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THEORETICAL PRINCIPLES OF CONDUCTING AGROCHEMICAL CERTIFICATION FOR ENVIRONMENTAL LAND USE

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Abstract: *Organic farming is a promising area for agricultural production, with environmentally safe and rational land use. The aim of sustainable land management is to optimize the activities of agricultural workers to improve the environmental, economic and social dynamics of agricultural sector development by maintaining and improving the quality of soils and consumption products.*

Development of ecologically safe land use with the use of geoinformation technologies is possible due to the creation of a database of enterprises engaged in organic farming, which will provide information not only about the state of land resources, but also about the main causes of soil quality deterioration based on agrochemical indicators.

Due to the nature and complexity of land issues, geoinformation systems help solve land management issues and analyze the agri-environmental status of territories. At the same time, this spatial stratification contributes to the involvement of farmers and local governments in the overall process of improving agriculture and environmental management. Geoinformation systems in agrochemical certification are focused on preventive maintenance, not rehabilitation, and provide methodology and approach to integrate socio-economic, biological and biochemical information needed to improve green land use strategies.

The novelty of this study is to improve the processes of providing landowners with information on soils by creating and filling up a registration database for agricultural enterprises engaged in organic farming based on agrochemical certification.

Keywords: *ecological safety, land management, agroecological zones, geoinformation systems.*

Topicality. The Strategy for the Development of Ukraine's Environmental Policy in 2020 envisages the development of a state environmental monitoring system. The demand for environmentally friendly food is increasing every year and

organic farming is becoming more and more popular. Provision of food for the population is an economic, environmental and social problem of society.

Nowadays, in order to prevent anthropogenic load on agricultural land, it is very important to introduce land use types of environmental orientation such as "rational", "effective", "optimal", "sustainable", "environmentally balanced", "environmentally balanced", "environmentally balanced" , etc. At the same time, the types of land use described should not only be different in name, but also be judged by a set of indicators to which agrochemicals belong.

Agrochemical certification helps to monitor the condition of soils on agricultural lands. This is done in order to detect changes in the state of the land in a timely manner, evaluate them, prevent negative processes and eliminate their consequences. Such passports include initial and current levels of soil nutrient supply and contamination levels.

In order to arrange environmentally safe land use, many different data have to be taken into account: agrochemical characteristics of soils, their state of contamination with toxic substances and radionuclides, etc. This defines the need for a tool that allows you to collect, manage, analyze, report and transmit data both descriptively and spatially. Geoinformation technology is such a tool.

Analysis of recent research and publications. Studies of environmentally friendly agricultural land use have been covered in the works of such authors as Makarenko N.A., Dobryak D.S., Razumny I.A., Bondar V.I., Budyak V.M., Gunko L.A., Sohnych A.Y., Bulygin S.Y., Degtyarev V.V., Tarariko O.G., Demidov O.A. and others. Questions of efficiency of application of geoinformation systems in the rational organization of agricultural land territory were studied by such scientists as Vinogradov B.V., Dovgy S.O., Kohan S.S., Moskalenko A.A., Vostokov A.B., Drozdovsky O.P. An analysis of the latest scientific publications and research in the field of environmentally friendly land use shows the importance of improving the information base used in conducting agrochemical certification.

