellites. Lviv Polytechnic National University, Department of Photogrammetric and Geoinformatics

(Prof. O. Dorozhynsky), Kyiv National Technical University of Construction and Architecture (Professor S.Voytenko), Research Institute of Geodesy and Cartography (Professor Y.Karpinsky). Significant practical experience in using geoinformation technologies in Ukraine for various needs of the state, including land resources, is in SSPE "Geosystem", and their developments are used in practice on the territory of Ukraine and Europe.

Study of the problem

The intensive and modern pace of development of the society and the state of Ukraine as a whole includes new requirements for the protection and rational use of agricultural land, the accounting of quantitative and qualitative conditions, the accurate accounting of lands by their categories and the targeted use of lands of all forms of ownership.

Since the beginning of 2018, tax legislation has changed, which in turn led to inventory of land registrations and their quantitative and qualitative characteristics. The relevant government agencies received the task, to provide fast reliable data, in accordance with the basis of the State Land Cadastre, and compare them with the statistical data of village councils that were provided since 2001. Relevant information and certain changes were entered 2 times in 1 year in the software of the corresponding form, in which the information about the owners and users of the land plots and their transition by categories of land, form of ownership, type of use, change of land were displayed. This entailed a complicated procedure for accounting of the use of land for the reporting past periods. Particular attention was paid to agricultural land since the Vinnytsia region is the leader among the regions of Ukraine in the volume of gross agricultural production, production rates, production per capita, grain production, sugar beet, potatoes, fodder products, meat, milk, cattle population, cows and poultry.

Particular emphasis is placed on the economic feasibility of the use of arable land, farms and large farms of "agroholdings", which are used on a legislative level in accordance with lease agreements or use land shares (units), or use without legal documents land shares (units), the plots for conducting private peasant farms, land stock, agricultural reserve (state property). According to the report provided by the Department of Agricultural Development, Ecology and Natural Resources of the State Administration of Vinnytsia region, programs of support of agricultural producer are introduced in the framework of the implementation of tasks in economic development programs of Ukraine. The total amount of support to the agrarian sector is more than 6 billion UAH. 2,5 bln. UAH. Vinnytsia region has one of the most powerful agro- industrial complex in Ukraine, which demonstrates high rates of development and important results of management. In 2017, in January-October 2017, the total agricultural output increased by 13% compared to the same period of last year, including by 19.2% in crop production and by 1.2% in livestock production. According to the results of 10 months, the Vinnytsia region has taken the first place. The production of sugar beets has a direct dependence on the work of sugar factories. To date, there are only 6 factories remaining, but the modernization of their production allows processing of the same volumes of sugar beet, as in previous years. Potato production is also gradually increasing, but this product is produced by 99.7% in households by conventional technology.

Land registries in the Vinnytsia region on the number of land users and landowners in the use of land, timely payment of land tax and rent, with the Department of Regional Statistics and registration of land in the form of 6-earth and 2-earth struck by their distinction. And the results of the village councils were generally different from true reality in real time. Quantitative accounting of the total area was very different. This is even very visible by using the Public Cadastral Map of Ukraine. It is impossible to reduce the data due to differences in the data provided by different services. The reports were expected, but unreliable. Specialists who go to the area and substantiate the data are not provided at all by the procedure of verification of reliability and comparison of statistical data. Relying on the data provided by the agronomists and lawyers of the existing private farms that rent the land on lease rights of formed land properly. Only the Head of the Vinnytsia Regional Agro industrial Complex tried to reproduce the true results for the district as a whole, went to the area and made an approximate report. Again, the results of coordinated activities to achieve the set goals did not give the desired result in the field of protection and rational use of agricultural land, the accounting of quantitative and qualitative state of land in terms of their categories and the targeted use of lands of all forms of property in the field of taxation. And the results presented by village councils were impressive in accordance with the "real picture". Quantitative accounting of the total area was very different. To bring data for a clear understanding of the present situation of the agricultural complex, requires a lot of human labor costs and the reliability of data, which is practically impossible to implement at the set time.

For the possibility of realizing the tasks in the investigated areas of Vinnytsia region, a new software interface is used to ensure that information is obtained reliable, fast and qualitative for further coordination with relevant departments of the state land cadastre of Ukraine. We can, in our heavy

research, without any technical errors, relying on computer user knowledge, by applying Crop zoom the original product of EOS Data Analytics, founded by Maxim Polyakov, a Ukrainian native, who specializes in the analysis and processing of large GIS data.

Crop zoom is oriented to the European market, while developers have left the service available free of charge for Ukraine. At least, this is the merit of a highly skilled specialist Nazariy Panchiy, who has achieved a high result. Direct cooperation and a clear understanding of the problems of modern Ukraine provided us with user access for further research in Ukraine. The problems in practice, as well as in science, are related to the reflection of the area of crops, types of crops, differences in the state of vegetation as they sprout, and predicting the yield of quantitative and qualitative state. Due to the capabilities of Crop zoom it became possible to obtain reliable data on the number of sowing areas of crops, their classification, state, development, deduction by the easiest means of dynamics of the NDVI index, reproduction of results in diagrams or profiles for a certain period with dynamics. It is also possible to use the functional measurement of the area along the visible contour of the area with an overlay on the Ukrainian "Public Cadastral Map" for targeting and linking to the area of users and owners; to compare the pace of changes in the quantitative and qualitative characteristics of different categories of land, type of land use, the definition of land, which is used without legal documents, which entails the administrative responsibility for avoiding payment of land tax.