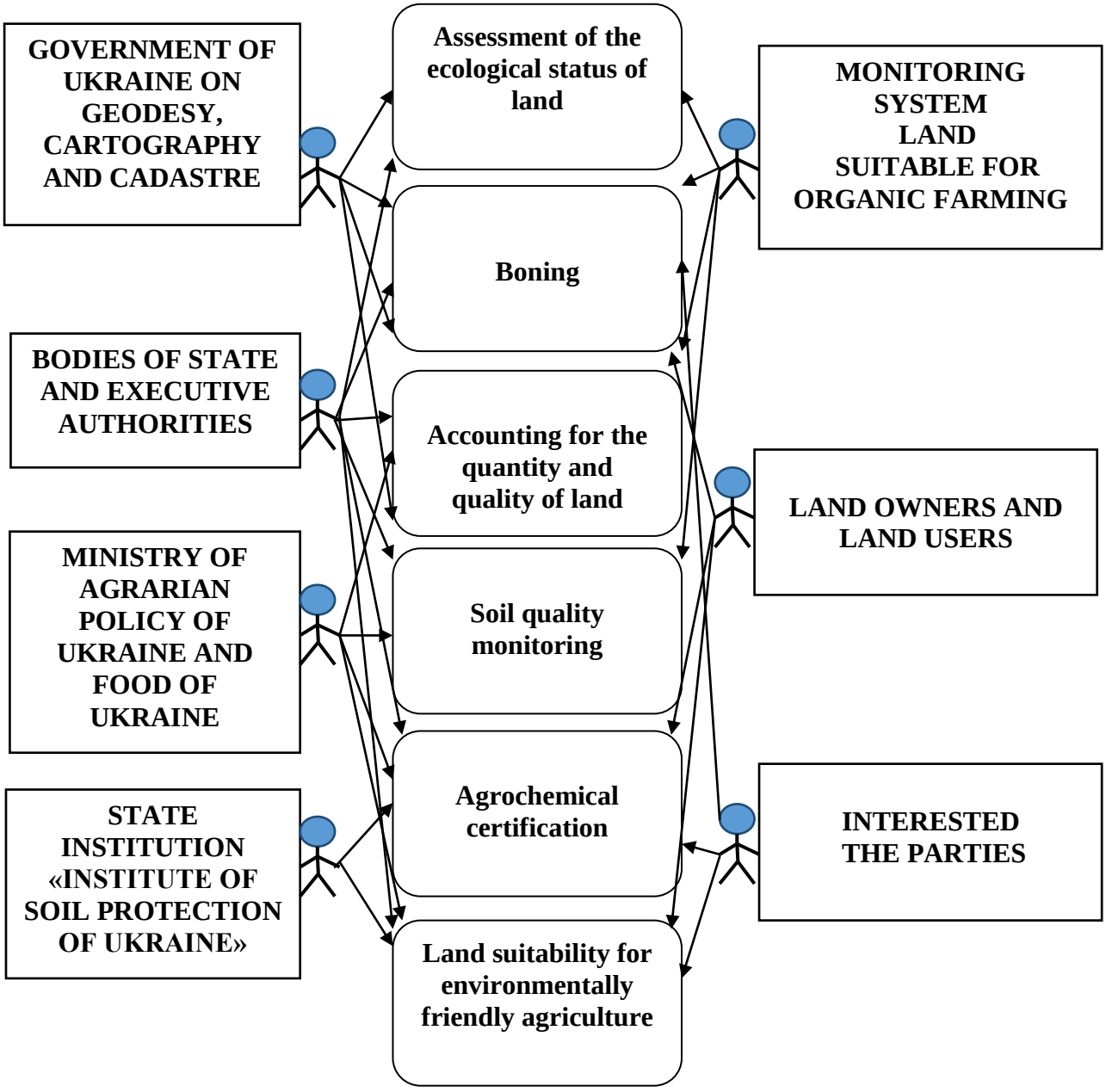
The aim of the study. To substantiate theoretical principles of agrochemical certification of agricultural land, as a necessary informative component of environmentally friendly land use.

Materials and methods of research. The object of the study is the agrochemical certification of agricultural land. Since the relationship between soil and soil cover with other sciences and different aspects of society is very interconnected, the objectives of the study included: investigating the impact of agrochemical certification on the creation of ecologically safe areas suitable for growing organic crop production; simplification of the system of analysis of agrochemical indicators for the use of geoinformation technologies; the needs of the population and the urgency of introducing organic farming; development of agricultural soil cartograms based on agrochemical certification.

The agrochemical certification of the land plot is the result of the monitoring of agricultural land, which is the result of state control over the quality of agricultural land: changes in fertility rates, degree of soil contamination and rational use of agricultural land. According to the purpose and task of agrochemical certification, methods of its research are divided into three groups: laboratory, physiological-agrochemical and field experiments, which are mutually complementary. Recent advances in science and technology, especially in the field of information technology, allow us to reach a new level of soil survey.

For agrochemical testing, Earth's remote sensing data, GPS, GLONASS receivers and automatic samplers are used. The use of modern geoinformation technologies allows to obtain maps of the spatial distribution of agrochemical indices within each field.

Results of the study and their discussion. During the creation of the registration base of agricultural enterprises engaged in growing organic crop production, the data of LLC "SAD" and LLC "Knyazhytske" in the territory of Kyiv region, Brovarsky district were used. It has been determined that consumers are interested in open access to an interactive map with indicators of soil quality and fertility of agricultural land.



Pic.1. Classification of types of tasks and users of ecologically safe land use database

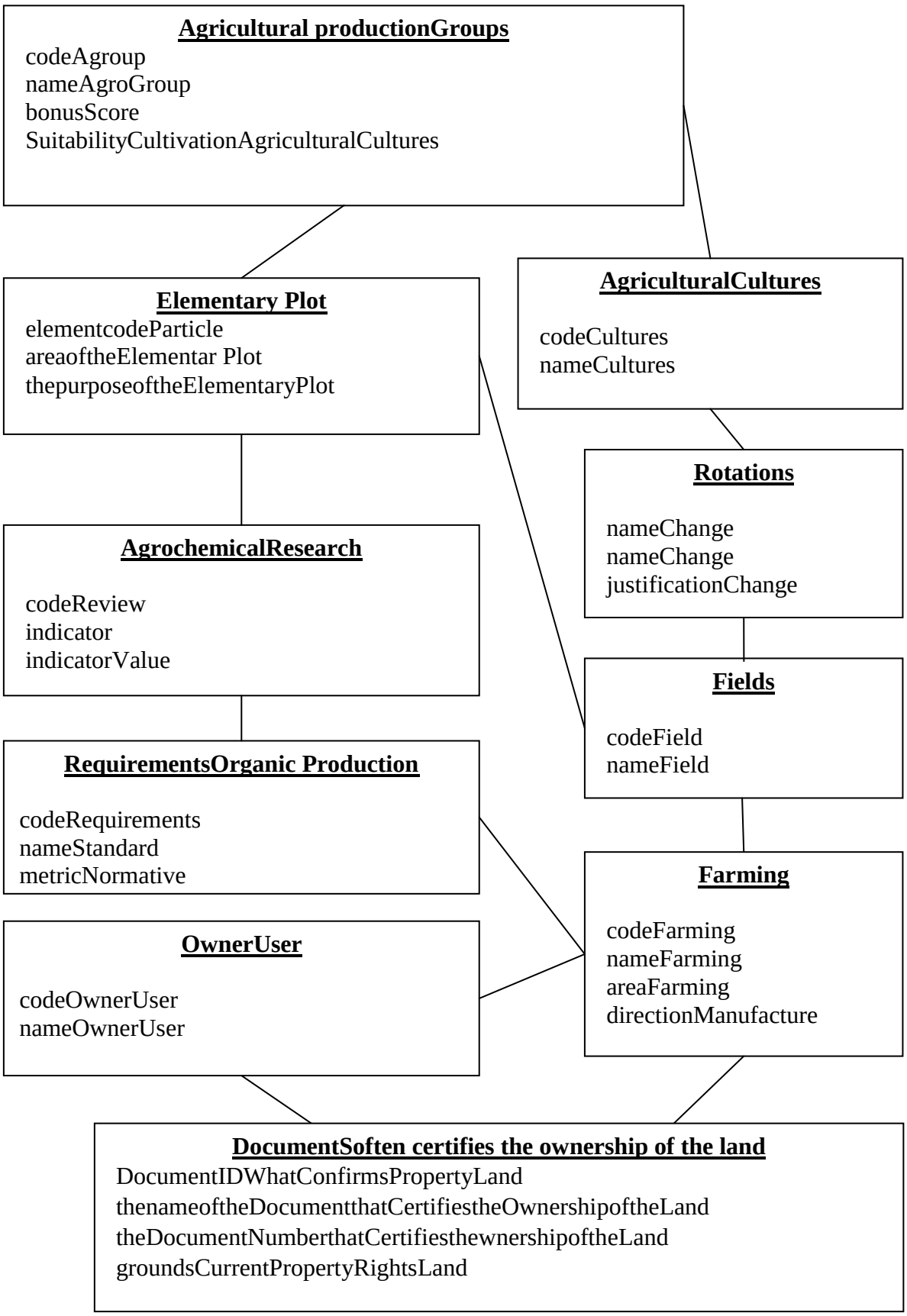
The most interested audience is the unit-holders who rent out their holdings. After conducting the examination and obtaining an agrochemical passport of the field, land, a document is provided in which the real indicators of the soil condition are recorded. Passing it to the tenant discusses the condition that the soils should be in worse condition after the expiration of the lease of the land. Namely, the passport is the only way to assess the quality of the soil cover before the transfer and when returning from the lease of the land allotment (pic. 1)