To solve a series of tasks it is easy to use in the browser Crop zoom, which is freely available, only on request of the registered user in the system, the necessary information can be obtained. The data on the request of a given task, which is readily available to the browser, it's only necessary to select the research area and the Input Location data. We are exploring, in particular, Vinnytsia region, in particular, Stepanivka village council of Vinnytsia district as of August 2017 (Figure 1)



Fig. 1. Display of crops August 2017.

Source: Own study based on the data from (KOLODIY, PODLIPNAY, YANOVYCH, 2018).

While exploring the object, we can draw a conclusion on the intensive use of agricultural land, as well as recognizing the crops in the colors specified in Legend. So, in the fields, we decipher the sown areas and crops, growing on them: orange - corn, pink - sunflower, green - winter wheat, yellow - winter rape, blue - soybean.

To determine the owners of the users, we impose on the Public Cadastral Map of Ukraine by applying the same area of study for solving the required task, namely the coincidence of lease agreements in accordance with existing legal documents and the procedure for land use and statistical data provided on the above-mentioned reports.

Relying on the data, provided by the agronomists and lawyers of the existing private and state owned enterprises, that rent the land on the right to lease the formed land properly. Or the use of land by the owners of agricultural land. The result is impressive with its data, which is very clearly reproduced from the comparison of data on certain fields that are being processed. Public cadastral map with overlapping data of Input Location on the territory, according to the previous picture(Fig. 1), located on the territory of Stepanivka village council of Vinnytsia district as of August 2017. (Figure 2) reflects the division into land shares (units), owned by citizens with the corresponding cadastral numbers, in turn, it allows us to conclude on the use of land with legal documents in the form of lease agreements and properly registered in accordance with the current legislation of Ukraine.



Fig. 2. Display of crops at once with the Public cadastral map of Ukraine August 2017.
 Source: Own study based on the data from (KOLODIY, PODLIPNAY, YANOVYCH, 2018).

Based on the information provided, in particular, of the users of the fragment of the investigated object, the State Property Rights Service on real estate - compliance is only 73%. The rest of the territory is used without proper legal documents for a variety of reasons. Among them the main are the acceptance of the inheritance, re-registration of ownership at the stage of initial registration, the left land without owners and users, the disability of the population to make the documents properly at their own expense, accompanied by long-term manipulations on the part of authorities, which are empowered, unauthorized occupation of lands, etc.

Thanks to Crop zoom in Crop Monitoring, it's possible to track the information about growing crops in certain areas of the research object for 3 years. The results obtained in percentage terms reproduce the following data on crops sown during 2016, 2017, 2018. Analytical accounting of main crops in percentages for 3 years (Fig. 3) and (Fig. 4).

YEARS ANALYSIS											↓ CSV	ha	%
Year	Maize	Other Cereals	Peas	Soybean	Spring Crops	Sugar Beet	Sunflower	Winter Barley	Winter Rapeseed	Winter Wheat			
2018	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	13.50%	86.50%			
2017	22.33%	0.00%	1.79%	7.52%	0.00%	1.39%	28.60%	0.00%	3.19%	35.18%			
2016	18.98%	1.01%	1.11%	8.81%	0.90%	0.91%	28.76%	6.23%	2.69%	30.59%			

Fig. 3. Analytical accounting of main crops for 3 years.
 Source: Own study based on the data from (KOLODIY, PODLIPNAY, YANOVYCH, 2018).

Summing up the research work with the new capabilities, provided by the specialists of the Crop zoom software, we were able to achieve the objectives and really evaluate the resource potential of Ukraine. We have highlighted the disadvantages of extensive use of land, estimated close to reality the economic feasibility of using arable land, farms and large farms of "agroholdings", using the resource potential of an agrarian country at the legislative level.

YEARS ACTIVITIES

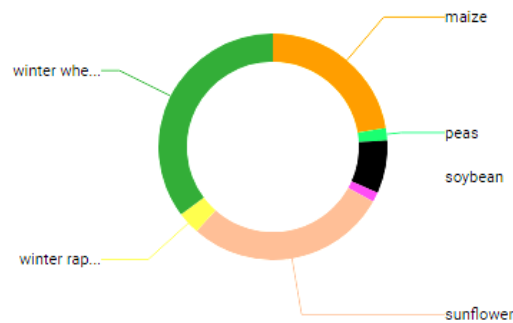


Fig. 4. Chart showing the data of the studied cultures.

Source: Own study based on the data from (KOLODIY, PODLIPNAY, YANOVYCH, 2018).

Conclusions

Using the latest Crop zoom software will allow to receive simultaneously the necessary information in the attachments of Input Location and Crop zoom application with subsequent implementation, provide an opportunity to comprehend the authenticity of the provided information to match the number of data, but nowadays it is difficult for Ukraine, as there is a lack of State bodies funding for equipping of workplaces and even partially for conducting the courses for specialists of relevant organizations, territorial bodies. These all lead to negative shadow schemes for "no taxes" and rational(irrational) land use, to the enrichment of users, who use land in an intensive manner, not observing the protection and rational use with application of different chemicals against pests, which have a negative impact on agricultural products and in the future will lead to the diseases among consumers in general. Also, this software solve applied problems in various sectors of industry, water management, forestry, help to solve problems in construction monitoring, pipeline transportation and it is the most valuable in agriculture.

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