Optimal land use, in contrast to rational land use, involves establishing environmentally sound and economically viable relationships between different types of agricultural land [4] with the gradual removal of low-productive, heavily eroded and degraded land, that is, balancing anthropogenic and natural systems.

The main tasks of agrochemical certification, which should be facilitated by the creation of GIS, are [3]:

- monitoring of agrochemical parameters;
- control of the environmental situation;
- preparation and maintenance of up-to-date mapping and digital data;
- land management (turnover and use);
- control over the activities of landowners / land users;
- prompt processing of spatial data;
- assessment, zoning and planning of economic and environmental development of territories, etc.

The basis of the organic farming enterprise database is agrochemical certification data, which should include, in addition, agrochemical surveys, information on landowners / land users, crops and crop rotations, land requirements and suitability for organic farming, etc.



Pic.2. Conceptual model of geospatial database for ecological land use

In accordance with the methodology of agrochemical certification, the survey of agricultural land, sampling and processing [1]. The generated results are exported

to a spatially referenced database. Using such software as ArcGIS and digitizing the surveyed areas, entering informative data with subsequent analysis of the results of agrochemical research (pic. 2).

The system allows you to apply layers of soil properties to layers of seeding or yield maps, and to compare them with one another, using modern tools to determine the factors that affect yield. Soil mapping allows you to develop a fertilizer system, pick up the right hybrids for sowing, or analyze how agro-technological measures have affected the yield of a particular land plot. Thematic maps in the land use documentation are graphic materials in electronic and paper forms [2].

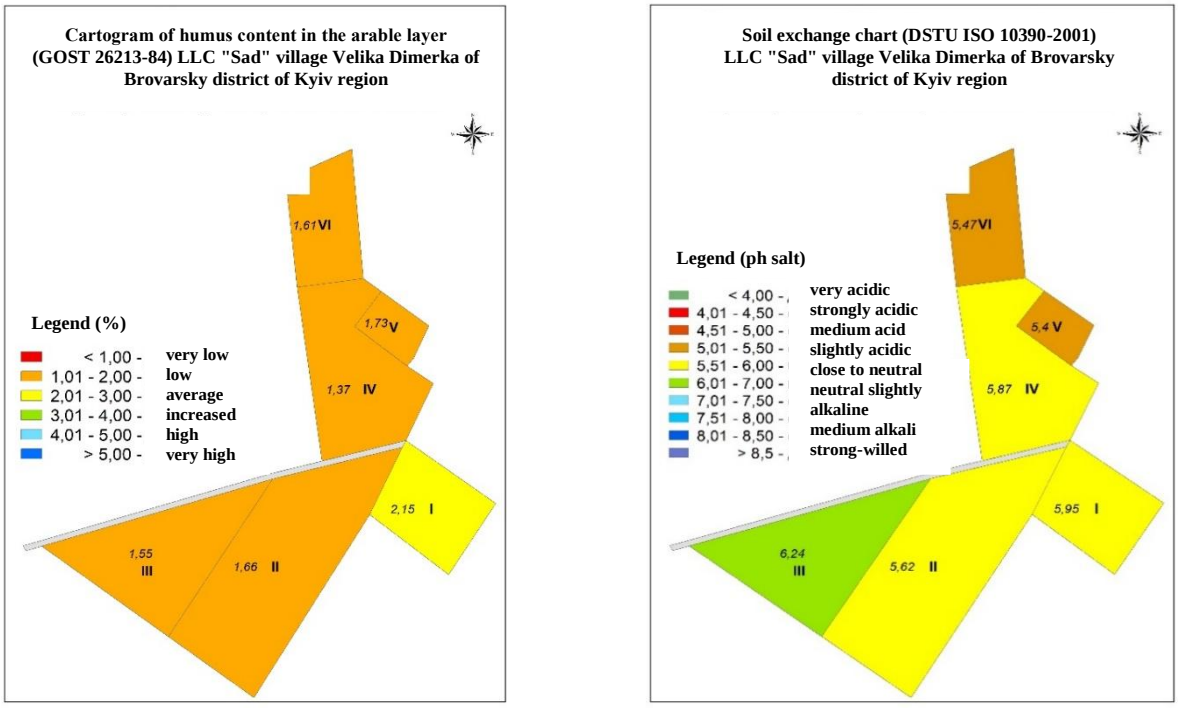
Recently, large agroholdings have been using the remote sensing system and the Global Positioning System (GPS) to sample, create various maps and cartograms, including agrochemicals. In most cases, using a digital agrochemical passport with such accuracy is sufficient. This makes it possible to make agrochemical cartograms with the spatial distribution of nutrients in a particular field, and also enables the introduction of accurate farming (pic. 3, 4).

In general, agrochemical certification of a land is an important tool in the formation of sustainable agricultural land use through the lens of interaction between the legal, technological, environmental and economic environment.

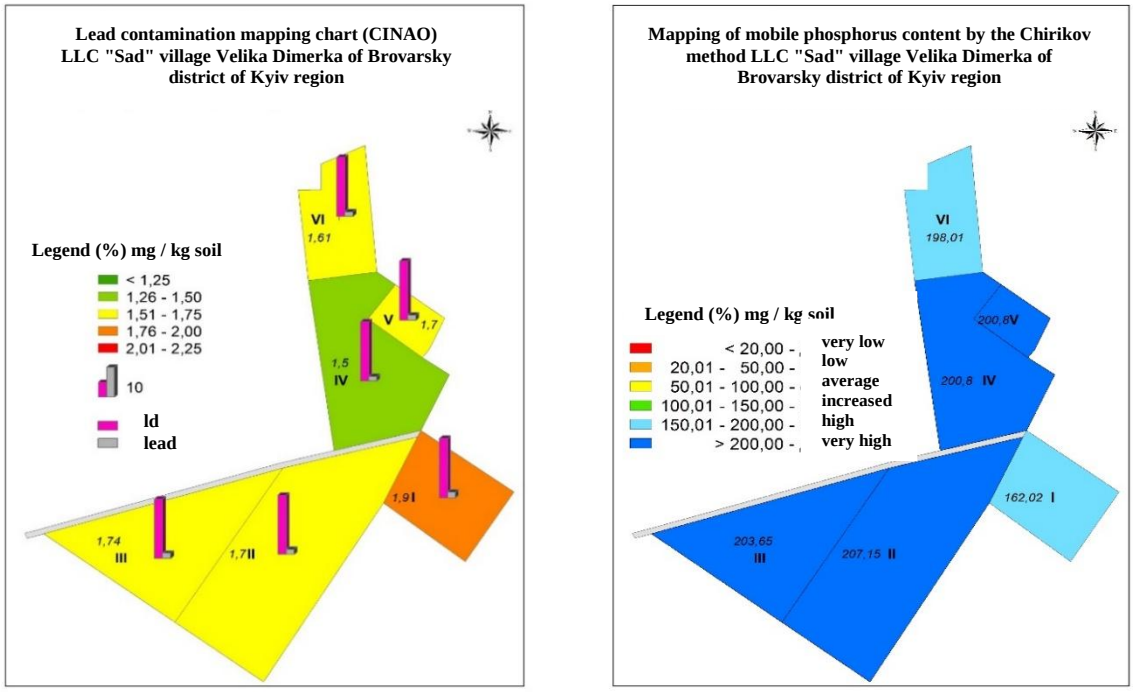
One of the methods of ecologically safe land use is the introduction of organic farming. Agrotechnics should ensure not only high but also stable crop yields, and at the same time soil condition should be monitored on the basis of agrochemical survey of the territories.

Soil conservation and resource conservation agriculture is a widely adapted approach to farming that will ensure more sustainable agricultural production, it is a broader concept. It is a system in which crop rotation is widely practiced and at least 30% of the soil surface is covered with plant residues and the following crop is sown.

Soil quality is evaluated on the basis of physical, chemical and biological parameters. Agrotechnical techniques such as plowing and leaving plant residues can change the quality of the soil.



Pic.3. Agrochemical cartogram of humus and exchange acidity on the example of fields of LLC "SAD".



Pic.4. Agrochemical cartogram of mobile phosphorus and lead contamination on the example of fields of LLC "SAD"

However, changes in soil quality are related not only to crop production technologies but also to environmental factors such as temperature and precipitation.

A comparative assessment of soil quality is the process by which system productivity is determined depending on alternative farming systems. The biotic and abiotic qualities of soil systems in all alternative farming systems are compared over time. This kind of comparison is useful for determining the impact of agricultural technology that has been in use for some period of time.

Agrochemical certification is the main informative source for the introduction of environmentally friendly land use. Thanks to prompt obtaining of qualitative indicators of soil condition, it becomes possible to prevent the depletion of land resources, which contributes to the expansion of enterprises engaged in growing organic crop production.

Organic farming is now considered to be one of the most powerful and effective technologies of agricultural production. Thanks to the use of synthetic compounds, the flow of energy resources to produce environmentally friendly products is reduced. This reduces the risk of using hazardous substances for consumption.

Creating a system of organic agricultural production is an environmentally and economically advantageous area of activity. Establishing a registration base for organic producers of crop production makes it possible to evaluate and compare certain types of farms over a specified period of time using statistical analysis.

Organic farming technology is used to establish ecological balance in and around the organic crop production industry.

Today, GIS is an indispensable means of exploring the challenges of spatial-distributed information, including input and storage of raw information, efficient processing of spatial data, visual and geostatistical analysis, and the preparation of various source mapping and other documents.

The spatial approach of using geoinformation systems makes it possible to use complex multidimensional and multicriteria models in the study of land use processes and the assessment of the negative effects of anthropogenic impact.

Conclusions and Prospects. Modern agricultural technologies require constant monitoring of soil fertility and prompt monitoring of changes taking place

over a wide range of parameters. Nowadays, agrochemical certification is one of the main types of differentiation of agricultural land suitable for ecologically safe land use. The interest of agricultural consumers and land users in the creation of a filled interactive soil map, which will include a complete database containing not only agrochemical soil indicators, crop rotation, but also methods of soil cover cultivation, has been investigated.

ESRI has found a comprehensive approach to addressing the challenges of environmentally friendly land use. The registration database of companies engaged in organic farming based on agrochemical certification in ArcGIS will provide full support for the technological chain of processing agrochemical data, from the introduction of these field observations, the creation of maps of various subjects and the receipt of reporting documentation, as well as to serve as a service agriculture and the formation of an information database by region and region.

The prospect of further research is to develop the structure of the base of enterprises engaged in organic farming based on ArcGIS, which will contain data on the location of the land, agrochemical soil indicators, numbering of fields, crop rotation, degree of soil contamination, suitability for growing products and ecological production

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И. С. Кузьменко

ТЕОРЕТИЧЕСКИЕ ПРИНЦИПЫ ПРОВЕДЕНИЯ АГРОХИМИЧЕСКОЙ ПАСПОРТИЗАЦИИ ДЛЯ ЭКОЛОГОБЕЗОПАСНОГО ЗЕМЛЕПОЛЬЗОВАНИЯ

Аннотация: *Органическое земледелие является перспективным направлением для сельскохозяйственного производства, при условии безопасного и рационального землепользования. Цель устойчивого управления земельными ресурсами - оптимизировать деятельность работников сельского хозяйства для улучшения экологической, экономической и социальной динамики развития аграрного сектора за счет сохранения и повышения качества почв и продуктов питания.*

Развитие экологически безопасного землепользования с использованием геоинформационных технологий возможен за счет создания базы данных предприятий, занимающихся органическим земледелием, которая обеспечит информацией не только о состоянии земельных ресурсов, но и об основных причинах ухудшения качества почв на основе агрохимических показателей.

Из-за характера и сложности земельных вопросов, геоинформационные системы помогают решать вопросы управления землей и анализировать агроэкологическое состояние территорий. В то же время, эта пространственная стратификация способствует включению фермеров и органов местного самоуправления в общий процесс совершенствования земледелия и экологического землеустройства. Геоинформационные системы в проведении агрохимической паспортизации ориентированы на превентивное обслуживание, а не на реабилитацию, и обеспечивают внедрение методологии и подход к интеграции социально-экономической, биологической и биохимической информации, необходимой для улучшения стратегий экологобезопасного землепользования.

Новизна данного исследования заключается в совершенствовании процессов в обеспечение землевладельцев об почвы, путем создания и наполнения базы регистрации сельскохозяйственных предприятий, занимающихся органическим земледелием на основе агрохимической паспортизации.

Ключевые слова: *экологобезопасность, землеустройство, агроэкологические зоны, геоинформационные системы.*

І. С. Кузьменко

ТЕОРЕТИЧНІ ЗАСАДИ ПРОВЕДЕННЯ АГРОХІМІЧНОЇ ПАСПОРТИЗАЦІЇ ДЛЯ ЕКОЛОГОБЕЗПЕЧНОГО ЗЕМЛЕКОРИСТУВАННЯ

Анотація: *Органічне землеробство є перспективним напрямком для сільськогосподарського виробництва, за умови екологічно безпечного та раціонального землекористування. Мета сталого управління земельними ресурсами - оптимізувати діяльність працівників сільського господарства для покращення екологічної, економічної та соціальної динаміки розвитку аграрного сектору за рахунок збереження та підвищення якості ґрунтів та продуктів споживання.*

Розвиток екологічно безпечного землекористування за використання геоінформаційних технологій можливий за рахунок створення бази даних підприємств, що займаються органічним землеробством, яка забезпечить інформацією не тільки про стан земельних ресурсів, а й про основні причини погіршення якості ґрунтів на основі агрохімічних показників.

Через характер та складність земельних питань, геоінформаційні системи допомагають вирішувати питання управління землею та аналізувати

агроекологічний стан територій. У той же час, ця просторова стратифікація сприяє включенню фермерів та органів місцевого самоврядування у загальний процес вдосконалення землеробства та екологічного землеустрою. Геоінформаційні системи в проведенні агрохімічної паспортизації орієнтовані на превентивне обслуговування, а не на реабілітацію, та забезпечують впровадження методології та підхід до інтеграції соціально-економічної, біологічної та біохімічної інформації, необхідної для покращення стратегій екологобезпечного землекористування.

Новизна даного дослідження полягає у вдосконаленні процесів о забезпечення землевласників інформацією про ґрунти, шляхом створення та наповнення бази реєстрації сільськогосподарських підприємств, що займаються органічним землеробством на основі агрохімічної паспортизації.

Ключові слова: *екологобезпечність, землевпорядкування, агроекологічні зони, геоінформаційні системи.*